NATIONAL ADULT CARDIAC SURGERY AUDIT (NACSA)

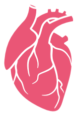
2020 SUMMARY REPORT
(2016/17-2018/19 DATA)

NICOR

CONTENTS

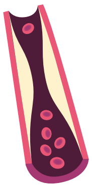
EXECUTIVE SUMMARY

PROCEDURE NUMBERS



34,000

The total numbers of cardiac surgical operations performed in the UK has been gradually falling over the last 10 years, but the numbers over the last 3 years of this audit have been largely the same. In 2008/9 there were 41,586 procedures performed compared to an average of around 34,000 per year during the last 3 years (2016/19).



7000 cases

Coronary artery bypass graft surgery (CABG) continues to be the commonest operation, but there has been a gradual drop in the cases performed over time. This is almost entirely due to the decrease in the numbers of elective cases (from 8,592 in 2016/17, to 6,996 in 2018/19). The numbers of urgent CABG cases are unchanged over the last 3 years (with around 7,000 cases each year).

MORTALITY/SURVIVAL RATES

The mortality rates following cardiac surgery (overall, including emergencies) have been falling since the first data were collected, and in particular over the past 13 years (from 3.61% in 2006/07 to 2.59% in 2018/19). It appears that this improvement may have plateaued over the last 5 years.

The mortality rates following CABG surgery in the UK are excellent with mortality rates of around 1% for non-emergency cases (giving 99% survival rates following surgery). In 2018/19 the mortality following elective CABG was 0.74%, and for urgent CABG 1.32%.

1.1.1 TIMELINESS OF URGENT CABG OPERATIONS

There has been no improvement in proportion of urgent CABG operations performed within the target of 7 days of coronary angiography. No hospital met the 75% target, with only 6 achieving the target in >50% of patients in 2018/19. In England as a whole only 34.9% of patients met the target in 2018/19 (with worse performance seen in the other 3 nations).

DAY OF SURGERY ADMISSIONS FOR ELECTIVE OPERATIONS

There has been some improvement in proportion of elective cardiac operations with day of surgery admission (DOSA), but many more patients could be offered this. Only one hospital met the target (of >50% of elective admissions), with only 3 hospitals managing to achieve >30%. In the UK it has increased from 9.7% (2016/17) to 12.8% (2018/19), with England the best performing nation (13.7% in 2018/19).

WAITING TIMES FOR ELECTIVE CABG OPERATIONS

There has been no improvement in waiting times for elective CABG. Overall mean waiting times (from angiography to surgery) have increased in the UK from 95 to 107 days over the 3 years (2016/17 to 2018/19). Only seven NHS hospitals achieved mean waiting times of less than 12 weeks in 2018/19. Seven hospitals had waiting times of >20 weeks, with evidence of worsening performance in 6 out of 7 of them in the last year.

POST-OPERATIVE LENGTH OF STAY

7.8 days

Patients are experiencing a shorter post-operative length of stay (PLOS) following first time CABG. The mean PLOS has fallen from 8.1 to 7.8 days across the UK over the last 3 years. However, there is a large variation in PLOS between the best and worst units from an average of 6.2 to 11 days (2018/19).

FOCUS ON AORTIC VALVE REPLACEMENT

Over the past 3 years the numbers of isolated aortic valve replacement (AVR) and combined AVR & CABG operations have fallen. This has corresponded to a time when transcatheter aortic valve implantation (TAVI) rates are increasing. For the first time, in 2018/19 the numbers of TAVI cases (5,197) have overtaken isolated AVR (5,091). Overall the total number of all procedures for aortic valve disease has continued to increase in the UK over the past 5 years.

The mortality rates for isolated AVR surgery in the UK are excellent, with rates of 0.9% for patients under 75 years of age, and between 1.2 to 1.3% for those over 75 years. The mortality rate has been lower than predicted by EuroSCORE 2 with 0.7%, 2.2% and 6.1% mortality seen in the low, medium and high risk (predicted <4%; 4-8%; >8% risk) groups respectively.

98.2%

The majority of isolated AVR operations were performed with the implantation of a bioprosthesis. There was a big variation in the usage rates of bioprostheses between hospitals from 63.3% to 94.1%, compared to 82.5% overall in the UK. The vast majority (98.2%) of patients over the age of 70 received a bioprosthesis. However, the biggest variation is seen in patients under the age of 60, and the rates of bioprosthesis usage between hospitals, from 74% to 14.9%, compared to 39.9% for the UK as a whole.

FOCUS ON SURGERY FOR ACUTE AORTIC DISSECTION

During the three year audit period (2016/19) there were just over 400 cases per year of emergency surgery performed for acute aortic dissection in the UK. The mean number of cases performed by each unit was 11.7 per year. There is a wide variation in throughput, with the largest UK unit performing 32 cases and the smallest only 2.7 per year on average. The UK mean mortality rate (in hospital) during this time was 17.7%. There is possibly a trend towards hospitals performing >12 cases of aortic dissection surgery per year having a lower mortality rate (16.3% vs 19.6%, P=0.12) compared to those hospitals performing fewer operations, however this was not statistically significant.

1. INTRODUCTION

This annual report looks at all Adult Cardiac Surgery undertaken in the UK over the past 3 years - between 1st April 2016 and 31st March 2019. It is a summary of all the NHS hospitals around the UK, as well as five private hospitals and one hospital from the Republic of Ireland.

The data are complete for all NHS work in England, Wales and Northern Ireland. Unfortunately, due to unresolved data protection issues at the time of analysis, this is the first report in over 10 years that does not have complete data from every hospital in the UK for the last financial year (2018/19). This relates more to issues around permission to transmit data to NICOR than non-compliance with the audit. Data have not been submitted from 5 hospitals (2 NHS in Scotland and 3 Private providers in England). Sadly, this makes some year to year comparisons incomplete at a UK level. However, where this occurs it is highlighted within the report and tables. It is anticipated that this will have been resolved for next year's report.

1.1 ACTIVITY LEVELS AND TRENDS: SIMILAR NUMBERS OF OPERATIONS OVERALL, BUT FEWER ELECTIVE CABG OPERATIONS

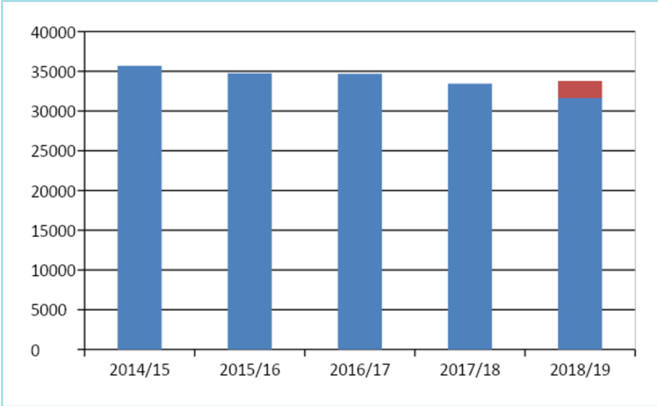
The total numbers of cardiac surgical operations performed in the UK has been gradually falling over the last 10 years. In 2008/9 there were 41,586 procedures performed compared to an average of around 34,000 per year during the last 3 years (2016/19). Data are incomplete from 5 hospitals in 2018/19, but when an estimate of throughput for this last year is made by adding the case numbers (2,134 operations) of those 5 hospitals in 2017/18 to the UK total for 2018/19 there appears to be no drop in cases over the last year of the audit [Figure 1 and Table 1].

Table 1: *Numbers of cardiac operations performed each year in the UK for past 5 years*

	2014/15	2015/16	2016/17	2017/18	2018/19
All procedures - UK	35,685	34,752	34,670	33,440	31,642

Data missing from 2 Scottish and 3 private hospitals in 2018/19.

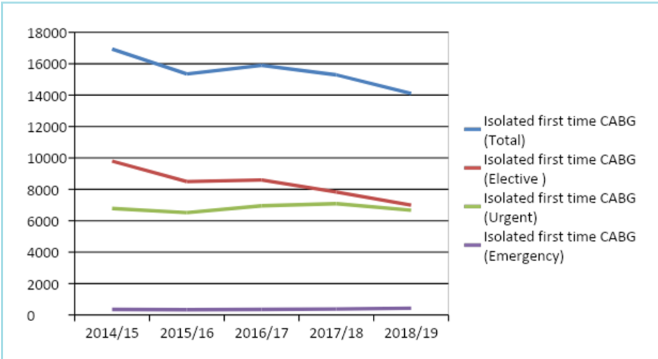
Figure 1: *Numbers of cardiac operations performed each year in the UK for past 5 years*



Data missing from 2 Scottish and 3 private hospitals in 2018/19. An estimate of caseload number (shown in figure) from these 5 units (2,134 operations based on 2017/18) added to 2018/19, shows very little difference in UK annual throughput between the last 2 years of the audit).

Coronary artery bypass graft surgery (CABG) continues to be the commonest operation, however there has been a gradual drop in the cases performed over time [Figure 2 and Table 2]. This change is almost entirely due to the decrease in the numbers of elective cases (where patients are admitted from home for a planned operation). The numbers of urgent CABG cases (which are usually performed on inpatients in the days following an admission with an MI) are unchanged each year. Emergency CABG procedures (which cannot wait and which are performed on the day of referral for surgery) are relatively uncommon. This is likely to be due to the success of PCI as treatment for a lot of these types of very unstable cases.

Figure 2: *Numbers of isolated CABG operations in the UK (total and divided into operative urgency)*



Data missing from 2 Scottish and 3 private hospitals in 2018/19.

Table 2: *Numbers of isolated CABG operations in the UK (total and divided into operative urgency)*

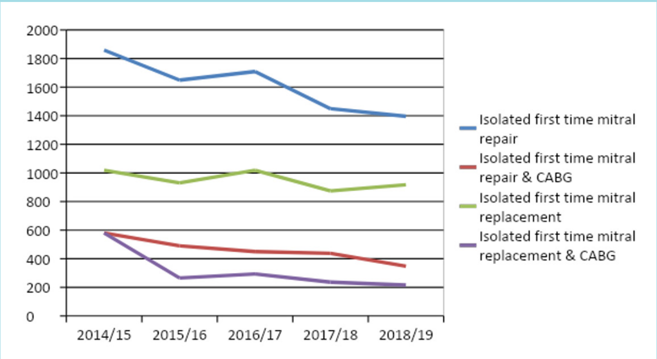
	2014/15	2015/16	2016/17	2017/18	2018/19
Isolated first time CABG (Total)	16,935	15,345	15,897	15,289	14,098
Isolated first time CABG (Elective)	9,800	8,500	8,592	7,826	6,996
Isolated first time CABG (Urgent)	6,782	6,512	6,951	7,086	6,668
Isolated first time CABG (Emergency)	353	333	354	377	434

Data missing from 2 Scottish and 3 private hospitals in 2018/19.

Operations on heart valves, either with or without combined CABG surgery, form the bulk of the remaining cardiac procedures performed in the UK. The commonest of these are operations on the aortic valve, usually for aortic stenosis (a narrowing of the valve). The advent of TAVI (transcatheter aortic valve implantation) has transformed the treatment of aortic valve disease, especially in very elderly patients. For the first time TAVI has overtaken surgical aortic valve replacement (AVR) in 2018/19 for the UK as a whole. More focussed audit data on AVR are included later in this report (see Section 7).

The trends for mitral valve operations are shown in Figure 3 and Table 3. Mitral valves can either be replaced (MVR) or repaired. In patients with a degenerative valve that is leaking, a mitral valve repair is usually preferred where it is technically feasible. Patients with narrowed (stenotic) valves, or with valves that cannot be repaired, will usually have their valves replaced. Although mitral valve repair is generally the recommended option, the numbers of cases in the UK have been falling over the last 5 years. Also, the numbers of patients having mitral surgery (repair or replacement) combined with CABG has been falling over time.

Figure 3: *Numbers of cases of mitral operations in the UK with and without concomitant CABG*



Excludes redo operations and cases where other valves also operated on. Data missing from 2 Scottish and 3 private hospitals in 2018/19.

Table 3: *Numbers of cases of mitral operations in the UK with and without concomitant CABG*

	2014/15	2015/16	2016/17	2017/18	2018/19
Isolated first time mitral repair	1,859	1,649	1,709	1,449	1,396
Isolated first time mitral repair & CABG	580	490	450	438	348
Isolated first time mitral replacement	1,019	930	1,019	874	917
Isolated first time mitral replacement & CABG	580	265	293	236	216

Excludes redo operations and cases where other valves also operated on. Data missing from 2 Scottish and 3 private hospitals in 2018/19.

1.2 REASSURINGLY LOW MORTALITY RATES BUT VARIABLE MORBIDITY RATES

For the purposes of this audit, death following cardiac surgery is defined as occurring when a patient dies during the hospital admission during which the operation takes place. This may be during the operation itself, or many weeks (or even months) later if the patient never leaves hospital following their surgery. Hospitals submit their mortality data to NICOR and this is then cross-checked and validated against the ONS death certificate data. The death may be as a result of the surgery or a separate disease or problem during that admission. Deaths that occur after discharge to home are not counted (however soon after surgery).

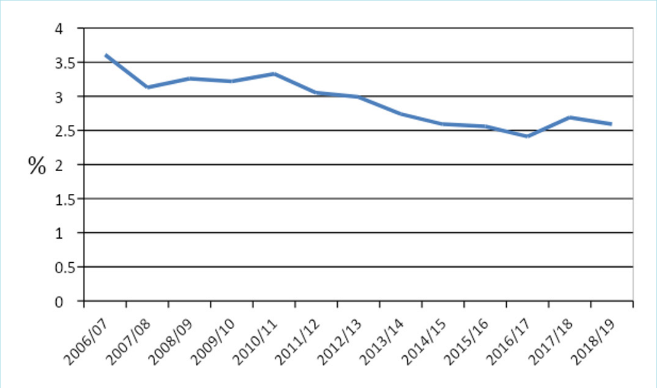
The National Adult Cardiac Surgery audit (NACSA) forms part of the Clinical Outcomes Publication (COP) which monitors and publishes outcomes and survival rates for all hospitals and consultants performing adult cardiac surgery. This information is published separately elsewhere (www.SCTS.org).

The mortality rates following cardiac surgery overall have been falling over the decades since the first data were collected, and in particular over the past 13 years [Figure 4 and Table 4]. It appears that this improvement over time may have plateaued over the last 5 years.

Table 4: *Crude annual mortality rates (%) following all cardiac surgery (including emergencies) in the UK since 2006*

2006/07	2007/08	2008/09	2009/10	2010/11	2011/12	2012/13	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19
3.61	3.13	3.26	3.22	3.33	3.05	2.99	2.74	2.59	2.56	2.41	2.69	2.59

Figure 4: *Crude annual mortality rates (%) following all cardiac surgery (including emergencies) in the UK since 2006*



Excludes redo operations and cases where other valves also operated on. Data missing from 2 Scottish and 3 private hospitals in 2018/19.

The mortality rates for the last 5 years following CABG surgery are shown in Figure 5 and Table 5. Overall the rates in the UK are excellent with mortality rates of around 1% for non-emergency cases (giving 99% survival rates following surgery). In 2018/19 the mortality following elective CABG was 0.74%, and for urgent CABG 1.32%.

Figure 5: *Mortality rates (%) following isolated first time CABG (for UK)*

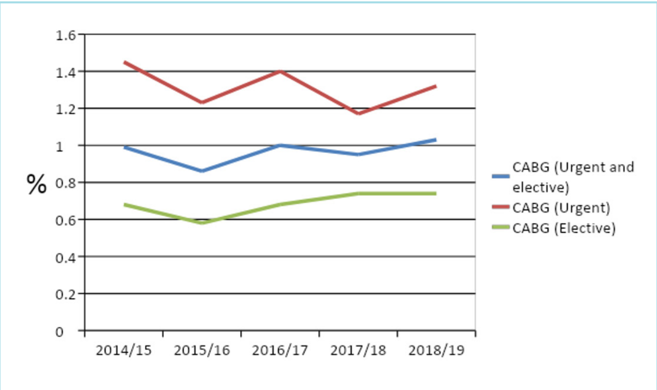


Table 5: *Mortality rates (%) following isolated first time CABG (for UK)*

UK	2014/15	2015/16	2016/17	2017/18	2018/19
CABG (Urgent and elective)	0.99	0.86	1.0	0.95	1.03
CABG (Urgent)	1.45	1.23	1.4	1.17	1.32
CABG (Elective)	0.68	0.58	0.68	0.74	0.74

Mortality rates following different types of mitral valve surgery are shown in Figure 6 and Table 6. Results following isolated mitral repair surgery are excellent with mortality rates of just over 1% during the last 5 years. As would be expected, the addition of CABG increases the risk of both MVR and mitral repair operations. These patients have a combination of both coronary artery and valve disease, are usually a sicker cohort and often have a different pathology (ischaemic rather than degenerative) within their mitral valve. MVR and CABG combined is the highest risk with a mortality of 7.61% in 2018/19. This compares to reported rates in the UK of around 11% in 2001 (National Adult Cardiac Surgical Database report 2000/2001).[1]

Figure 6: *Mortality rates (%) following different types of mitral surgery (with or without CABG) in the UK. Excludes emergencies and patients having other concomitant procedures. MVR mitral valve replacement.*

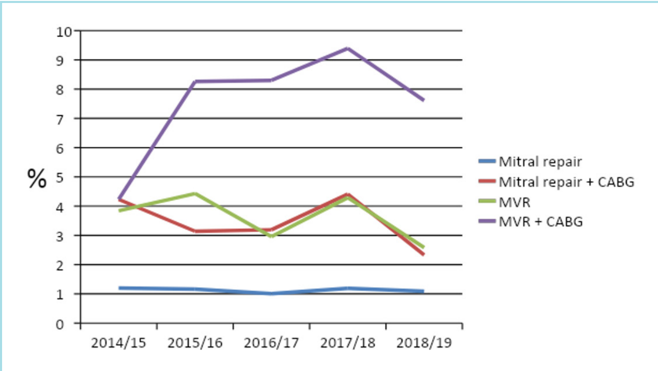


Table 6: *Mortality rates (%) following different types of mitral surgery (with or without CABG) in the UK*

	2014/15	2015/16	2016/17	2017/18	2018/19
Mitral repair	1.2	1.16	1.01	1.19	1.09
Mitral repair + CABG	4.23	3.14	3.19	4.41	2.33
MVR	3.84	4.43	2.96	4.29	2.58
MVR + CABG	4.23	8.26	8.3	9.39	7.61

Excludes emergencies and patients having other concomitant procedures. MVR mitral valve replacement.

Overall mortality rates following cardiac surgery are now generally low in the UK and may not, on their own, reflect the quality of care given by individual hospitals. There are many complications of cardiac surgery that patients particularly fear, including postoperative stroke and deep sternal wound infection.

The rates of several measures of morbidity following CABG surgery are shown here within an interactive report. These demonstrate rates of complications (including reoperation for bleeding, reoperation for deep wound infection, post op stroke and post op kidney failure) at UK level, as well as at the four nation and individual hospital levels.

Data completeness and accuracy is less good for the morbidity measures within the dataset than it is for mortality. However, many units do achieve 100% for most measures and this should be the aim for all units, in order to allow fair comparisons. Where units are obvious outliers with apparently very high rates of complications this is often due to poor data submission by that unit. Units with very low rates of complications may also be under-reporting. There are now new tools within the online dataset at NICOR that allow units and audit leads to continuously monitor their data completeness.

For the UK as a whole, the complications following first time CABG surgery in 2018/19 include a 2.87% rate for the need to return to theatre post-operatively (for any cause); and a return to theatre (for bleeding) rate of 2.3%. Both of these rates have reduced slightly since 2017/18 from 3.11% and 2.59% respectively. The rate of deep sternal wound infection (serious enough to require surgery to treat it) has remained about the same at 0.33%. The rate of any new post-operative stroke (CVA or TIA combined) was 0.93% (compared to 0.6% in 2017/18); and kidney failure (requiring renal support therapy) was 1.33% (1.61% in 2017/18).

2. QUALITY IMPROVEMENT METRICS

2.1 NO IMPROVEMENT IN PROPORTION OF URGENT CABG PERFORMED WITHIN 7 DAYS OF CORONARY ANGIOGRAPHY

QI Metric Description/Name	Urgent CABG performed within 7 days of coronary angiography
Why is this important?	Most patients with NSTEMI requiring revascularisation with CABG should be operated on during the same hospital admission (ESC/EACTS Revascularisation Guidelines 2018).[2] This is because the highest risk of a further MI or death is in the first month following the initial presentation. Timely surgery is therefore associated with better patient outcomes. Patients usually require 5 days antiplatelet therapy cessation prior to surgery in order to reduce the risks of bleeding at surgery. The optimal window for surgery is between 5 to 7 days following diagnosis (and referral). Longer waits for surgery as an inpatient uses considerable hospital resources and blocks ward beds from allowing other admissions.
QI theme	Safety and Effectiveness
What is the standard to be met?	The Commissioning for Quality and Innovation framework (CQUIN) target recommended that 100% of patients should meet the target of undergoing urgent CABG within 7 days of angiography.[3] In the 2019 NCAP report no NHS centre met this target. As a result a revised target of 75% was set for this audit cycle.
Key references to support the metric	ESC/EACTS Revascularisation Guidelines[2] CQUIN target[3]
Numerator	All patients requiring urgent first time CABG receiving this within 7 days of the diagnostic angiogram
Denominator	All patients requiring urgent first time CABG
Trend	No significant improvement over the last three years
Variance	Only 6 centres achieve this in over 50% of cases; no centre achieves the standard.

The proportion of patients undergoing urgent CABG within 7 days of referral is shown in Figure 7 and Table 7. There is considerable regional variation with the best performance in England compared to the other 3 nations, with around 35% of patients achieving the target. However, this is still much worse than the target of 75%. There has been no evidence of improvement over the last 3 years in any region.

Figure 7: *Proportion (%) of urgent CABG performed within 7 days of coronary angiogram by UK region*

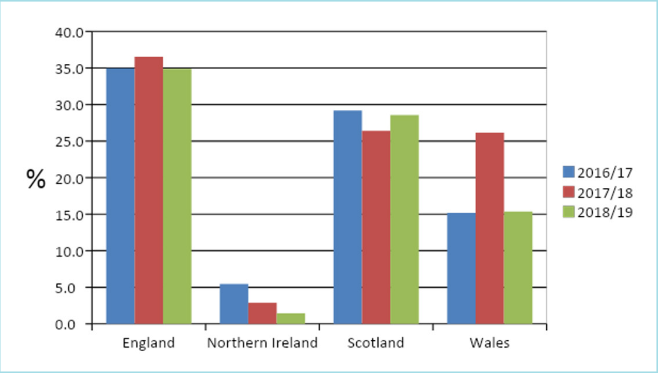


Table 7: *Proportion (%) of urgent CABG performed within 7 days of coronary angiogram by UK nation*

	2016/17	2017/18	2018/19
England	35.0	36.6	34.9
Northern Ireland	5.5	2.9	1.5
Scotland	29.2	26.4	28.6
Wales	15.2	26.1	15.4

Hospital level data are shown in Table 8. No hospital met the 75% target, with only 6 achieving the target in >50% of patients in 2018/19.

Table 8: *Proportion (%) of urgent CABG performed within 7 days of coronary angiogram by Hospital (ranked by highest for 2018/19, audit target is 75%)*

Hospital	2016/17	2017/18	2018/19
James Cook University Hospital	48.2	57.2	61.5
St George's Hospital	47.4	59.7	55.0
University Hospital Coventry	43.3	57.0	54.9
University Hospital of North Staffordshire	56.4	60.1	54.6
Harefield Hospital	36.2	37.5	53.8
New Cross Hospital	48.1	51.4	51.1
Barts and the London	43.0	65.6	48.1
Freeman Hospital	47.6	50.0	45.2
King's College Hospital	50.7	47.5	45.1
Manchester Royal infirmary	33.8	54.7	41.2
Papworth Hospital	31.4	21.3	32.1
St Thomas Hospital	42.1	34.0	32.0
Liverpool Heart and Chest Hospital	13.7	19.4	31.8
Bristol Royal Infirmary	41.4	33.3	31.2
Royal Brompton Hospital	30.6	34.6	30.9
Mater Misericordiae Hospital	25.0	36.8	30.0
Blackpool Victoria Hospital	33.9	27.1	29.7
John Radcliffe Hospital	23.9	29.0	29.3
Southampton General Hospital	30.1	34.4	28.8
Aberdeen Royal infirmary	19.2	18.8	28.6
Glenfield Hospital	34.7	29.6	27.2
Hammersmith Hospital	38.2	35.5	26.9
Wythenshawe Hospital	41.8	30.1	24.5
Nottingham City Hospital	13.3	15.2	23.5
Basildon Hospital	41.2	33.6	22.4
Morriston Hospital	19.1	37.8	20.5
Leeds General Infirmary	24.2	36.8	16.7
University Hospital of Wales	13.5	22.4	13.8
Derriford Hospital	21.4	16.9	13.3
Castle Hill Hospital	13.6	14.2	10.4
Queen Elizabeth Hospital, Edgbaston	23.9	17.8	8.7
Northern General Hospital	11.1	9.5	8.1
Royal Victoria Hospital	5.5	2.9	1.5
Royal Infirmary of Edinburgh	47.0	49.2	No data
Golden Jubilee Hospital	26.8	23.1	No data

Recommendations for those not achieving the standard

Hospitals not reaching the target should undertake a review of their processes to identify where delays occur and how these can be avoided. If necessary, advice should be sought from centres with evidence of the best performance. A QI action plan should be instigated to reduce delays.

2.2 SOME IMPROVEMENT IN PROPORTION OF ELECTIVE CARDIAC OPERATIONS WITH DAY OF SURGERY ADMISSION (DOSA) BUT MORE PATIENTS COULD BE OFFERED THIS

QI Metric Description/Name	Day of surgery admission for elective CABG
Why is this important?	Admission to hospital 24 hours prior to elective surgery is inefficient and an unnecessary and expensive use of ward beds. Units should have processes and protocols in place to allow thorough preoperative assessment (including for anaesthesia) without the need for admission the day before an operation. These processes may also reduce the need for last minute theatre cancellations (due to more timely pick up of other comorbidities).
QI theme	Effectiveness
What is the standard to be met?	At least 50% of elective patients should be admitted on the day of surgery
Key references to support the metric	Get it Right First Time [GIRFT] report 2018 [4]
Numerator	All patients undergoing elective CABG who were admitted on the same day as the day of surgery
Denominator	All patients undergoing elective first time CABG
Trend	Gradual improvement over three years but still at a low level: from 9.7% to 12.8%
Variance	Only 1 centre has achieved the target and only 3 centres have achieved this for >30% of patients.

The proportion of patients admitted for elective cardiac surgery on the day of their operation is shown for each UK region in Figure 8 and Table 9. There is a gradual upward trend but no region met the 50% target. The best results were in England with 13.7% meeting this target in 2018/19. Overall in the UK there appears to have been a slight improvement over the 3 years, but not to a level that is close to achieving the GIRFT recommended levels.

Figure 8: *Proportion (%) of elective cardiac operations with day of surgery admission by UK nation*

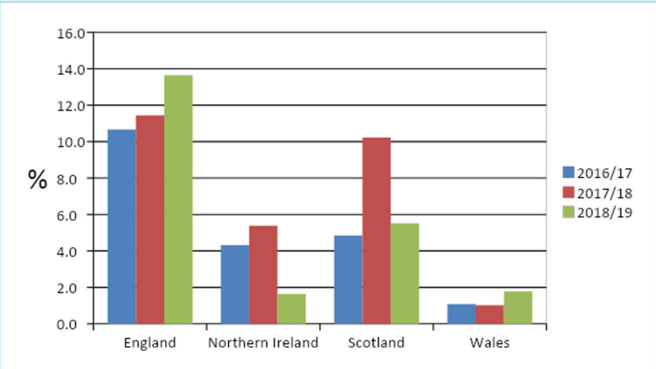


Table 9: *Proportion (%) of elective cardiac operations with day of surgery admission by UK nation*

Nation	2016/17	2017/18	2018/19
UK	9.7	10.8	12.8
England	10.7	11.4	13.7
Northern Ireland	4.3	5.4	1.6
Scotland	4.9	10.2	5.5
Wales	1.1	1.0	1.8

Hospital level data for DOSA are shown in Table 10. Only one hospital met the target (Blackpool), with only 3 hospitals managing to achieve >30%.

Table 10: *Proportion (%) of elective cardiac operations with day of surgery admission by Hospital (ranked by highest for 2018/19, audit target is 50%)*

Hospital	2016/17	2017/18	2018/19
UK	9.7	10.8	12.8
Blackpool Victoria Hospital	73.5	68.6	70.7
James Cook University Hospital	44.2	41.7	47.4
Southampton General Hospital	43.5	39.8	38.6
Liverpool Heart and Chest Hospital	0.5	3.1	23.6
Papworth Hospital	27.5	22.4	22.3
Harefield Hospital	2.7	1.4	21.9
John Radcliffe Hospital	15.1	27.3	17.3
University Hospital of North Staffordshire	13.8	15.7	17.0
Bristol Royal Infirmary	16.6	12.7	16.7
Freeman Hospital	8.0	8.1	15.9
King's College Hospital	14.7	15.4	9.5
University Hospital Coventry	3.8	6.9	8.6
Royal Brompton Hospital	1.4	1.5	8.1
St George's Hospital	7.6	9.4	6.7
Basildon Hospital	4.3	4.2	6.5
Barts and the London	3.1	3.7	5.8
Aberdeen Royal Infirmary	13.0	23.3	5.5
Spire St Anthony's Hospital (PP)	1.0	5.6	5.3
Leeds General Infirmary	4.4	6.9	5.3
Derriford Hospital	1.6	2.3	3.8
St Thomas' Hospital	0.2	No data	3.2
Morriston Hospital	1.8	0.6	2.9
Queen Elizabeth Hospital, Edgbaston	1.4	0.9	2.5
Royal Victoria Hospital	4.3	5.4	1.6
Hammersmith Hospital	2.4	2.8	1.6
New Cross Hospital	0.5	1.2	1.4
Manchester Royal Infirmary	3.1	0.6	1.3
Royal Sussex County Hospital	0.9	1.1	1.2
Wythenshawe Hospital	0.8	1.4	1.0
University Hospital of Wales	0.6	1.4	0.6
Spire Southampton Hospital (PP)	1.0	1.6	0.5
Northern General Hospital	0.2	0.2	0.5
Glenfield Hospital	0.4	0.5	0.3
Nottingham City Hospital	0.3	1.6	0.3
Wellington Hospital North (PP)	15.4	56.0	No data
Harley Street Clinic (PP)	11.6	28.0	No data
Cromwell Hospital (PP)	21.9	22.2	No data
London Bridge Hospital (PP)	16.9	22.1	No data
Golden Jubilee Hospital	2.8	9.7	No data
Royal Infirmary of Edinburgh	4.5	5.2	No data
Castle Hill Hospital	0.2	No data	No data

PP = private hospital.

Recommendation for those not achieving the standard

Hospitals not reaching the target should undertake a review of their processes to identify the barriers to achieving this target (such as introducing pre-assessment clinics). If necessary, advice should be sought from centres with evidence of the best performance. A QI action plan should be instigated to achieve this target.

2.3 | NO IMPROVEMENT IN WAITING TIMES FOR ELECTIVE CABG

QI Metric Description/Name	Waiting times for elective CABG
Why is this important?	Patients should not wait any longer than necessary for elective coronary artery surgery that is expected to improve both symptoms and/or life expectancy
QI theme	Safety
What is the standard to be met?	NHS England target of 18 weeks (126 days) from GP referral to treatment (but this includes several other steps in the pathway prior to final referral for surgery), meaning that the portion from the performance of diagnostic investigations to the treatment should be considerably less than 18 weeks. The finding of an abnormality on the coronary angiogram is usually the point that triggers the consideration of a referral for cardiac surgery. This time (from angiogram to operation) is the portion of the patient pathway that surgical teams can influence. A target of 84 days means that the surgical team has taken 67% (12 weeks) of the referral-to-treatment time.
Key references to support the metric	NHS England Commissioning target
Numerator	All patients undergoing elective first time CABG
Denominator	Not applicable
Trend	Mean waiting times have increased in the UK from 95 to 107 days over the last three years. They have fallen in Northern Ireland but increased in England and Wales.
Variance	Only seven NHS hospitals achieved mean waiting times of less than 12 weeks from angiography to surgery in 2018/19. Seven hospitals had waiting times of >20 weeks, with evidence of worsening performance in 6 out of 7 of them in the last year.

Waiting times for elective CABG by UK region are shown in Figure 9 and Table 11. Overall mean waiting times have increased in the UK from 95 to 107 days over the 3 years. Times have improved in Northern Ireland, but are still longer than in the UK as a whole. Waiting times are getting longer in England and Wales.

Figure 9: *Waiting time (mean days) from angiogram to operation date for elective CABG by UK nation*

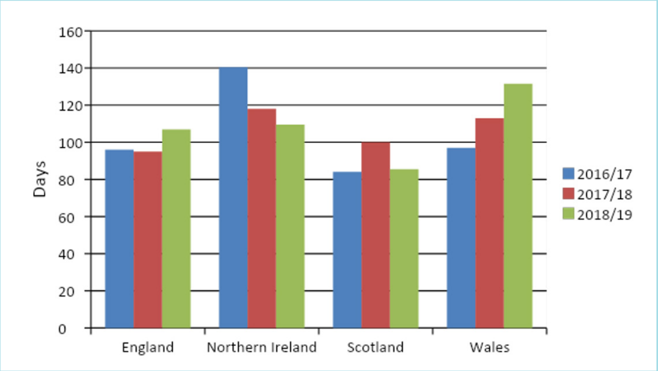


Table 11: *Waiting time (mean days) from angiogram to operation date for elective CABG by UK nation*

Nation	2016/17	2017/18	2018/19
UK	95	97	107
England	96	95	107
Northern Ireland	140.5	118	109.5
Scotland	84	100	85.5
Wales	97	113	131.5

Data for individual hospitals are shown in Table 12. Only seven NHS hospitals achieved mean waiting times of less than 12 weeks from angiography to surgery in 2018/19. Seven hospitals had waiting times of >20 weeks, with evidence of worsening performance in 6 out of 7 of them in the last year.

Table 12: *Waiting time (mean days) from angiography to operation date for elective CABG by Hospital (ranked by shortest for 2018/19)*

Hospital	2016/17	2017/18	2018/19
Cromwell Hospital (PP)	12	8.5	14
Spire St Anthonys' Hospital (PP)	118	25	20
James Cook University Hospital	83	70	50
Royal Brompton Hospital	65	57	63
Spire Southampton Hospital (PP)	67	46.5	67
Liverpool Heart and Chest Hospital	120	104	67
University Hospital Coventry	82	63	75
St George's Hospital	113	102	76
New Cross Hospital	85	64	76
Hammersmith Hospital	98	74	79
Barts and the London	112	113	86
Aberdeen Royal Infirmary	82	104	86
Southampton General Hospital	90	76	87
Freeman Hospital	85	119	87
Morriston Hospital	99	29	88
Nottingham City Hospital	126	118	99
John Radcliffe Hospital	92	70	100
Harefield Hospital	95	119	101
Glenfield Hospital	93	82	106
Basildon Hospital	67	48	107
Royal Victoria Hospital	141	118	110
Blackpool Victoria Hospital	80	89	110
Bristol Royal Infirmary	83	100	111
University Hospital of North Staffordshire	84	87	116
Manchester Royal Infirmary	111	176	117
St Thomas Hospital	101	101	123
Wythenshawe Hospital	122	118	124
Northern General Hospital	96	147	125
Papworth Hospital	114	143	140
Derriford Hospital	121	100	141
University Hospital of Wales	97	114	141
Leeds General Infirmary	86	118	148
King's College Hospital	110	123	153
Queen Elizabeth Hospital	132	118	175
Castle Hill Hospital	154	138	200
London Bridge Hospital (PP)	22	24	No data
Wellington Hospital North (PP)	21	28	No data
Harley Street Clinic (PP)	24	29	No data
Royal Infirmary of Edinburgh	85	82	No data
Golden Jubilee Hospital	89	104	No data

PP = private hospital.

Recommendations for those not achieving the standard

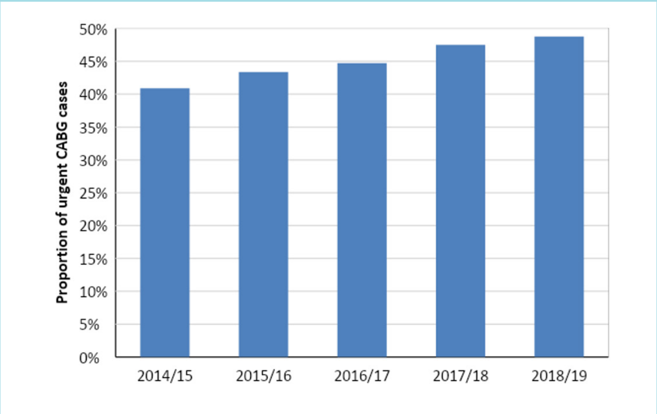
Hospitals with prolonged waiting times for elective CABG surgery should review their processes and referral pathways to identify the causes of any delays. If necessary, advice should be sought from centres with evidence of the best performance. A QI action plan should be instigated to achieve this target.

Patients should be offered surgery in neighbouring hospitals with shorter waiting times if reductions in waiting times cannot be demonstrated.

2.4 | HIGHER PROPORTION OF FIRST TIME CABG PATIENTS HAVING URGENT SURGERY

QI Metric Description/Name	Proportion of first time CABG performed as an urgent case
Why is this important?	Timely CABG surgery during the same hospital admission as a NSTEMI is recommended. Patients should not be routinely sent home without an operation (often called "home and date" for surgery). Patients with NSTEMI requiring revascularisation are the commonest reason for referral for CABG. There should be an emphasis on providing CABG surgery urgently rather than electively, before the patient has further cardiac events (death or another MI).
QI theme	Safety and Effectiveness
What is the standard to be met?	There are no existing audit standards for this metric. This audit outlines the current UK performance and allows identification of poorer performance by units. Based on current UK data there is an expectation that at least 50% of CABG operations in each hospital should be performed urgently.
Key references to support the metric	No reference; NACSA recommendation.
Numerator	All patients undergoing first time CABG as an urgent case.
Denominator	All patients undergoing first time CABG.
Trend	Gradual improvement in the UK over the last three years, from 44.7% to 48.8%.
Variance	The best unit achieves 67% of CABG cases performed urgently, compared with 23% in the worst. 17 (out of 35) units achieve greater than 50% of cases.

Figure 10: *Proportion (%) of first time isolated CABG cases performed as urgent procedures (UK)*



The rise in the proportion of CABG surgery performed urgently in the UK is largely because the numbers of elective cases are falling [Figure 2].

Table 13: *Proportion (%) of first time isolated CABG cases performed as urgent procedures (UK)*

	2014/15	2015/16	2016/17	2017/18	2018/19
UK	40.9	43.4	44.7	47.5	48.8

The proportion of urgent CABG cases performed by each hospital over the last 3 years is shown in Table 14. Seventeen hospitals have rates of >50% in the last year, with a highest of 66.7% in one unit. The worst performing unit only achieved 22.6% in 2018/19.

Table 14: *Proportion (%) of first time isolated CABG cases performed as urgent procedures by Hospital (ranked by highest in 2018/19)*

Hospital	2016/17	2017/18	2018/19
UK	44.7	47.5	48.8
Southampton General Hospital	68.9	63.8	66.7
Morriston Hospital	65.7	61.9	64.1
James Cook University Hospital	58.7	57.0	61.3
Bristol Royal Infirmary	61.6	63.7	59.3
King's College Hospital	45.2	49.2	58.3
New Cross Hospital	41.8	46.4	57.4
University Hospital of North Staffordshire	53.4	70.0	57.1
University Hospital Coventry	52.2	52.0	57.0
Freeman Hospital	43.4	43.7	56.0
Manchester Royal Infirmary	65.1	67.7	55.8
Wythenshawe Hospital	61.5	54.9	55.6
University Hospital of Wales	61.6	52.8	55.6
Northern General Hospital	50.1	45.7	54.1
Liverpool Heart and Chest Hospital	47.7	47.2	53.7
St George's Hospital	43.5	50.6	53.7
Queen Elizabeth Hospital	49.8	51.6	53.1
Nottingham City Hospital	49.0	52.8	50.4
Glenfield Hospital	43.1	51.9	49.9
Basildon Hospital	46.6	49.2	49.0
John Radcliffe Hospital	42.7	44.4	48.8
Leeds General Infirmary	41.0	58.1	46.7
Aberdeen Royal Infirmary	46.8	53.0	46.2
St Thomas Hospital	45.3	52.5	46.2
Hammersmith Hospital	42.5	47.3	45.4
Barts and the London	33.7	37.2	45.3
Royal Victoria Hospital	30.0	47.1	42.3
Papworth Hospital	46.2	47.6	42.2
Royal Sussex County Hospital	41.8	49.8	40.4
Blackpool Victoria Hospital	40.0	32.0	38.0
Castle Hill Hospital	39.6	37.5	37.4
Derriford Hospital	38.2	38.6	37.4
Harefield Hospital	39.1	33.1	32.2
Royal Brompton Hospital	17.8	21.2	22.6
Royal Infirmary of Edinburgh	23.3	31.6	No data
Golden Jubilee Hospital	24.3	32.4	No data

Recommendation for those not achieving the standard

Hospitals with low rates of urgent CABG surgery should review their processes and referral pathways to identify the causes. If necessary, advice should be sought from centres with evidence of the best performance. A QI action plan should be instigated to achieve this target.

2.5 PATIENTS ARE EXPERIENCING A SHORTER POST-OP LENGTH OF STAY (PLOS) FOLLOWING FIRST TIME CABG

QI Metric Description/Name	Post-op length of stay following first time CABG
Why is this important?	Length of stay in hospital is prolonged in patients with complications following surgery. Prolonged PLOS increases costs of care. Evidence from the GIRFT report in 2018 suggested that improvements in 7 day working practices within surgical units may possibly help to reduce PLOS.
QI theme	Effectiveness
What is the standard to be met?	There are no clear audit standards for PLOS. The audit seeks to show the current practice around the UK, and to give a benchmark for units with below average performance.
Key references to support the metric	Not applicable
Numerator	All patients requiring first time CABG
Denominator	Not applicable
Trend	There has been a gradual reduction in PLOS from 8.1 to 7.8 days across the UK over the last 3 years
Variance	The mean varies from 5.9 to 11 days between centres

The mean PLOS has fallen from 8.1 to 7.8 days across the UK over the last 3 years. The variation between the 4 UK nations is shown in Figure 11 and Table 15. The best performance was seen in England with 7.6 days in 2018/19 compared to the other 3 nations. PLOS appears to be shortening over the audit period in England, Wales and Northern Ireland. It has been lengthening in Scotland (but data are missing from 2 hospitals in 2018/19).

The median PLOS of 6 days in the UK describes what would be expected for a "typical" patient, but disguises the fact that some patients may stay considerably longer in hospital. Median PLOS are a day longer in Wales, Scotland and Northern Ireland when compared to England (7 days vs. 6 days).

Figure 11: *Post op length of stay (mean days) following first time CABG by nation*

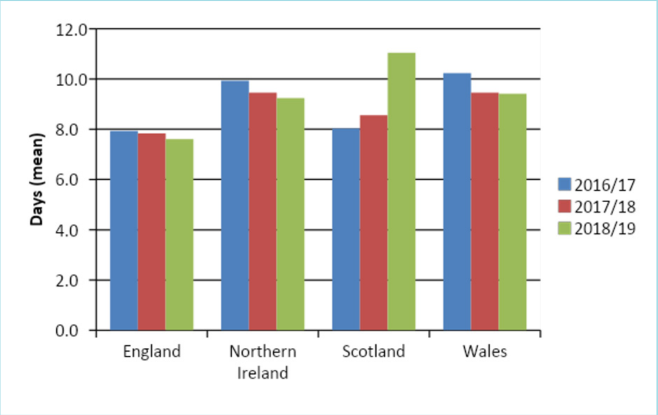


Table 15: *Post op length of stay (mean days) following first time CABG for UK and by nation*

Nation	Mean days		
	2016/17	2017/18	2018/19
UK	8.1	8.0	7.8
England	7.9	7.8	7.6
Northern Ireland	9.9	9.5	9.2
Scotland	8.0	8.6	11.0
Wales	10.2	9.5	9.4

Data missing from 2 Scottish hospitals in 2018/19.

Table 16: *Post op length of stay (median days) following first time CABG for UK and by nation*

Nation	Median days		
	2016/17	2017/18	2018/19
UK	6	6	6
England	6	6	6
Northern Ireland	7	7	7
Scotland	7	7	9
Wales	7	7	7

Data missing from 2 Scottish hospitals in 2018/19.

The mean PLOS after CABG for each hospital is shown in Table 17. There is a large variation between the best and worst units from an average of 6.2 to 11 days.

Table 17: *Post op length of stay (mean days) following first time CABG for individual hospitals (ranked by shortest for 2018/19*

Hospital	Mean days 2016/17	2017/18	2018/19
UK	8.1	8.0	7.8
Spire Southampton Hospital (PP)	5.8	6.0	5.9
Royal Sussex County Hospital	7.0	7.6	6.2
James Cook University Hospital	6.9	7.5	6.3
New Cross Hospital	6.2	6.2	6.5
Derriford Hospital	7.2	7.9	6.7
Glenfield Hospital	7.9	7.6	6.9
Royal Brompton Hospital	7.9	7.2	7.0
Wythenshawe Hospital	7.8	8.2	7.0
Freeman Hospital	7.9	7.3	7.2
Spire St Anthony's Hospital	6.5	7.3	7.2
Nottingham City Hospital	9.8	8.2	7.2
St George's Hospital	7.7	7.4	7.3
University Hospital Coventry	7.5	7.6	7.3
Harefield Hospital	7.9	7.2	7.4
Basildon Hospital	7.8	7.2	7.5
John Radcliffe Hospital	8.5	7.2	7.5
Leeds General Infirmary	7.8	8.5	7.7
Papworth Hospital	8.4	7.5	7.7
Castle Hill Hospital	8.1	7.4	7.7
Bristol Royal Infirmary	7.1	7.8	7.7
Barts and the London	8.3	8.0	7.7
University Hospital of North Staffordshire	8.1	8.0	8.0
Northern General Hospital	8.5	8.5	8.0
Liverpool Heart and Chest Hospital	8.5	8.4	8.0
Hammersmith Hospital	8.2	8.0	8.1
Queen Elizabeth Hospital, Edgbaston	8.6	9.0	8.1
St Thomas Hospital	7.7	8.4	8.1
Blackpool Victoria Hospital	7.3	7.2	8.2
King's College Hospital	8.2	9.2	9.0
Royal Victoria Hospital	9.9	9.5	9.2
Southampton General Hospital	10.9	8.7	9.3
Morriston Hospital	10.3	8.8	9.3
Manchester Royal Infirmary	7.6	8.2	9.4
University Hospital of Wales	10.2	10.2	9.5
Aberdeen Royal Infirmary	10.0	11.6	11.0
London Bridge Hospital (PP)	7.1	6.9	No data
Harley Street Clinic (PP)	6.6	7.2	No data
Royal Infirmary of Edinburgh	7.1	7.4	No data
Golden Jubilee Hospital	7.7	8.0	No data
Wellington Hospital North (PP)	8.7	8.8	No data
Cromwell Hospital (PP)	7.1	10.9	No data

PP= PP private hospital.

Recommendation for those not achieving the standard

Hospitals with prolonged post-operative length of stays following CABG should review their processes and care pathways following surgery. Systemic causes of prolonged stay should be identified. If necessary, advice should be sought from centres with evidence of the best performance. A QI action plan should be instigated to reduce lengths of stay.

3. AREAS FOR MOVING TOWARDS QUALITY IMPROVEMENT METRICS

3.1 AORTIC VALVE REPLACEMENT (AVR)

Aortic valve replacement (AVR) is the second most commonly performed cardiac operation in the UK. It has been the mainstay of the treatment of aortic valve dysfunction (most commonly aortic stenosis – a narrowing of the valve) for several decades. However, newer developments in the way the surgery can be performed, and in particular the introduction of transcatheter aortic valve implantation (TAVI), have led to changes in clinical practice over the last 10 years.

There are no clear audit standards for AVR against which to design a QI metric. The audit seeks to show changes over time in the practice around the UK, as well as giving a benchmark for surgical outcomes for patients undergoing AVR. In general, younger patients receive mechanical valves and older patients receive tissue valves.

QI Metric Description/Name	Type of prosthesis used for patients undergoing surgical aortic valve replacement (SAVR).
Why is this important?	Implantation of bioprosthetic, rather than mechanical, valves avoids the need for lifelong anticoagulation and is preferred in elderly patients. However, although increased usage of bioprosthetic valves (including TAVI) in younger patients may improve quality of life in the short term (by avoiding anticoagulation), it is likely to lead to greater need for costly and higher risk re-intervention and repeat surgery (by AVR or TAVI) as the patient gets older.
QI theme	Effectiveness and Outcomes
What is the standard to be met?	There are no clear audit standards for AVR.
Key references to support the metric	Not applicable.
Numerator	All patients undergoing SAVR by type of valve by age group.
Denominator	All patients undergoing SAVR by age group.
Trend	Not applicable: focussed 1 year report.
Variance	Overall 1 in 6 receives a mechanical valve but there is significant variability between centres, ranging from 1 in 18 to 1 in 3.

Implantation of bioprosthetic, rather than mechanical, valves avoids the need for lifelong anticoagulation and is preferred in elderly patients. However, although increased usage of bioprosthetic valves (including TAVI) in younger patients may improve quality of life in the short term (by avoiding anticoagulation), it is likely to lead to greater need for costly and higher risk re-intervention and repeat surgery (by AVR or TAVI) as the patient gets older.

Over the past two years the numbers of isolated AVR and combined AVR & CABG operations have fallen [Figure 12]. This has corresponded to a time when TAVI rates are increasing. Overall the total number of all procedures for aortic valve disease has continued to increase in the UK over the past 5 years.

Aortic stenosis is predominantly seen in the ageing population. Around 34% of surgical isolated AVR operations are performed in patients over 75 years old [Table 2]. Despite the growth of TAVI 15% of surgical AVRs in the UK are performed in patients over 80 and in nearly 21% of cases in Wales [Table 19].

The in hospital mortality rates of surgical isolated AVR overall was 0.9% for patients under 75 years of age and between 1.2 to 1.3% for those over 75 years [Table 20].

The proportion of patients in the low, medium and high risk categories (as defined by a preoperative calculated EuroSCORE 2 risk of in hospital mortality of <4%; 4-8%; >8%) has not altered over the last 3 years [Table 21]. However, the fall in surgical AVR numbers has predominantly been in low risk patients, from 5,102 patients in 2016/17 down to 4,427 in 2018/19 (Table 22) as these are by far the largest group operated on.

The in hospital mortality rates for surgical AVR in the UK have been lower than predicted by EuroSCORE 2 with 0.7%, 2.2% and 6.1% mortality seen in the low, medium and high risk patients respectively [Figure 13, Table 23]. There has been little change in the mortality rates for the low and medium risk patients over the past 3 years. The change seen for the high risk patients is likely to be due to the small numbers of patients. Data for the high risk patients will also be skewed due to the increasing predominance in the use of TAVI for these patients, with patients only selected for operation that surgery is particularly suited for, or in whom TAVI may not be possible for technical reasons.

The majority of isolated AVR operations were performed with the implantation of a bioprosthesis [Table 24]. The numbers of homograft and Ross procedures (autograft) performed in the UK during 2016/19 was very small. There was a big variation in the usage rates of bioprostheses between hospitals from 63.3% to 94.1% (Table 25) compared to 82.5% overall in the UK. As would be expected the vast majority (98.2%) of patients over the age of 70 received a bioprosthesis [Table 27]. However, the biggest variation is seen in patients under the age of 60 and the rates of bioprosthesis usage between hospitals, from 74% to 14.9% [Table 28], compared to 39.9% for the UK as a whole. It is not possible to explain this 5 fold variation from any of the current guidelines.

Figure 12: *Patient numbers of isolated AVR, combined AVR & CABG and TAVI in the UK for the past 5 years*

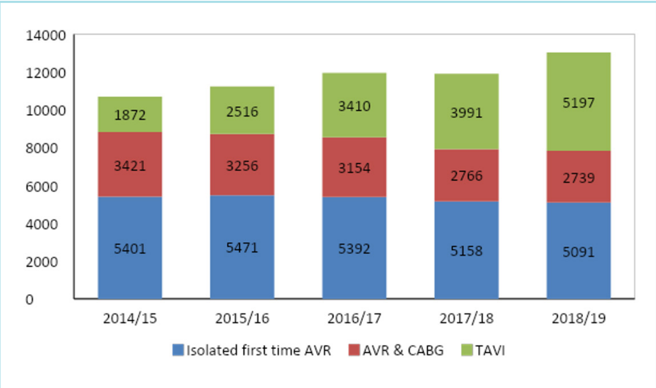


Table 18: *Patient numbers of isolated AVR, combined AVR & CABG and TAVI in the UK for the past 5 years*

	2014/15	2015/16	2016/17	2017/18	2018/19
Isolated first time AVR	5,401	5,471	5,392	5,158	5,091
AVR & CABG	3,421	3,256	3,154	2,,766	2,739
TAVI	1,872	2,516	3,410	3,991	5,197

Table 19: *Proportion (%) of cases of isolated AVR in the UK by age (years) category for the past 3 years*

Nation	Age groups, 2016/19 (aggregate data)		
	<75	75-80	>80
UK	66.0	19.0	15.0
England	66.4	18.9	14.7
Northern Ireland	68.2	20.7	11.1
Scotland	64.7	18.8	16.5
Wales	59.7	19.4	20.9

Table 20: *In Hospital Mortality rates (%) following isolated AVR in the UK by age category (years) for the past 3 years*

Nation	Age group, 2016-19 (aggregate data)		
	<75	75-80	>80
UK	0.9	1.3	1.2
England	0.8	1.3	1.3
Northern Ireland	0.5	0.9	0.0
Scotland	1.7	0.5	1.1
Wales	1.1	2.7	0.0

Table 21: *Proportion of cases (%, for each year) of isolated AVR in the UK by risk category (Low, Medium, High – by EuroSCORE 2) for the past 3 years*

Nation	2016/17			2017/18			2018/19		
	Low (<4%)	Medium (4%-8%)	High (>8%)	Low (<4%)	Medium (4%-8%)	High (>8%)	Low (<4%)	Medium (4%-8%)	High (>8%)
UK	89.2	9.0	1.8	87.7	10.2	2.1	87.7	10.4	1.9
England	89.2	9.1	1.7	87.8	10.1	2.2	87.9	10.1	2.0
Northern Ireland	94.7	4.3	1.1	93.1	6.4	0.5	92.5	6.9	0.6
Scotland	89.9	8.4	1.7	86.3	11.8	1.9	74.6	25.4	0
Wales	82.9	13.3	3.8	86.1	12.4	1.5	84.0	13.4	2.6

Data not submitted from 2 Scottish hospitals in 2018/19.

Table 22: *Numbers (n, for each year) of isolated AVR in the UK by risk category (Low, Medium, High – by EuroSCORE 2) for the past 3 years*

Nation	2016/17			2017/18			2018/19		
	Low (<4%)	Medium (4%-8%)	High (>8%)	Low (<4%)	Medium (4%-8%)	High (>8%)	Low (<4%)	Medium (4%-8%)	High (>8%)
UK	5102	515	103	4760	554	111	4427	526	98
England	4251	431	83	3931	452	97	4004	462	90
Northern Ireland	178	8	2	189	13	1	148	11	1
Scotland	474	44	9	417	57	9	50	17	0
Wales	199	32	9	223	32	4	225	36	7

Data not submitted from 2 Scottish hospitals in 2018/19.

Figure 13: *In Hospital Mortality rates (%) following isolated AVR in the UK by predicted operative risk category (Low, Medium, High – by EuroSCORE 2) for the past 3 years*

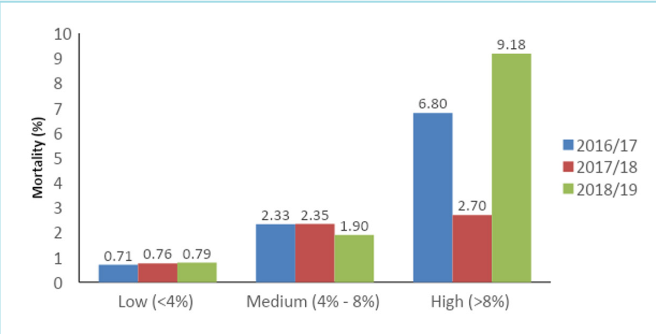


Table 23: *In Hospital Mortality rates (%) following isolated AVR in the UK by predicted operative risk category (Low, Medium, High – by EuroSCORE 2) for the past 3 years*

Nation	Age group, 2016-19 (aggregate data)		
	Low risk (<4%)	Medium risk (4% - 8%)	High risk (>8%)
UK	0.7	2.2	6.1
England	0.7	2.3	5.6
Northern Ireland	0.4	0	25
Scotland	1.4	1.7	0
Wales	0.6	2.0	15

Total case numbers are small in the High Risk category outside England. For numbers see Table 22.

Table 24: *Prosthesis types (number, %) used for isolated Aortic Valve Replacement in the UK for the past 3 years.*

Nation	Type of valve, 2016/19 (aggregate data)			
	Mechanical	Biological	Homograft	Autograft
UK	2,444 (17.3%)	11,663 (82.5%)	20 (0.14%)	11 (0.08%)
England	2,123 (17.5%)	9,950 (82.2%)	20 (0.17%)	11 (0.09%)
Northern Ireland	100 (18.1%)	451 (81.9%)	0	0
Scotland	176 (16.4%)	900 (83.6%)	0	0
Wales	45 (11.1%)	362 (88.9%)	0	0

Autograft = Ross procedure.

Table 25: *Proportion of prosthesis types (%) used for isolated Aortic Valve Replacement by Hospital for the past 3 years*

Hospital	Valve type (%), 2016/19 (aggregate data)	
	Mechanical	Biological
UK	17.3	82.5
King's College Hospital	5.9	94.1
London Bridge Hospital (PP)	7	93

Hospital	Valve type (%), 2016/19 (aggregate data) Mechanical	Biological
Basildon Hospital	8.9	91.1
Royal Sussex County Hospital	9.8	90.2
Royal Brompton Hospital	9.2	90
Morriston Hospital	11.1	88.9
Glenfield Hospital	11.3	88.7
Papworth Hospital	11.6	88.4
Manchester Royal infirmary	12	88.1
St Thomas Hospital	10.5	88.1
Harefield Hospital	12.8	87.2
Derriford Hospital	12.9	87.2
Blackpool Victoria Hospital	13.1	86.9
Freeman Hospital	14.2	85.6
Aberdeen Royal Infirmary	14.6	85.5
Liverpool Heart and Chest Hospital	14	85.1
Southampton General Hospital	13.7	84.3
Bristol Royal Infirmary	15.5	84.2
Hammersmith Hospital	14.9	83.8
Golden Jubilee Hospital	16.4	83.7
John Radcliffe Hospital	16.4	83.2
University Hospital Coventry	15.6	83
Royal Infirmary of Edinburgh	17.3	82.7
Royal Victoria Hospital	18.2	81.9
Queen Elizabeth Hospital, Edgbaston	19	81
Wythenshawe Hospital	21	79
James Cook University Hospital	21.8	78.2
University Hospital of North Staffordshire	22.3	77.8
Castle Hill Hospital	24	76
St George's Hospital	24.1	75.9
Nottingham City Hospital	25	75
New Cross Hospital	25.2	74.8
Northern General Hospital	29.2	70.8
Barts and the London	32.1	68
Leeds General Infirmary	36.7	63.3
University Hospital of Wales	No data	No data
Wellington Hospital North (PP)	No data	No data
Cromwell hospital (PP)	No data	No data
Harley Street Clinic (PP)	No data	No data
Spire St Anthony's Hospital (PP)	No data	No data
Spire Southampton hospital (PP)	No data	No data

Homograft and Autograft not shown due to very small numbers. Hospitals ranked by biological valve usage. PP private hospital.

Table 26: *Prosthesis types (number) used for isolated Aortic Valve Replacement in the UK over the last 3 years categorised by age of patient (<60; 60-69; >70 years)*

	Valve type by age group (n), 2016/19 (aggregate data)					
	<60		60-69		≥70	
Nation	Mechanical	Biological	Mechanical	Biological	Mechanical	Biological
UK	1,626	1,080	679	3,037	139	7,546
England	1,029	707	439	1,921	84	4,657
Northern Ireland	82	33	17	124	1	294
Scotland	25	7	12	76	2	206
Wales	490	333	211	916	52	2,389

Table 27: *Proportion of prosthesis types (%) used for isolated Aortic Valve Replacement in the UK over the last 3 years categorised by age of patient (<60; 60-69; >70 years)*

	Valve type by age group (%), 2016/19 (aggregate data)					
	<60		60-69		≥70	
Nation	Mechanical	Biological	Mechanical	Biological	Mechanical	Biological
UK	60.1	39.9	18.3	81.7	1.8	98.2
England	59.3	40.7	18.6	81.4	1.8	98.2
Northern Ireland	71.3	28.7	12.1	87.9	0.3	99.7
Scotland	78.1	21.9	13.6	86.4	1.0	99.0
Wales	59.5	40.5	18.7	81.3	2.1	97.9

Table 28: *Proportion of prosthesis types (%) used for isolated Aortic Valve Replacement by Hospital over the last 3 years categorised by age of patient (<60; 60-69; ≥70 years). Hospitals are ranked by biological valve usage rates in the <60 yr old patients.*

	Valve type by age group (%), 2016/19 (aggregate data)					
	<60		60-69		≥70	
Hospital	Mech	Biol	Mech	Biol	Mech	Biol
UK	60.1	39.9	18.3	81.7	1.8	98.2
King's College Hospital	26.0	74.0	0	100.0	0	100
Royal Brompton Hospital	27.9	72.1	4.0	96.0	0	100
Southampton General hospital	30.8	69.2	6.3	93.8	9.5	90.5
Manchester Royal infirmary	31.3	68.8	6.7	93.3	4.7	95.3
St Thomas Hospital	37.5	62.5	5.0	95.0	1.2	98.8
Harefield Hospital	40.0	60.0	12.4	87.6	0	100
Glenfield Hospital	43.6	56.4	14.1	85.9	0.8	99.2
Golden Jubilee Hospital	48.1	51.9	18.2	81.8	3.7	96.3
Basildon Hospital	52.5	47.5	5.2	94.8	0	100
Hammersmith Hospital	53.6	46.4	5.6	94.4	0	100
Royal Infirmary of Edinburgh	53.7	46.3	12.6	87.4	7.3	92.7
Freeman Hospital	53.7	46.3	18.1	81.9	1.4	98.6
Blackpool Victoria Hospital	54.3	45.7	12.5	87.5	1.1	98.9
Nottingham City Hospital	54.5	45.5	37.4	62.6	5.6	94.4

Hospital	Valve type by age group (%), 2016/19 (aggregate data) <60 Mech	Biol	60-69 Mech	Biol	≥70 Mech	Biol
Derriford Hospital	54.9	45.1	12.7	87.3	0.6	99.4
Bristol Royal Infirmary	56.6	43.4	12.8	87.2	2.6	97.4
Royal Sussex County Hospital	60.0	40.0	3.7	96.3	0	100
Liverpool Heart and Chest Hospital	62.8	37.2	14.0	86.0	0.8	99.2
Aberdeen Royal Infirmary	63.2	36.8	14.8	85.2	0	100
Papworth Hospital	64.7	35.3	8.7	91.3	0.5	99.5
St George's Hospital	66.7	33.3	30.8	69.2	2.9	97.1
James Cook University Hospital	66.7	33.3	27.5	72.5	1.3	98.7
Morriston Hospital	68.3	31.7	14.0	86.0	1.1	98.9
John Radcliffe Hospital	69.1	30.9	5.6	94.4	1.3	98.7
Queen Elizabeth Hospital, Edgbaston	70.9	29.1	8.7	91.3	0.8	99.2
Royal Victoria Hospital	71.3	28.7	12.1	87.9	0.3	99.7
Leeds General Infirmary	76.8	23.2	45.8	54.2	9.8	90.2
Barts and the London	77.1	22.9	33.7	66.3	4.6	95.4
Wythenshawe Hospital	77.1	22.9	20.7	79.3	1.0	99.0
University Hospital Coventry	78.3	21.7	11.7	88.3	0	100
University Hospital of North Staffordshire	81.4	18.6	32.9	67.1	0.8	99.2
New Cross Hospital	83.9	16.1	21.3	78.7	1.6	98.4
Castle Hill Hospital	84.8	15.2	36.5	63.5	2.8	97.2
Northern General Hospital	85.1	14.9	51.7	48.3	2.6	97.4
University Hospital of Wales	NA	NA	NA	NA	NA	NA

Mech = Mechanical, Biol = Biological.

Recommendations

Commissioning bodies and the professional societies (SCTS and BCIS) should produce guidance on types of AVR implantation in young (<60) patients.

In patients <60 years old undergoing surgical AVR the benefit of avoiding anticoagulation has to be carefully weighed against the high likelihood of needing further intervention in the future (either by redo surgery or TAVI) and the cost to the NHS and risk to the patient that is involved in the longer term. Bioprosthetic aortic valve implantation is not recommended in patients <60 years old who are likely to need anticoagulation for a reason other than for their prosthetic valve.

3.2 | EMERGENCY AORTIC SURGERY

Emergency surgery on the thoracic aorta for acute dissection is complex and high risk. However, without surgery up to 50% of patients will die within 24-48 hours of presentation, and up to 80% will die within a fortnight. There are no agreed standards against which quality improvement metrics can be designed to plan and implement care pathways (time to diagnosis, referral times to surgical teams, volumes for operators and centres, etc).

The audit seeks to show the outcomes of surgery for acute aortic dissection in the UK. It also describes the different rota models of surgical teams currently providing emergency aortic surgery. It examines whether it is possible to define the minimum activity level for a surgeon performing this type of high risk, but low volume, surgery.

QI Metric Description/Name	Outcomes after surgery for aortic dissection
Why is this important?	Emergency surgery on the thoracic aorta for acute dissection is complex and high risk. However, without surgery up to 50% of patients will die within 24-48 hours of presentation, and up to 80% will die within a fortnight. The GIRFT report into Cardiothoracic Surgery in 2018 recommended patients with acute aortic syndromes (such as aortic dissection) should only be operated on by rotas of surgeons in acute aortic surgery specialist teams.[4] In particular it specifies that operations on aortic dissection should only be performed by specialist surgeons and that minimum activity levels for each surgeon should be defined.
QI theme	Outcomes.
What is the standard to be met?	No agreed standards.
Key references to support the metric	International series[5-7]
Numerator	All patients undergoing surgery for aortic dissection.
Denominator	Not applicable.
Trend	Not applicable: focused 1 year report.
Variance	Mean cases per year by unit ranged from 3-32. There were regional variations in crude mortality. Mortality was not related to size of the consultant rota, but there was a trend for a lower mortality if mean unit case volume was >12.

The GIRFT report into Cardiothoracic Surgery in 2018 recommended patients with acute aortic syndromes (such as aortic dissection) should only be operated on by rotas of surgeons in acute aortic surgery specialist teams.[4] In particular it specifies that operations on aortic dissection should only be performed by specialist surgeons and that minimum activity levels for each surgeon should be defined.

The audit seeks to show the outcomes of surgery for acute aortic dissection in the UK. It also describes the different rota models of surgical teams currently providing emergency aortic surgery. It examines whether it is possible to define the minimum activity level for a surgeon performing this type of high risk, but low volume, surgery.

During the three year audit period (2016/19) there were just over 400 cases per year of surgery performed for acute aortic dissection in the UK [Table 29 and Table 30].

The mean number of cases performed by each unit was 11.7 per year. This compares to a median of 9.5 cases per year for each hospital in the USA.[5] There is a wide variation in throughput, with the largest UK unit performing 32 cases and the smallest only 2.7 per year on average.

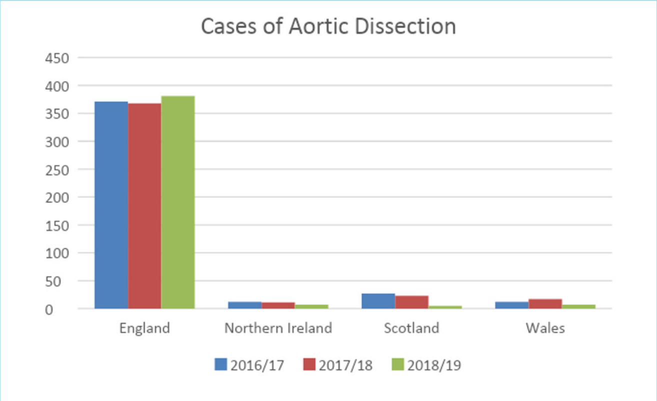
The UK mean mortality rate (in hospital) during this time was 17.7%. This is very similar to the reported rates of 17.2% in the UK (2007/2013), 17% in the USA (2014/17) and 16.9% in the German GERAADA registry of aortic dissection.[5-7] The lowest mortality rates were seen in England compared to the other 3 nations [Figure 15], although care is needed with interpreting this due to the relatively low numbers of hospitals and operations performed outside England. There does not appear to have been any improvement in UK mortality rates in the past decade.

The mortality rates seen in this audit are very different to those reported in GIRFT (2018) which quotes a mean UK mortality rate of 12.3% for England. However, GIRFT has used HES data and has included all aortovascular surgery performed on a non-elective basis (and so will include many cases that are not acute aortic syndromes or emergencies).

Table 29: *Total numbers of cases and survival rates (in hospital) following emergency aortic dissection surgery in the UK (2016/19)*

2016/19 (aggregate)	Total cases	Survival (n)	Survival rate (%)	Mortality rate (%)
UK	1,263	1,039	82.3	17.7

Figure 14: *Number of emergency aortic dissection cases by nation and by year*



Data not submitted from 2 Scottish hospitals in 2018/19.

Table 30: *Number of emergency aortic dissection cases by nation and by year*

Nation	2016/17	2017/18	2018/19
England	371	368	381
Northern Ireland	12	11	7
Scotland	27	23	5
Wales	12	17	7

Data not submitted from 2 Scottish hospitals in 2018/19.

As would be expected with low volume procedures there was considerable variation in operative survival rates between hospitals [Figure 16]. This ranged from 57% to 100% over the aggregated three year period. Contrary to some previous studies there does not appear to be a correlation between improved survival rates with increasing hospital case volume during this audit period. Although one hospital is a statistical outlier (3 SD lower than the UK mean), care needs to be taken interpreting this due to the low volume of cases (usually at least 100 cases are required for valid comparisons).

In light of the GIRFT report into cardiothoracic surgery (2018) suggesting that aortic dissections should be operated on by specialist teams of aortic surgeons, we examined the various types of on call rota currently in place for consultant surgeons. The maximum case numbers for an individual surgeon was 16 cases in one year, and 33 cases over the three years combined. Only 22 surgeons in the UK perform four or more cases per year on average.

Hospitals were categorised into whether the hospital performed >12 cases per year; the number of surgeons in a unit performing aortic dissection surgery (greater or less than 5); the proportion of consultants in a unit performing the surgery (greater or less than 50%); whether two or more consultants performed >4 cases per year; or whether each surgeon performed an average of >2 cases/year [Table 32 and Table 33]. These categories of rota were chosen as they are possible solutions that have been, or could be, applied within units to achieve the GIRFT recommendation.

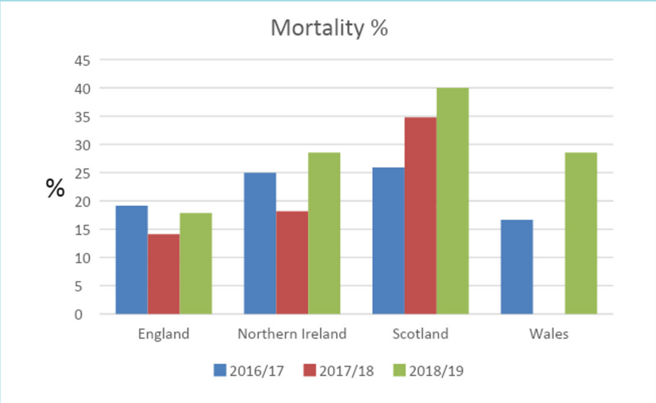
There is possibly a trend towards hospitals performing >12 cases of aortic dissection surgery per year having a lower mortality rate (16.3% vs 19.6%, P=0.12) compared to those hospitals performing fewer operations, however this was not statistically significant. The other types of rota examined, and in particular measures which have been, or could be, used to intensify surgical experience within a team or to increase individual surgeon case volumes, did not appear to influence outcomes.

It is recognised that increasing case volume generally contributes to improved surgical outcomes for many procedures. However, for aortic dissection, where extremely few surgeons perform any great number of operations, the data from this audit suggests that hospital factors as a whole (which would include things such as A&E delays from diagnosis to theatre time; cardiology, anaesthetic, theatre team and intensive care inputs) are likely to be more important than individual surgeon expertise performing the surgery. Allowing all units to perform >12 cases would require regional cooperation and for some units to stop performing aortic dissection surgery. This is already happening successfully in geographically close units (such as in London) but is likely to be much harder to achieve elsewhere.

A weakness of this audit is that it can only examine outcomes of patients that have actually undergone surgery for aortic dissection, as this is all that is collected within the NACSA dataset. It is recognised that several patients with aortic dissection presenting acutely do not reach theatre and therefore do not undergo an operation due to the rapidly fatal nature of the disease. It is also not possible to examine the effects of any delays in diagnosis at presentation to A&E, or to study the effects of any delays in transfer to theatre. This is particularly relevant if plans to reorganise aortic dissection services will require transfer to more specialised regional centres.

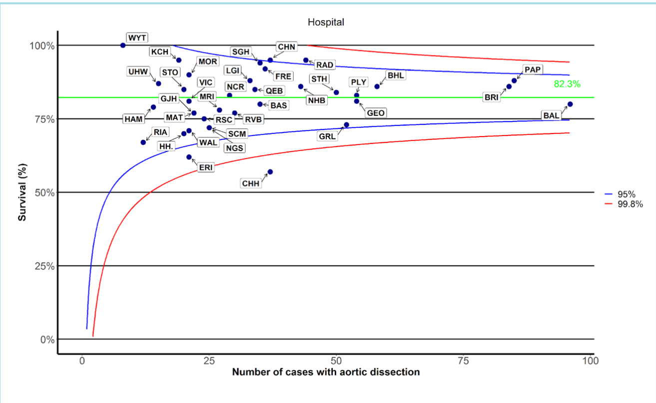
These data will allow regions and commissioners to assess the potential scale of any benefit that might be seen with regionalisation of emergency aortic services. A potential for a 3% reduction in mortality rates would equate to approximately 1 extra life saved every 3 years in an average unit performing 12 cases per year).

Figure 15: *Mortality rates (in hospital %) following emergency aortic dissection cases by nation and by year*



The UK mean mortality for the 3 years combined was 17.7%. Data not submitted by 2 Scottish hospitals in 2018/19.

Figure 16: *Funnel plot of survival rates (in hospital) following emergency aortic dissection surgery by hospital (Aggregate data for 2016/19)*



Mean (green), 2SD (blue) and 3 SD (red). For hospital codes see Table 32.

Table 31: *Mortality rates (in hospital %) following emergency aortic dissection cases by nation and by year*

Nation	2016/17	2017/18	2018/19
England	19.1	14.1	17.9
Northern Ireland	25.0	18.2	28.6
Scotland	25.9	34.8	40.0
Wales	16.7	0.0	28.6

The UK mean mortality for the 3 years combined was 17.7%.

Table 32: *Characteristics of each unit performing aortic dissection surgery, showing total number of consultant surgeons in each unit performing any cardiac surgery, and the number of those performing at least one aortic dissection during 2016/19*

Hospital	Surgeons in unit (n)	Surgeons operating on cases of Aortic Dissection (n)	Unit Mean Cases/year	Cases/surgeon/year
BAL. Barts and the London	20	15	32.0	2.1
PAP. Papworth Hospital	16	14	28.3	2.0
BRI. Bristol Royal Infirmary	14	8	28.0	3.5
BHL. Liverpool Heart and Chest hospital	24	7	19.3	2.8
GEO. St George's Hospital	10	8	18.0	2.3
PLY. Derriford Hospital	9	8	18.0	2.3
GRL. Glenfield Hospital	11	8	17.3	2.2
STH. St Thomas Hospital	14	5	16.7	3.3
RAD. John Radcliffe Hospital	10	9	14.7	1.6
NHB. Royal Brompton Hospital	14	5	14.3	2.9
CHH. Castle Hill Hospital	7	6	12.3	2.1
CHN. Nottingham City Hospital	6	5	12.3	2.5
FRE. Freeman Hospital	11	9	12.0	1.3
BAS. Basildon Hospital	8	7	11.7	1.7
SGH. Southampton General Hospital	7	6	11.7	1.9

Hospital	Surgeons in unit (n)	Surgeons operating on cases of Aortic Dissection (n)	Unit Mean Cases/year	Cases/surgeon/year
QEB. Queen Elizabeth Hospital, Edgbaston	7	7	11.3	1.6
LGI. Leeds General Infirmary	8	8	11.0	1.4
GJH. Golden Jubilee Hospital	18	7	11.0	1.6
ERI. Royal Infirmary of Edinburgh	8	6	10.5	1.8
RVB. Royal Victoria Hospital	11	11	10.0	0.9
NCR. New Cross Hospital	8	7	9.7	1.4
MRI. Manchester Royal Infirmary	8	5	9.0	1.8
NGS. Northern General Hospital	8	7	8.3	1.2
SCM. James Cook University Hospital	7	7	8.3	1.2
RSC. Royal Sussex County Hospital	5	5	8.0	1.6
MAT. Mater Misericordiae Hospital	NA	NA	7.3	NA
WAL. University Hospital Coventry	6	4	7.0	1.8
VIC. Blackpool Victoria Hospital	12	6	7.0	1.2
MOR. Morriston Hospital	5	5	7.0	1.4
STO. University Hospital of North Staffordshire	6	6	6.7	1.1
HH. Harefield Hospital	10	4	6.7	1.7
KCH. King's College Hospital	9	4	6.3	1.6
UHW. University Hospital of Wales	6	6	5.0	0.8
HAM. Hammersmith Hospital	7	1	4.7	4.7
RIA. Aberdeen Royal Infirmary	6	3	4.0	1.3
WYT. Wythenshawe Hospital	9	4	2.7	0.7

Units are ranked by mean number of cases performed per year in each hospital. Due to retirements, new consultant starters and locums, the numbers of surgeons may exceed the usual count of consultants within a unit.

Table 33: *Units were categorised according to different possible characteristics of the consultant surgeon on call rota for operations involving aortic dissection surgery*

Rota Type		Units (n)	Cases (3y)	Survived (3y)	Mortality (%)	P Value
≤50% surgeons in unit performing aortic dissection	Yes	10	267	222	16.8	0.70
	No	25	974	800	17.8	
≤5 surgeons in unit performing aortic dissection	Yes	12	296	246	16.9	0.69
	No	23	945	776	17.9	
≥2 surgeons in unit performing >=4 cases/yr	Yes	6	383	322	15.9	0.29
	No	29	858	700	18.4	
Unit performing ≥12 cases/year	Yes	13	730	611	16.3	0.12
	No	23	533	428	19.6	
Mean cases/year ≥2 for each surgeon performing Ao	Yes	12	664	547	17.6	0.98
	No	23	577	475	17.6	

Mortality rates for each rota model were calculated (across UK) for 3 years (2016/19) and statistical analysis performed (Chi Squared test).

Recommendations

Regions and units need to collect and audit data on all patients presenting with aortic dissection, not just those undergoing emergency surgery.

In regions or units where there are concerns about outcomes or case numbers, a system-level review should be undertaken for patients requiring surgery for aortic dissection, taking into account the need to optimise the entire pathway of care.

Regions seeking to redesign pathways for aortic dissection surgery should concentrate on unit case volumes and measures to increase hospital level expertise, rather than increasing surgical consultant sub-specialism. Although the evidence is weak, it is suggested that minimum levels of 12 cases per year (1 per month) within a unit may be required to see improvements in outcomes (mortality rates).

Units should seek to optimise pathways of care and team working (including A&E, cardiology, anaesthesia, theatre and perfusion staff, intensive care and nursing teams) to achieve the best outcomes for aortic dissection.

Reducing the numbers of surgeons within on call rotas, or aiming to have specialist rotas of aortic surgeons, is unlikely on its own to significantly improve outcomes without first increasing unit case volumes.

Units and regions should collect and audit data on all patients with aortic dissection that do not undergo surgery within their catchment areas. This should include deaths prior to operation and any delays to treatment (in particular time from acute presentation to A&E to time of operation).

REFERENCES

1. National Adult Cardiac Surgical Database (NACSD) Report 2000/2001. (Published by Dendrite Clinical Systems Ltd).
2. Neumann F J, Sousa-Uva M, Ahlsson A, et al. 2018 ESC/EACTS Guidelines on myocardial revascularization, European Heart Journal, Volume 40, Issue 2, 07 January 2019, Pages 87–165, https://doi.org/10.1093/eurheartj/ehy394
3. CQUIN IM1 Reducing cardiac surgery non-elective inpatient waiting. https://www.england.nhs.uk/wp-content/uploads/2016/03/im1-reduc-cardiac-surgry-non.pdf
4. GIRFT Programme National Specialty Report - Cardiothoracic Surgery (March 2018) https://gettingitrightfirsttime.co.uk/wp-content/uploads/2018/04/GIRFT-Cardiothoracic-Report-1.pdf
5. Ghoreishi M, Sundt TM, Cameron DE, et al. Factors associated with acute stroke after type A aortic dissection repair: An analysis of the Society of Thoracic Surgeons National Adult Cardiac Surgery Database. J Thorac Cardiovasc Surg. 2020;159(6):2143-2154.e3. doi:10.1016/j.jtcvs.2019.06.016
6. Bottle A, Mariscalco G, Shaw MA, et al. Unwarranted Variation in the Quality of Care for Patients With Diseases of the Thoracic Aorta. J Am Heart Assoc. 2017;6(3):e004913. Published 2017 Mar 14. doi:10.1161/JAHA.116.004913
7. Conzelmann LO, Weigang E, Mehlhorn U, et al. Mortality in patients with acute aortic dissection type A: analysis of pre- and intraoperative risk factors from the German Registry for Acute Aortic Dissection Type A (GERAADA). Eur J Cardiothorac Surg. 2016 Feb;49(2):e44-52. doi: 10.1093/ejcts/ezv356.

THANKS AND ACKNOWLEDGEMENTS

We would like to thank the contribution of the following individuals and organisations:

- All hospitals and individual cardiac surgeons, nurses, data managers and clinical audit teams who contribute to this audit. Without their engagement, patients would not have benefited from improved care over the last ten years. We would like to thank the clinical teams who have contributed a case study. By sharing best practice, they illustrate the role of good quality data in improving patient care.

- Our patient representatives on the NCAP Operational and Methodology Group and the NICOR Patient Advisory Group and Panel for their contribution to the programme and their help in determining the content of this report.

This report was prepared by Andrew Goodwin (Clinical Lead for NACSA), Samuel Perwaiz (Project Manager), Jiaqiu Wang (NICOR Analyst) and Ebere Okafor (Project Coordinator) with support from colleagues within the NCAP team and the NACSA Domain Expert Group (in particular Uday Trivedi, SCTS Cardiac Audit Lead, and Simon Kendall President of SCTS who have contributed to the draft versions).

We also appreciate the continuing support of colleagues within the National Institute for Cardiovascular Outcomes Research (NICOR), the clinical leads of the other domains within the National Cardiac Audit Programme (NCAP), members of the NCAP Operational & Methodology Group, chaired by Prof Mark de Belder, the NCAP Delivery Group, chaired by Mr James Chal, and colleagues from UCL Partners. We also acknowledge the encouragement of Ross Pow, of Power of Numbers Ltd, who facilitated workshops to guide the interpretation and presentation of various aspects of NCAP.

The NCAP is commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP). Please go to www.hqip.org.uk for more information.
Email: nicor.auditenquiries@nhs.net

This report is available online at:
https://www.nicor.org.uk/national-cardiac-audit-programme/adult-cardiac-surgery-surgery-audit/

This report was published on 10 December 2020

NATIONAL INSTITUTE FOR CARDIOVASCULAR OUTCOMES RESEARCH (NICOR)

NICOR is a partnership of clinicians, IT experts, statisticians, academics and managers who, together, are responsible for six cardiovascular clinical audits (the National Cardiac Audit Programme – NCAP) and a number of new health technology registries, including the UK TAVI registry. Hosted by Barts Health NHS Trust, NICOR collects, analyses and interprets vital cardiovascular data into relevant and meaningful information to promote sustainable improvements in patient well-being, safety and outcomes. It is commissioned by the Healthcare Quality Improvement Partnership (HQIP) with funding from NHS England and the Welsh Government and, for four of the domains, from the Scottish Government. Funding has been sought to aid the participation of hospitals in Northern Ireland, the Republic of Ireland and the private sector.
Email: nicor.auditenquiries@nhs.net

SOCIETY OF CARDIOTHORACIC SURGEONS IN GREAT BRITAIN & IRELAND

The SCTS is an affiliated group of the Royal College of Surgeons of England and has charitable status. The Charity's objects are to enable surgeons to achieve and maintain the highest standards of surgical practice and patient care.
www.scts.org

BARTS HEALTH NHS TRUST

With a turnover of £1.5 billion and a workforce of around 17,000 people, Barts Health is a leading healthcare provider in Britain and one of the largest NHS Trusts in the country. The Trust's five hospitals – St Bartholomew's Hospital in the City, The Royal London Hospital in Whitechapel, Newham Hospital in Plaistow, Whipps Cross Hospital in Leytonstone and Mile End Hospital – deliver high quality compassionate care to the 2.5 million people of east London and beyond.

THE HEALTHCARE QUALITY IMPROVEMENT PARTNERSHIP (HQIP)

HQIP is led by a consortium of the Academy of Medical Royal Colleges, the Royal College of Nursing and National Voices. Its aim is to promote quality improvement in patient outcomes, and in particular, to increase the impact that clinical audit, outcome review programmes and registries have on healthcare quality in England and Wales. HQIP holds the contract to commission, manage and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP), comprising around 40 projects covering care provided to people with a wide range of medical, surgical and mental health conditions. The programme is commissioned by NHS England, the Welsh Government and, with some individual projects, other devolved administrations and crown dependencies.
www.hqip.org.uk/national-programmes