

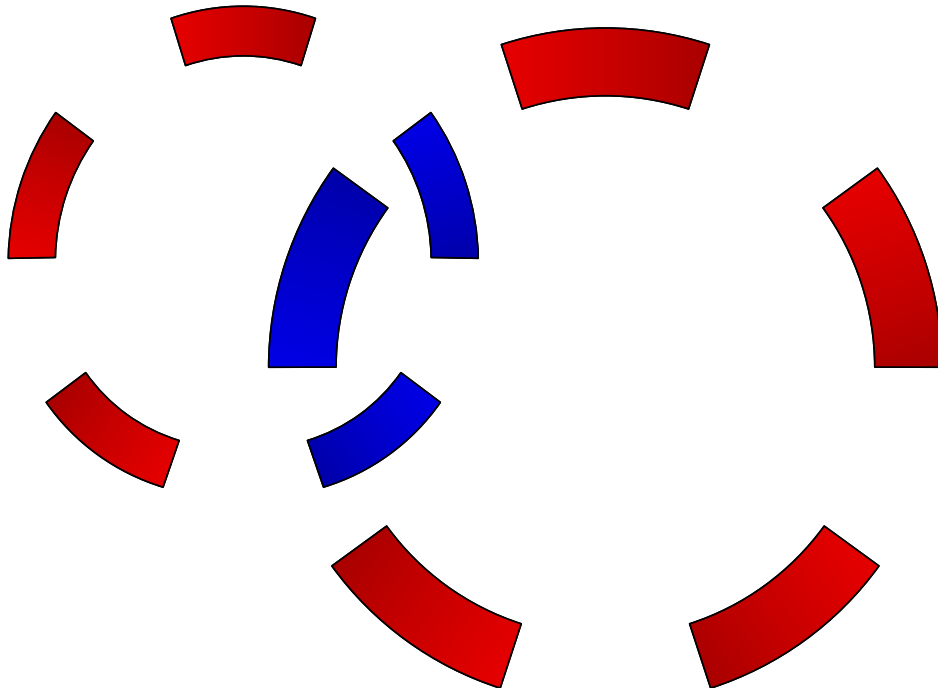


OF GREAT BRITAIN AND IRELAND

# UK Carotid Endarterectomy Audit

## Round 5

(Operation dates 1/10/2011 – 30/09/2012)



**October 2013**

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	<p><b>The Royal College of Surgeons of England</b> is an independent professional body committed to enabling surgeons to achieve and maintain the highest standards of surgical practice and patient care. As part of this it supports Audit and the evaluation of clinical effectiveness for surgery.</p> <p>The RCS managed the publication of the 2013 annual report.</p>
	<p><b>The Vascular Society of Great Britain and Ireland</b> is the specialist society that represents vascular surgeons. It is one of the key partners leading the audit.</p>
	<p><b>The Healthcare Quality Improvement Partnership (HQIP)</b> 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, and in particular to increase the impact that clinical audit has on healthcare quality in England and Wales. HQIP hosts the contract to manage and develop the National Clinical Audit and Patient Outcomes Programme (NCAPOP). Their purpose is to engage clinicians across England and Wales in systematic evaluation of their clinical practice against standards and to support and encourage improvement in the quality of treatment and care. The programme comprises more than 30 clinical audits that cover care provided to people with a wide range of medical, surgical and mental health conditions.</p>

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We would like to acknowledge the support of the hospitals that participated in this Audit and thank their staff for the considerable time devoted to data collection.

We would also like to thank the Clinical Standards Department at the Royal College of Physicians for managing the Carotid Interventions Audit until 31 December 2012, during which time most of the data used in this report was collected. We particularly thank Mrs Alex Hoffman, Mr Michael Roughton, Dr Geoffrey Cloud and Professor Antony Rudd.

## Foreword

This fifth public report from the Carotid Interventions Audit demonstrates continuing improvement in the service that hospital teams provide to patients.

Levels of participation have again improved, with 97% of eligible NHS trusts in England, Northern Ireland, Scotland and Wales participating in the audit, and with 95% of cases in England compared with Hospital Episode Statistics included in the report. This makes it the most robust review of UK carotid surgical interventions ever.

The time between referral and treatment has continued to fall and indicates a commitment to improving the quality of service within the NHS. There is much to be pleased with, but there are also areas to examine. Our results show some variation in the time to intervention between hospitals in the UK. Some are very good, treating nearly all patients within the NICE target of 14 days from the onset of symptoms. Others need to improve their performance. The clinical teams and the executives of these organisations need to ask themselves how they can meet the NICE recommendations, and should consider moving the service and resources to adjacent better performing Trusts.

Quality Improvement represents a challenge to organisations. Discussions with high performing centres indicate that a focus on a facilitated pathway of referral, seven day TIA clinic access and working in teams (as opposed to the traditional consultant firm approach) are the keys to improving access to treatment for patients. Lessons could be learnt from the re-organisation of stroke services in London. Fewer centres are seeing more patients, and patients are now treated quickly.

The audit results also show that stroke and other peri-operative complications of carotid surgery remain low. In this report, we have included comparative outcome information at an organisation-level for the first time. This complements the publication of surgeon level outcomes that the National Vascular Registry published in July 2013. Carotid surgery is being performed more effectively than ever before in the NHS. What is required now is for clinical teams to work hard on managing their pathways of care to treat all patients within the NICE target.

David Mitchell  
Chair, Audit & Quality Improvement committee,  
The Vascular Society of Great Britain & Ireland

Professor Julian Scott  
President of the Vascular Society of Great Britain & Ireland

## Executive Summary

### Background

This report is based on Round 5 of the National Carotid Interventions Audit, which includes all carotid endarterectomies performed between 1 October 2011 and 30 September 2012. The initial data submission deadline was 31 December 2012 but the report was refined to include data submitted to the Audit as part of the initiative to publish surgeon-level outcomes. To show how clinical practice and outcomes have changed over time, the report also contains information from Rounds 3 (1 October 2009 – 30 September 2010) and 4 (1 October 2010 – 30 September 2011).

The objectives of the National Carotid Interventions Audit are:

1. To assess the current speed of delivery of carotid endarterectomy in the UK.
2. To assess variations in access and quality of care for patients needing carotid endarterectomy.
3. To assess 30-day mortality and complications rates following carotid endarterectomy.
4. To stimulate improvements over time in the quality of care provided to patients undergoing carotid endarterectomy.

### Methods

Data on carotid procedures are prospectively entered by vascular surgeons, other members of the vascular team and audit personnel into a secure webtool (National Vascular Database). The database captures patient demographic information as well as clinical information on symptoms, medication and treatments. Critical steps in the care pathway are recorded with dates (or within date bands where precise information is not available). This includes data on time from symptom to referral, and time to referral to the surgical service. Time from symptom to carotid intervention is also recorded. Finally, the NVD captures outcomes including complication rates for stroke and cranial nerve injury, as well as patient survival whilst an inpatient and at 30 days post-surgery.

### Participation

In Round 5, data were submitted by 440 (94%) of the 468 eligible surgeons, who were working at 117 (97%) of the 121 eligible NHS trusts and Health Boards in England, Wales, Scotland and Northern Ireland.

NHS organisations submitted a total of 5723 interventions to the Audit. Among these, there were:

- 4941 symptomatic patients
- 5571 cases with complete 30 day survival information
- 4836 cases for whom information was submitted on a follow-up appointment

Carotid endarterectomy is more common among men than women, with 67% of procedures performed in men. The mean age of patients having the surgery was 71 years. Nearly three-quarters of the patients had at least 70% stenosis in their ipsilateral artery at the time of operation, and 86% were symptomatic. Among the 4941 patients with symptomatic disease, TIA was the most common symptom (48%) followed by stroke (34%). Of the 782 patients undergoing CEA for asymptomatic disease, 110 (14%) were prior to major surgery such as CABG and 32 (0.4%) were part of a randomised controlled trial.

### Times along the care pathway

The current NICE guideline recommends two weeks as the target time from symptom to operation in order to minimise the chance of a high risk patient with TIA developing a stroke. In Round 5:

- The median time from symptom onset to carotid surgery was 13 days (IQR 7–28).
- The median time from symptom onset to referral was 4 days (IQR 2–10).
- The median time from referral to carotid surgery was 7 days (IQR 4–17).

The median times reported in Round 5 are lower than those reported in Round 3 and 4, and represent continuing improvement in access.

The median times along the care pathway were similar for patients with symptoms of stroke or TIA. However, patients with amaurosis fugax took comparatively longer to progress from symptom onset to surgery, with the median delay being 21 days (IQR 10-46).

When the delay between symptom and procedure was more than 14 days, the main causes of delay reported to the Audit were: delay in referral (38%), delay in patient presentation (27%), operation cancellation as patient was unfit or patient choice (18%), and lack of operating time (12%).

### Postoperative Surgical outcomes

Patients may experience various complications following carotid endarterectomy, including: bleeding, myocardial infarct, cranial nerve injury, or stroke. The risk of a complication remains low, with rates (and 95% confidence intervals (CI)) across Rounds 3 to 5 summarised below.

Complication	Procedures in Rounds 3-5	Complication rate (%)	95% CI
Myocardial Infarct	16774	0.6	0.5 to 0.7
Bleeding	16774	3.4	3.1 to 3.7
Death and/or stroke within 30 days	16485	2.4	2.1 to 2.6
Cranial Nerve Injury	16774	3.8	3.5 to 4.1

The data for Rounds 3 to 5 were used to calculate risk adjusted rates of death/stroke by NHS trust / Health Board. To assess whether there are systematic differences in outcomes between organisations, the figures were examined using a funnel plot.

All the NHS trusts had a risk adjusted rate of death/stroke within 30 days that fell within the expected range given the number of procedures performed at the organisation.



## Recommendations

1. All staff involved in organising and delivering care to patients who require carotid surgery need to examine their data and assess their performance against standards within NICE Guideline CG68.
2. Clinicians should ensure that data from patients having carotid surgery are included in national clinical audit. Appropriate time within job plans must be made available for consultants to validate and act upon their data.
3. Systems should be in place to ensure that coding of patients with carotid surgery is accurate. This requires close collaboration between hospital coding departments and clinicians and is likely to require regular (at least monthly) coding review meetings with the vascular team.
4. Services offering carotid surgery must have a clearly documented pathway of care. This should state how the patient accesses services and how they flow through to surgery if required.
5. Clinicians involved in providing care to patients with TIA and minor stroke should ensure that there are agreed referral protocols to minimise delays in the pathway.
6. Referrals to vascular surgery or interventional radiology should go to a central point within the department, rather than individual clinicians. There should be someone available to deal with referrals on a daily basis (during the working week and at the weekend).
7. Patients requiring carotid endarterectomy should be allocated to the next available operating list (ideally within 3 days of referral).
8. Carotid intervention should be prioritised as urgent/emergency in all symptomatic cases.
9. Clinical teams should seek feedback from patients to help improve the quality of care offered.
10. Stroke teams should publicise their services to primary care and the public. Attention should be given to highlighting the importance of amaurosis fugax because this diagnosis is associated with significantly greater delays in the pathway.



## Introduction

### Background

The Carotid Interventions Audit was initiated in 2005 as a collaboration between the Vascular Society of Great Britain & Ireland and the Royal College of Physicians. The purpose of the Audit was to gather information about the pathway of care for patients with carotid stenosis who undergo carotid interventions (either surgery or endovascular stenting). This report is on the fifth round of the Audit.

This report focuses on surgical carotid endarterectomy (CEA) and has four main aims:

1. To assess the current speed of delivery of carotid endarterectomy in the UK.
2. To assess variations in provision of imaging and CEA to encourage national and local action to improve quality and increase capacity.
3. To assess 30-day mortality and complications at follow-up against the available evidence base.
4. To stimulate improvements over time in the quality of care provided to patients undergoing carotid endarterectomy.

In January 2013, the National Vascular Registry was formed by the amalgamation of the National Vascular Database and the UK Carotid Interventions Audit projects. The Registry was commissioned by the Healthcare Quality Improvement Partnership (HQIP) as part of the National Clinical Audit and Patient Outcomes Programme (NCAPOP) and is based in the Clinical Effectiveness Unit of the Royal College of Surgeons of England. The aim of the Registry is to measure the quality and outcomes of care for patients who undergo vascular surgery in England and Wales.

Since Round 3, the reports on carotid endarterectomy procedures have been based on data collected over an annual period (see below). For each Round, the deadline for NHS trusts to submit data has been 31<sup>st</sup> December. However, the publication of this report was delayed so that it could include additional data submitted to the Audit as part of the initiative to publish surgeon-level outcomes.

### Audit periods

Round	Operations Performed Between	Deadline for Submission of Cases	Report Date
Round 1 (24 months)	1 <sup>st</sup> December 2005 and 31 <sup>st</sup> December 2007	31 <sup>st</sup> March 2008	August 2008
Round 2 (21 months)	1 <sup>st</sup> January 2008 and 30 <sup>th</sup> September 2009	31 <sup>st</sup> December 2009	April 2010
Round 3 (12 months)	1 <sup>st</sup> October 2009 and 30 <sup>th</sup> September 2010	31 <sup>st</sup> December 2010	March 2011
Round 4 (12 months)	1 <sup>st</sup> October 2010 and 30 <sup>th</sup> September 2011	31 <sup>st</sup> December 2011	April 2012
Round 5 (12 months)	1 <sup>st</sup> October 2011 and 30 <sup>th</sup> September 2012	31 <sup>st</sup> December 2012	October 2013

## Evidence base for carotid interventions

The evidence used for setting audit questions is derived from two main sources:

1. National Clinical Guidelines 2009 *Stroke: The diagnosis and acute management of stroke and transient ischaemic attacks by the National Institute for Health and Clinical Excellence*  
<http://www.nice.org.uk/Guidance/CG68>
2. National Stroke Strategy 2007 <http://www.dh.gov.uk> and the accompanying publication *Implementing the National Stroke Strategy – an imaging guide*

Patients with significant narrowing of their carotid arteries are at increased risk of stroke. Those with transient symptoms have the highest risk of stroke in the period immediately following the onset of symptoms. There is a large body of evidence showing that the greatest benefit from carotid intervention is seen if the procedure is carried out quickly following onset of symptoms. Both NICE and the National Stroke Strategy have set targets for the time from symptoms to intervention. For the symptom to surgery pathway to work well, it requires many stakeholders to co-ordinate care delivery. The general public and healthcare professionals need to be aware of the symptoms of stroke and TIA; and what to do when they recognise these symptoms. General practitioners need to refer promptly and NHS trusts need to have organised stroke services with rapid access to specialist clinicians, imaging and surgery. This audit provides data on the efficiency of the pathway of care and outcomes for patients who have had an endarterectomy.

## Methodology

Data are entered, by vascular surgeons, other members of the vascular team and audit personnel, prospectively into a secure webtool (National Vascular Database) that captures core demographic information as well as clinical data about symptoms, medication and treatment for each case. Critical steps in care are recorded with dates (or within date bands where precise information is not available). The data on time from symptom to referral, referral to imaging and time to referral to the surgical service are recorded. Time from symptom to carotid intervention is also captured. This enables all stakeholders to examine the components of care the pathway, involving general practitioners, physicians, radiologists, vascular technologists, surgeons and their surgical teams. Outcomes including complication rates for stroke and cranial nerve injury are captured as well as survival within hospital and at 30 days post surgery.

Data are analysed by a dedicated team, including statistical support, within the Clinical Effectiveness Unit of the Royal College of Surgeons of England to compare performance of individual trusts and regions with national averages, and in comparison with previous rounds of the audit.

## Limitations

The cohort in this audit includes only patients who received carotid endarterectomy. The findings, therefore, exclude patients that were referred for consideration but did not undergo CEA. This could occur because they declined the surgery, did not have appropriate symptoms, were clinically unfit for CEA, developed an inoperable stenosis (occluded) whilst waiting for CEA or had a disabling stroke whilst waiting for CEA.

## Carotid stents

The number of stents submitted to Round 5 was insufficient for inclusion within this report. There were a total of 37 stent cases on the NVD, with data locked for analysis at the deadline, from 11 NHS trusts, ranging between 1 and 14 per organisation. There were 273 stents identified in HES for England for the same time period (L31.4) from a total of 28 NHS trusts. The median number of cases per English NHS trust was 4 and the mean was 10. Only five trusts in England carried out more than 20 carotid stents within the Round 5 time period.

## Definitions

### Dataset

The Clinical Audit dataset used since 2009 is in **Appendix 2**. It includes the following key aspects of carotid endarterectomy delivery and outcomes:

**Inpatient:** Patient demographics, pre-operative investigations, surgical techniques, inpatient stay and condition at hospital discharge.

**Follow-up:** Patient mortality at 30 days post-operatively and post-operative assessment when the patient is seen at follow-up to assess surgical outcome.

### Key indicators for carotid endarterectomy

The key indicators included in this report are based on the NICE Acute Stroke and TIA guideline and the National Stroke Strategy which set optimal times for managing patients from symptom to surgery. The standards include:

- Patients referred to vascular surgery for CEA within 7 days of experiencing the index symptom that triggered referral.
- The median delay and inter-quartile range between the index symptom that that triggered referral and the date of referral.
- Patients receiving CEA within 7 days of referral to vascular surgery for CEA.
- The median delay and inter-quartile range between the date of referral and the date of CEA.
- Patients receiving CEA within 2 days of experiencing the index symptom that triggered referral (National Stroke Strategy Standard).
- Patients receiving CEA within 14 days of experiencing the index symptom that triggered referral (NICE Guideline).
- The median delay and inter-quartile range between the index symptom that triggered referral and the date of CEA.

## NHS trust / Health Board and surgeon participation

During the Round 5 period, data were submitted on a total of 440/468 (94%) surgeons (representing 117/121, (97%) of the eligible NHS trusts and Health Boards).

Since Round 1, participation in the Audit has improved:

- NHS trusts /Health Boards, from 76% (102/135) to 93% (122/131) to 97% (126/130) to 98% (125/128).
- Surgeons, from 61% (240/396) to 93% (352/390) to 87% (382/437) to 93% (425/457) to 94% (440/468).
- 26 surgeons submitted cases from more than one NHS trust within Round 5.

A full list of participants is shown in **Appendix 3**.

## Comparison of Audit data with national administrative health databases

The Hospital Episode Statistics (HES) database is the national statistical data collection for England of the care provided by NHS hospitals and for NHS hospital patients treated elsewhere. It provides data for a wide range of analyses on the healthcare delivered by the NHS, providing information for the NHS, Government and many other organisations. Similar databases are used in Wales (PEDW) and Scotland (SMR).

The number of carotid endarterectomy procedures (OPCS codes L29.4 and L29.5) that were performed over the equivalent audit period in HES was used to compare the completeness of cases contributed to the Audit by each NHS trust/Health Board.

- There were 5346 CEA cases recorded on HES for the Round 5 time period in England. Round 5 captured 5083/5346 (95%) of comparable cases in England.
- There were 319 CEA cases recorded on PEDW for the Round 5 time period in England. Round 5 captured 220/319 (69%) of comparable cases in Wales.
- There were 451 CEA cases recorded on SMR01 for the Round 5 time period in Scotland. Round 5 captured 354/451 (78%) of these cases.
- The data for Northern Ireland was not available.

From now on, in this report, the term *HES* is used generically to describe the hospital data that are routinely collected by these national agencies.

Please note that the HES data is based on the date of discharge from hospital, whereas this Audit collects data based on the date of operation. There were a number of operations that were performed in the latter half of September 2012, so were included in this Audit, but were discharged from hospital in October 2012 or later, so are not recorded in HES. The HES comparator figure also includes some cases from Round 4 that were discharged from hospital in October 2011.

The median number of cases per NHS trust in England was:

- 45 (IQR 30-68) reported in the Audit in Round 5.
- 47 (IQR 31-68) recorded on HES in Round 5.

## How to read this report

The report does not contain every carotid intervention that took place within the UK between 1<sup>st</sup> October 2011 and 30<sup>th</sup> September 2012. Only cases entered into the CIA and locked to at least phase 1 (discharge from hospital) were included in the analysis. The analysis of care in the follow up period after discharge requires records to be locked to phase 2 (post discharge clinic visit) and contains a smaller number of cases.

Patients suitable for intervention but not operated upon are not included in this Audit.

Results are presented as totals and/or percentages, medians and inter-quartile ranges (IQR).

Where the numerators and percentages do not add up exactly this is due to:

- Differences between the denominators within the table
- The ability to select more than one answer option
- The rounding up or down of the individual percentage values

The number of cases included in each analysis may vary depending on the level of information that has been provided by the contributors and the total number of cases that meet the inclusion criteria for each analysis. Details are given in **Appendix 4**.

Where individual NHS trust and Health Board results are given, the denominators are based on the number of cases for which the question was applicable and answered.

For clarity of presentation, the terms *Trust* or *Trusts* is used generically to describe NHS trusts and health boards.

## Results

### Carotid endarterectomy procedures reported to the Audit

The number of patients in the last three rounds of the Audit are summarised in the table below. From Rounds 1 to 4, there was an increase in the number of cases submitted to the Audit, year on year. The number of cases in Round 5 is similar to the numbers in Round 4, which reflects similar high-levels of participation and case-ascertainment.

Type of denominator	Round 3	Round 4	Round 5	
	National Denominator	National Denominator	National Denominator	Median number per trust (IQR)
All cases	5292	5759	5723	44 (27-67)
All symptomatic cases	4475	5014	4941	37 (24-56)
All cases with 30-day survival data	5180	5723	5571	43 (25-65)
All cases where a follow-up appointment was conducted	4508	4982	4836	39 (22-56)

### Patient characteristics

Carotid endarterectomy procedures were more common among men than women, with 67% of patients undergoing these procedures in Round 5 being men. The mean age of patients was 72 years (see Table 1). Nearly three-quarters of the patients had at least 70% stenosis in their ipsilateral artery at the time of operation, and 86% were symptomatic. Among the 4941 patients with symptomatic disease, TIA was the most common symptom (48%) followed by stroke (34%).



**Table 1: Patient Demographics**

	National	Denominator
<b>Q1.7</b> Male N (%)	3829 (67%)	5723
<b>Q1.5</b> Age Mean (SD)	71.6 years (10)	
Co-morbidities		
<b>Q2.1</b> Diagnosed diabetic	1175 (21%)	5723
<b>Q2.2</b> Current symptoms/ treatment ischaemic heart disease	1496 (26%)	
Pre-op drugs prior to surgery		
<b>Q10.1</b> Antiplatelet/antithrombotic treatment	5491 (96%)	5723
<b>Q10.3</b> Statin therapy	5010 (89%)	5619
Stopped therapy		
<b>Q10.2a</b> Aspirin	348 (9%)	3799
<b>Q10.2b</b> Stopped x days prior surgery	1(1-3)	
<b>Q10.2c</b> Clopidogrel	526 (24%)	2211
<b>Q10.2d</b> Stopped x days prior surgery	5(2-7)	
<b>Q10.2e</b> Dipyridamole	75 (20%)	374
<b>Q10.2f</b> Stopped x days prior surgery	2(1-5)	
<b>Q10.2g</b> Warfarin	236 (93%)	255
<b>Q10.2h</b> Stopped x days prior surgery	5(3-5)	
<b>Q20.5</b> Drugs prescribed post-op		
Anti-thrombotic	4595 (99%)	4630
Statin	4100 (89%)	
<b>Q7.2</b> Rankin score prior to surgery		
0-2	5255 (92%)	5722
3	401 ( 7%)	
4-5	66 ( 1%)	
<b>Q4.1</b> Patients symptomatic for carotid disease	4941 (86%)	5723
<b>Q4.1c</b> If symptomatic, index symptom:		
Amaurosis fugax	840 (17%)	4941
TIA	2354 (48%)	
Stroke	1680 (34%)	
None of the three above	67 ( 1%)	
<b>Q5.2a</b> Grade of ipsilateral carotid stenosis		
<50%	45 ( 0.8%)	5682
50-69%	1405 (25%)	
70-89%	2603 (46%)	
90-99%	1593 (28%)	
Occluded	36 ( 0.6%)	
<b>Q5.2b</b> Grade of contralateral carotid stenosis		
<50%	3418 (63%)	5438
50-69%	906 (17%)	
70-89%	532 (10%)	
90-99%	241 ( 4%)	
Occluded	341 ( 6%)	

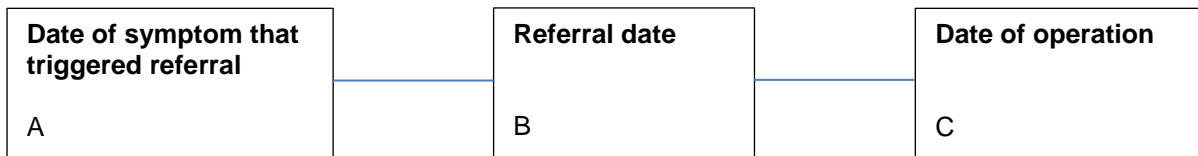
The level of stenosis in the ipsilateral and contralateral arteries shown here were at the time of initial imaging. Many patients may have had subsequent imaging to confirm the level of stenosis.

## Key dates in the care pathway from symptom to surgery

Several key dates for symptomatic patients were collected to calculate timescales across the pathway of care. Audit participants submitted these with varying degrees of completeness, and the denominators for measuring change between two specific dates varied (see N values)

The median provides the best estimate for the interval between each point of the care pathway. NB: It is not appropriate to add up the median delays of adjacent time periods.

**Figure 1: A summary of the key dates that were collected for symptomatic patients during the care pathway (symptom to surgery)**



A to C

**R5 Median = 13, IQR (7-28) days, N= 4419**

R4 Median = 15, IQR (8-41) days, N= 4355

R3 Median = 20, IQR (9-53) days, N= 3799

A to B

**R5 Median = 4, IQR (2-10) days, N= 4342**

R4 Median = 5, IQR (2-14) days, N= 4272

R3 Median = 6, IQR (2-20) days, N= 3709

B to C

**R5 Median = 7, IQR (4-17) days, N= 4940**

R4 Median = 8, IQR (4-23) days, N= 5013

R3 Median = 12, IQR (5-31) days, N= 4474

## Summary of key delays

The ten year National Stroke Strategy, published in 2007, states a target of 48 hours from symptom to operation to minimise the risk of high risk patients with TIA developing a stroke and the current NICE guidelines recommend two weeks.

**Table 2: Summary of key delays**

		Round 3	Round 4	Round 5
		National	National	National
<b>Carotid imaging</b>				
Time from index symptom (Q4.1a) to initial diagnostic imaging (Q5.1)	N	3497	4057	4138
	Median (days)	5	3	3
	IQR (days)	2-15	1-10	1-7
Time from further pre-operative carotid imaging to confirm diagnosis (Q5.3) to operation (Q1.1)	N	2113	2321	2356
	Median (days)	6	6	5
	IQR (days)	2-21	1-14	1-13
Time from further pre-operative carotid imaging to confirm patency (Q6.1) to operation (Q1.1)	N	1440	1486	1470
	Median (days)	1	1	1
	IQR (days)	0-1	0-1	0-1
Time from initial imaging (Q5.1) to first being seen by the surgical team (Q3.1a)	N	4113	4641	4653
	Median (days)	4	3	2
	IQR (days)	1-14	1-9	0-7
<b>Referral</b>				
Time from index symptom (Q4.1a) to referral (Q3.1) (A-B in Fig. 1)	N	3709	4272	4342
	Median (days)	6	5	4
	IQR (days)	2-20	2-14	2-10
Time from referral (Q3.1) to first being seen by the surgical team (Q3.1a)	N	4475	5014	4937
	Median (days)	1	1	1
	IQR (days)	0-7	0-6	0-4
Time from referral (Q3.1) to admission (Q1.11)	N	3913	4078	4036
	Median (days)	13	11	8
	IQR (days)	5-34	5-28	3-20
<b>Surgery</b>				
Time from index symptom (Q4.1a) to operation (Q1.1) (A-C in Fig. 2.1)	N	3799	4355	4419
	Median (days)	20	15	13
	IQR (days)	9-53	8-41	7-28
Time from referral (Q3.1) to operation (Q1.1) (B-C in Fig. 1)	N	4474	5013	4940
	Median (days)	12	8	7
	IQR (days)	5-31	4-23	4-17
Time from first being seen by the surgical team (Q3.1a) to operation (Q1.1)	N	4474	5013	4937
	Median (days)	8	6	6
	IQR (days)	3-20	2-14	2-12
Time from admission (Q1.11) to operation (Q1.1)	N	4475	5014	4941
	Median (days)	1	1	1
	IQR (days)	1-2	0-2	0-2

In some NHS trusts, the median referral to admission time was longer than the median referral to operation time because some patients were admitted then referred. This was reported for 905 cases, which were not used to calculate the median referral to admission time. The majority of these cases were admitted following stroke (522/905, 58%).

We have compared timings for stroke, TIA, amaurosis fugax and other from Rounds 4 and 5. For this analysis, we grouped chronic cerebral hypoperfusion with the 'other' symptoms. There were significant differences for each symptom, and the breakdown is shown in the table below.

**Table 3: Key milestone timings (days) for different symptoms**

Round 4		Symptom Type			
		Amaurosis Fugax	TIA	Stroke	Other & CCH
Time from index symptom (Q4.1a) to referral (Q3.1) (A-B in Fig. 1)	N	648	2018	1565	41
	Median (days)	10	4	5	5
	IQR (days)	3-30	1-12	2-11	2-30
Time from referral (Q3.1) to operation (Q1.1) (B-C in Fig. 1)	N	880	2345	1719	69
	Median (days)	13	8	7	36
	IQR (days)	6-32	4-21	4-19	10-97
Time from index symptom (Q4.1a) to operation (Q1.1) (A-C in Fig. 1)	N	662	2062	1588	43
	Median (days)	28	14	14	46
	IQR (days)	13-61	7-36	8-35	10-125
Round 5		Symptom Type			
Time from index symptom (Q4.1a) to referral (Q3.1) (A-B in Fig. 1)	N	650	2083	1570	39
	Median (days)	7	3	4	8
	IQR (days)	3-20	1-8	2-9	1-24
Time from referral (Q3.1) to operation (Q1.1) (B-C in Fig. 1)	N	840	2353	1680	67
	Median (days)	11	7	7	55
	IQR (days)	5-27	4-15	4-14	10-82
Time from index symptom (Q4.1a) to operation (Q1.1) (A-C in Fig. 1)	N	661	2129	1589	40
	Median (days)	21	11	12	60
	IQR (days)	10-46	6-24	7-26	16-107

### Cases where the time of the symptom that triggered referral is not known

In records that did not have the exact date on which the patient experienced the symptom that triggered referral, the timing of this symptom was recorded in time bands.

Data on exact time of symptom was not known for 676 cases in the 12 month time period for Round 3, 657 cases in the 12 month period for Round 4 and 520 cases in the 12 month period for Round 5.

## Reasons for delays of more than two weeks between index symptom and surgery

*There is evidence that greater benefit from carotid endarterectomy is achieved when surgery is performed early, ideally within two weeks of the initial symptom (Rothwell et al., 2004).*

86 per cent of cases (4941/5723) were reported as symptomatic. The date of the index symptom and the date of surgery were known for 89% of symptomatic cases (4419/4941). Among these, 53% of patients had a delay of more than two weeks (2331/4419). The reason for delay was reported for 1932 (83%) of these 2331 patients.

**Table 4: Self-reported reasons for delays of more than two weeks between index symptom and surgery**

Q11.1 If elapsed time between the symptom that triggered referral and surgery is >2 weeks, what was the reason?	Round 3 (2243 cases)	Round 4 (2191 cases)	Round 5 (1932 cases)
Reason cited *	National N (%)	National N (%)	National N (%)
Delay in presentation	551 (25%)	565 (26%)	517 (27%)
Delay in referral	906 (40%)	899 (41%)	740 (38%)
Delay in carotid imaging	280 (12%)	243 (11%)	191 (10%)
Patient cancellation/delay - unfit	197 (9%)	206 (9%)	162 (8%)
Patient cancellation/delay - patient choice	213 (10%)	210 (10%)	192 (10%)
Limited availability of surgeon	248 (11%)	225 (10%)	160 (8%)
Limited availability of anaesthetist	24 (1%)	13 (0.6%)	9 (0.5%)
Limited availability of radiologist	2 (0.1%)	4 (0.2%)	6 (0.3%)
Lack of operating time	301 (13%)	220 (10%)	237 (12%)
Other case took priority	61 (3%)	49 (2%)	78 (4%)
Other	316 (14%)	339 (15%)	277 (14%)

\* Multiple reasons could be selected.

### Changes in delays during Rounds 3 to 5

To demonstrate reductions in delays, the symptomatic cases for Rounds 3 to 5 were divided into *six month periods*, and plotted on the same graph to show the median delays over the whole 36 month period. The six month intervals were defined as follows:

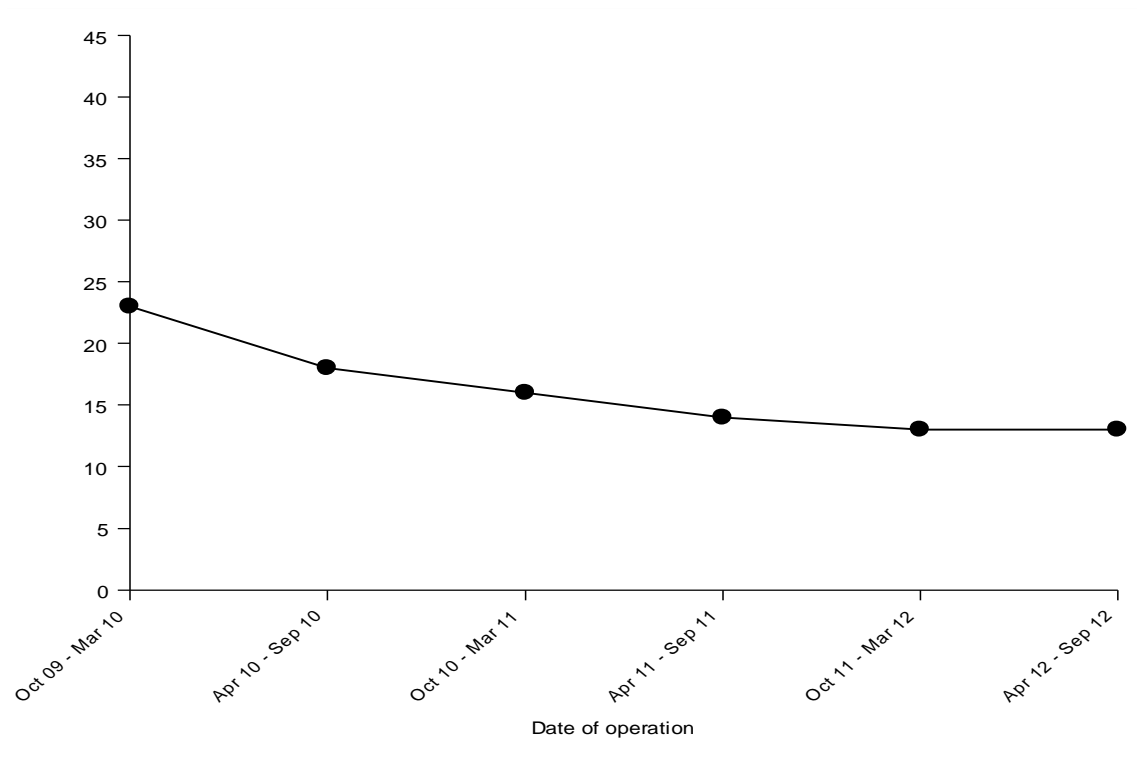
Round 3 : October 2009 to March 2010 and April 2010 to September 2010.

Round 4 : October 2010 to March 2011 and April 2011 to September 2011.

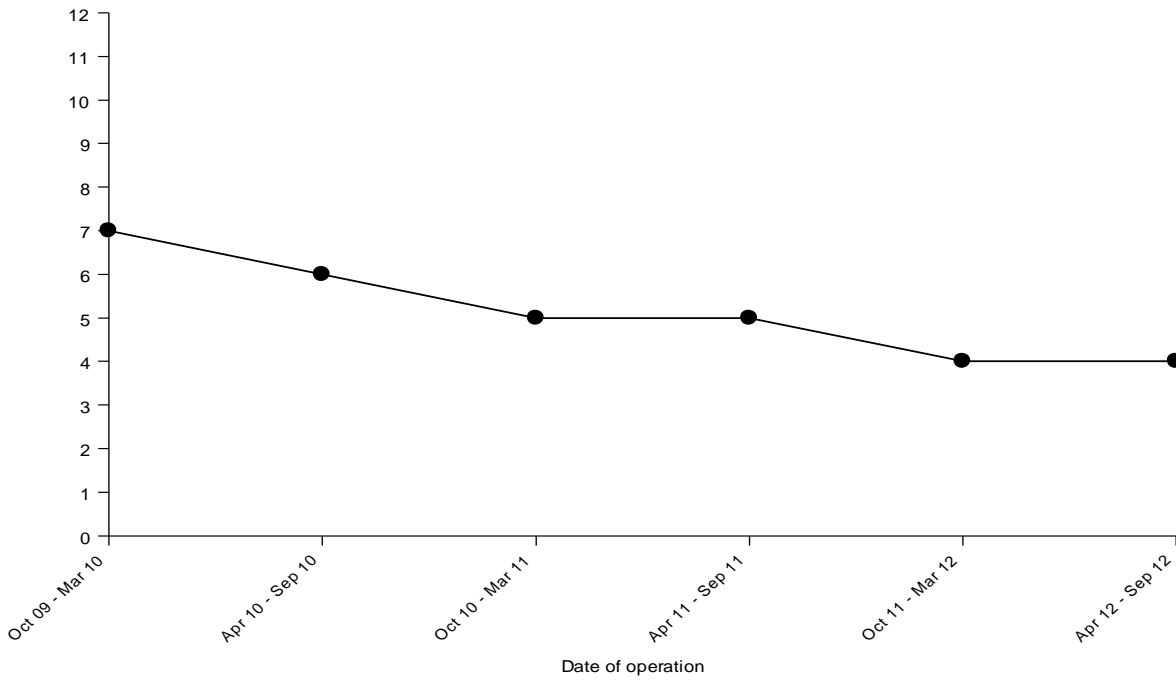
Round 5 : October 2011 to March 2012 and April 2012 to September 2012

Figures 2 to 4 show the reduction in median delays for the key parts of the pathway (see **Figure 1** on page 14 for the definition of key parts).

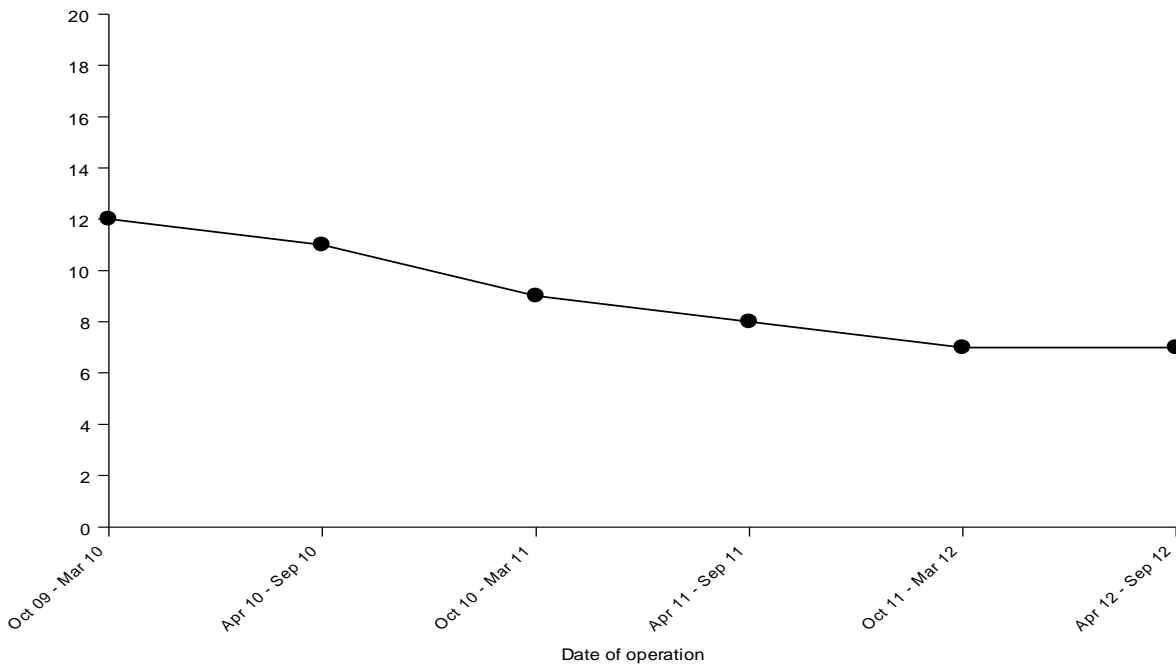
**Figure 2: Index symptom to operation (number of days) during Rounds 3 - 5 (A-C)**



**Figure 3: Index symptom to referral (number of days) during Rounds 3 - 5 (A-B)**



**Figure 4: Referral to operation (number of days) during Rounds 3 - 5 (B-C)**



## Referral for carotid endarterectomy

Patients may be referred for carotid endarterectomy from various medical practitioners. These different referral pathways have the potential to influence the speed of access to vascular services and ultimately surgery itself. The most common source of referral in Round 5 was the stroke physician, followed by the general practitioner (see Table 5a). The time spent travelling the care pathway was typically shortest for patients referred by stroke physicians.

**Table 5a: Specialist who referred the patient to the surgical team**

Q3.2 Who referred the patient to the team under whose care the procedure was performed?	Round 3 (5292 cases)	Round 4 (5759 cases)	Round 5 (5723 cases)
	National N (%)	National N (%)	National N (%)
General Practitioner	453 (9%)	397 (7%)	333 (6%)
Neurologist	328 (6%)	357 (6%)	309 (5%)
Stroke physician	3261 (62%)	3896 (68%)	4146 (72%)
Radiologist	39 (1%)	38 (1%)	29 (1%)
Care of Elderly consultant	413 (8%)	295 (5%)	265 (5%)
Cardiologist/Cardiothoracic surgeon	205 (4%)	162 (3%)	153 (3%)
Vascular surgeon	139 (3%)	147 (3%)	109 (2%)
Self-referral	29 (1%)	27 (1%)	16 (0%)
Other surgeon	41 (1%)	48 (1%)	52 (1%)
Ophthalmologist	198 (4%)	194 (3%)	146 (3%)
Other	186 (4%)	198 (3%)	165 (3%)

In Round 5, 20% of cases (1,086/5530) were referred from another NHS trust.



**Table 5b: Delays by referral source**

Q3.2 Who referred the patient to the team under whose care the procedure was performed?	Round 5		
	All Round 5 cases (5723 cases)	Round 5 SYMPTOMATIC patients	
		Median (IQR) time from symptom to referral (days)	Median (IQR) time from referral to operation (days)
	National N (%)	National N (IQR)	National N (IQR)
General Practitioner	333 (6%)	8 (3-27)	24 (9-55)
Neurologist	309 (5%)	4 (2-11)	9 (4-22)
Stroke physician	4146 (72%)	4 (2-9)	7 (3-14)
Radiologist	29 (1%)	10 (1-21)	10 (6-17)
Care of Elderly consultant	265 (5%)	5 (2-13)	11 (6-23)
Cardiologist/Cardiothoracic surgeon	153 (3%)	1 (0-4)	26 (11-82)
Vascular surgeon	109 (2%)	5 (1-21)	8 (4-26)
Self-referral	16 (0%)	0 (0-1)	32 (7-63)
Other surgeon	52 (1%)	8 (4-13)	5 (2-18)
Ophthalmologist	146 (3%)	10 (2-38)	32 (11-59)
Other	165 (3%)	6 (2-22)	9 (5-18)

## Operation characteristics

There are various aspects of the operative technique may influence outcome of a carotid endarterectomy. Shunts may be placed to ensure blood supply to the brain during the procedure but these are not always required. The need for shunting is reduced when local anaesthetic (LA) is used as the patient can be assessed for signs of cerebral ischaemia.

A review of the evidence on carotid patching following carotid endarterectomy has demonstrated that patching is associated with a reduction in the risk of stroke of any type or death during the perioperative period and long term follow-up (Bond et al., 2004). Tacking sutures at the distal end of the endarterectomy may help to prevent the intimal flap from occluding the artery when flow is restored.

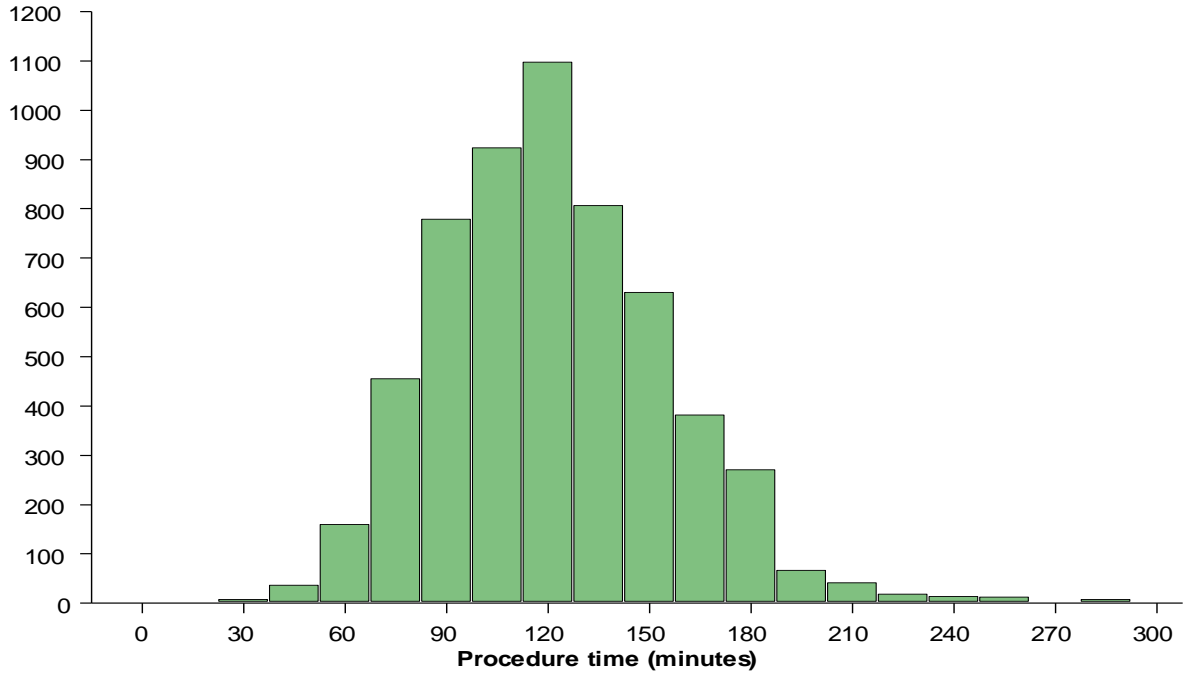
**Table 6: Characteristics of operations**

Aspect of care	Round 3	Round 4	Round 5
	National N (%)	National N (%)	National N (%)
<b>Q12.6</b> Timing of surgery: elective	4295/5267(82%)	4458/5723 (78%)	4270/5700 (75%)
<b>Q12.7</b> Type of anaesthetic			
General (GA)	2837/5292 (54%)	3142/5759 (55%)	3199/5722 (56%)
Local / Block (LA)	2359/5292 (45%)	2525/5759 (44%)	2445/5722 (43%)
Started with LA, switched to GA	96/5292 (2%)	92/5759 (2%)	78/5722 (1%)
<b>Q13.4</b> Carotid shunt			
Used	2381/5185 (46%)	2503/5648 (44%)	2674/5610 (48%)
Attempted and abandoned	30/5185 (1%)	45/5648 (1%)	51/5610 (1%)
<b>Q13.5</b> Type of endarterectomy			
Standard	4712/5134 (92%)	5133/5608 (92%)	5047/5532 (91%)
Eversion	422/5134 (8%)	475/5608 (8%)	485/5532 (9%)
<b>Q13.6</b> Carotid patch	3769/5205 (72%)	4096/5688 (72%)	4269/5653 (76%)
<b>Q13.7</b> Distal tacking sutures used	2400/5086 (47%)	2756/5592 (49%)	3008/5499 (55%)
Median (IQR) duration of operation in minutes	120 (95-145)	120 (95-145)	120 (95-145)
<b>Q13.9</b> Completion assessment technique			
At least one of the following:	1834/4946 (37%)	2124/5510 (39%)	2048/5382 (38%)
Angiography	64/4946 (1%)	40/5510 (1%)	12/5382 (0%)
Duplex carotid imaging	290/4946 (6%)	331/5510 (6%)	298/5382 (6%)
Angioscopy	186/4946 (4%)	132/5510 (2%)	134/5382 (2%)
Hand-held Doppler	1345/4946 (27%)	1652/5510 (30%)	1658/5382 (31%)
<b>Q14.1</b> Time spent in recovery			
None	238/5030 (5%)	226/5629 (4%)	219/5482 (4%)
Less than 4 hours	3744/5030 (74%)	4176/5629 (74%)	4102/5482 (75%)
Between 4 and 12 hours	696/5030 (14%)	812/5629 (14%)	689/5482 (13%)
More than 12 hours	352/5030 (7%)	415/5629 (7%)	472/5482 (9%)
<b>Q14.2</b> Where was the patient admitted post-operatively (after any period in recovery)			
Intensive Care Unit (ICU)	147/5163 (3%)	202/5644 (4%)	126/5547 (2%)
High Dependency Unit (HDU)	1840/5163 (36%)	2020/5644 (36%)	2060/5547 (37%)
Ward	2836/5163 (55%)	3035/5644 (54%)	2849/5547 (51%)
Post Anaesthetic Care Unit (PACU)	340/5163 (7%)	387/5644 (7%)	512/5547 (9%)
<b>Length of Stay (days)</b>			
Median (IQR)	3 (2-5)	3 (2-6)	3 (2-6)

In this round, the median time to perform a carotid endarterectomy was 120 minutes (Figure 5). The average duration of an operation has remained consistent over the last three Rounds.

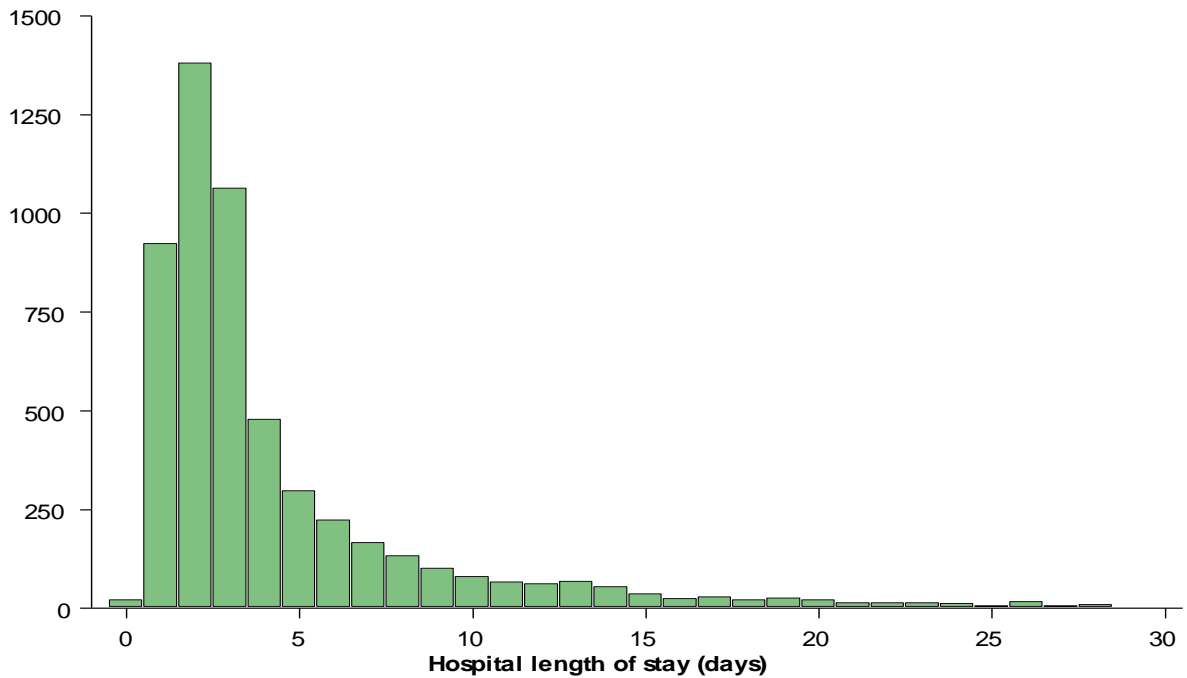
Patients remained in hospital typically between 2 and 6 days (Figure 6).

**Figure 5: Duration of operation**



This graph excludes four patients with times over 300 minutes for presentation purposes.

**Figure 6: Distribution of Hospital length of stay**



This graph excludes 199 patients with LOS greater than 28 days for presentation purposes.

## Follow-up care

In the sections that follow, the denominator of the total number of cases changes because follow-up data were not submitted for all patients. Of the 5723 Round 5 records that were complete to at least Phase 1, follow-up data were submitted for 5413 (95%) patients.

### Access to follow-up appointments

*Post-operative and post-discharge assessment of patients undergoing CEA is essential in order to:*

- *Assess the outcomes of surgery*
- *Inform the assessment of risk versus benefit of surgical intervention*

**Table 7: Follow-up appointments**

Access to follow-up appointments	Round 3	Round 4	Round 5
	National N (%)	National N (%)	National N (%)
<b>Q19.1</b> Offered an appointment? (Yes)	4802/5058 (95%)	5340/5551 (96%)	5192/5373 (97%)
<b>Q19.2</b> Attended the appointment (Yes)	4514/4802 (94%)	4988/5340 (93%)	4838/5192 (93%)
Median time (IQR) from discharge ( <b>Q16.2</b> ) to follow-up ( <b>Q19.2</b> ) in days	48 (39-67)	48 (39-64)	48 (39-63)
<b>Q19.3</b> Specialist who assessed the patient at follow-up *			
Surgeon	3825/4495 (85%)	4114/4960 (83%)	3915/4824 (81%)
Neurologist	88/4495 (2%)	113/4960 (2%)	83/4824 (2%)
Stroke Physician	290/4495 (6%)	380/4960 (8%)	508/4824 (11%)
Surgeon and Stroke Physician	62/4495 (1%)	69/4960 (1%)	111/4824 (2%)
Other	342/4495 (8%)	429/4960 (9%)	415/4824 (9%)

\*multiple specialists could be selected

It is recommended that all patients are followed up by both the surgical and stroke teams to ensure that all post-operative complications are assessed.

## Postoperative surgical outcomes

Patients may experience various complications following carotid endarterectomy. These can be one of the following:

- Bleeding.
- Myocardial Infarct: otherwise known as a heart attack, this involves the interruption of blood supply to part of the heart.
- Cranial Nerve Injury: abbreviated to CNI, this is damage to one of the nerves to the face and neck.
- Transient Ischaemic Attack: a “mini-stroke” or TIA occurs when the blood supply to the brain is briefly interrupted.

The likelihood of a complication following carotid endarterectomy is low, and has remained at similar levels throughout Rounds 3 to 5.

**Table 8a: Summary of reported complications following carotid endarterectomy by Audit Round**

		Round 3	Round 4	Round 5
Complication	Stage complication experienced	National N (%)	National N (%)	National N (%)
Myocardial Infarct	Inpatient	40/5292 (0.8%)	38/5759 (0.7%)	22/5723 (0.4%)
Bleeding	Inpatient	182/5292 (3.4%)	194/5759 (3.4%)	193/5723 (3.4%)
	of which returned to theatre	112/5292 (2.1%)	134/5759 (2.3%)	145/5723 (2.5%)
CNI	Inpatient CNI	106/5292 (2.0%)	115/5759 (2.0%)	93/5723 (1.6%)
	CNI (found at follow-up)	106/4508 (2.4%)	111/4982 (2.2%)	134/4836 (2.8%)
	Overall CNI	197/5292 (3.7%)	222/5759 (3.9%)	211/5723 (3.7%)
TIA	Inpatient	29/5292 (0.5%)	27/5759 (0.5%)	32/5723 (0.6%)
Stroke	Inpatient stroke	105/5292 (2.0%)	83/5759 (1.4%)	75/5723 (1.3%)
	Stroke at any point by follow-up	136/5185 (2.6%)	115/5728 (2.0%)	111/5572 (2.0%)
	Stroke within 30 days of operation	118/5185 (2.3%)	102/5728 (1.8%)	103/5572 (1.8%)
Death	Inpatient death	34/5292 (0.6%)	29/5759 (0.5%)	27/5723 (0.5%)
	Death within 30 days of operation	42/5180 (0.8%)	48/5723 (0.8%)	44/5571 (0.8%)
Stroke/Death	Death within 30 days and/or stroke within 30 days	139/5185 (2.7%)	125/5728 (2.2%)	124/5572 (2.2%)
MI/Stroke/Death	Inpatient	153/5275 (2.9%)	123/5759 (2.1%)	104/5721 (1.8%)

**Table 8b: Summary of reported complications following carotid endarterectomy for Round 3-5**

Complication	Stage complication experienced	Procedures N	Complication rate (%)	95% CI
Myocardial Infarct	Inpatient	16774	0.6	0.5 to 0.7
Bleeding	Inpatient	16774	3.4	3.1. to 3.7
	of which returned to theatre	16774	2.3	2.1 to 2.6
CNI	Inpatient CNI	16774	1.9	1.7 to 2.1
	CNI (found at follow-up)	14326	2.5	2.2 to 2.7
	Overall CNI	16774	3.8	3.5 to 4.1
TIA	Inpatient	16774	0.5	0.4 to 0.6
Stroke	Inpatient stroke	16774	1.6	1.4 to 1.8
	Stroke at any point by follow-up	16485	2.2	2.0 to 2.4
	Stroke within 30 days of operation	16485	2.0	1.8 to 2.2
Death	Inpatient death	16774	0.5	0.4 to 0.7
	Death within 30 days of the operation	16474	0.8	0.7 to 1.0
Stroke/ Death	Death within 30 days and/or stroke within 30 days	16485	2.4	2.1 to 2.6
MI/Stroke/ Death	Inpatient	16755	2.3	2.0 to 2.5

## Rates of stroke/death within 30 days among NHS trusts

Data for Rounds 3 to 5 were used to calculate risk-adjusted rates of death/stroke by NHS trust / Health Board. A logistic regression model was used to adjust the rates for differences between patients treated at the various organisations and took into account the following characteristics: age, diabetes, symptoms/treatment for ischaemic heart disease/congestive heart failure, peripheral vascular disease and the Rankin Scale.

A funnel plot was used to assess whether there are systematic differences between outcomes between NHS organisations. This is a widely used graphical method for comparing the outcomes of surgeons or hospitals [Spiegelhalter, 2005].

In these plots, each dot represents an NHS organisation. The solid horizontal line is the national average. The vertical axis indicates the outcome with dots higher up the axis showing trusts with a higher stroke and/or death rate. The horizontal axis shows NHS trust activity with dots further to the right showing the organisations that perform more operations. The benefit of funnel plot is that it shows whether the outcomes of NHS trusts differ from the national average by more than would be expected from random fluctuations. Random variation will always affect outcome information like mortality rates, and its influence is greater among small samples. This is shown by the two funnel-shaped dotted lines. These lines define the region within which we would expect the outcomes of NHS trusts to fall if their outcomes only differed from the national rate because of random variation.

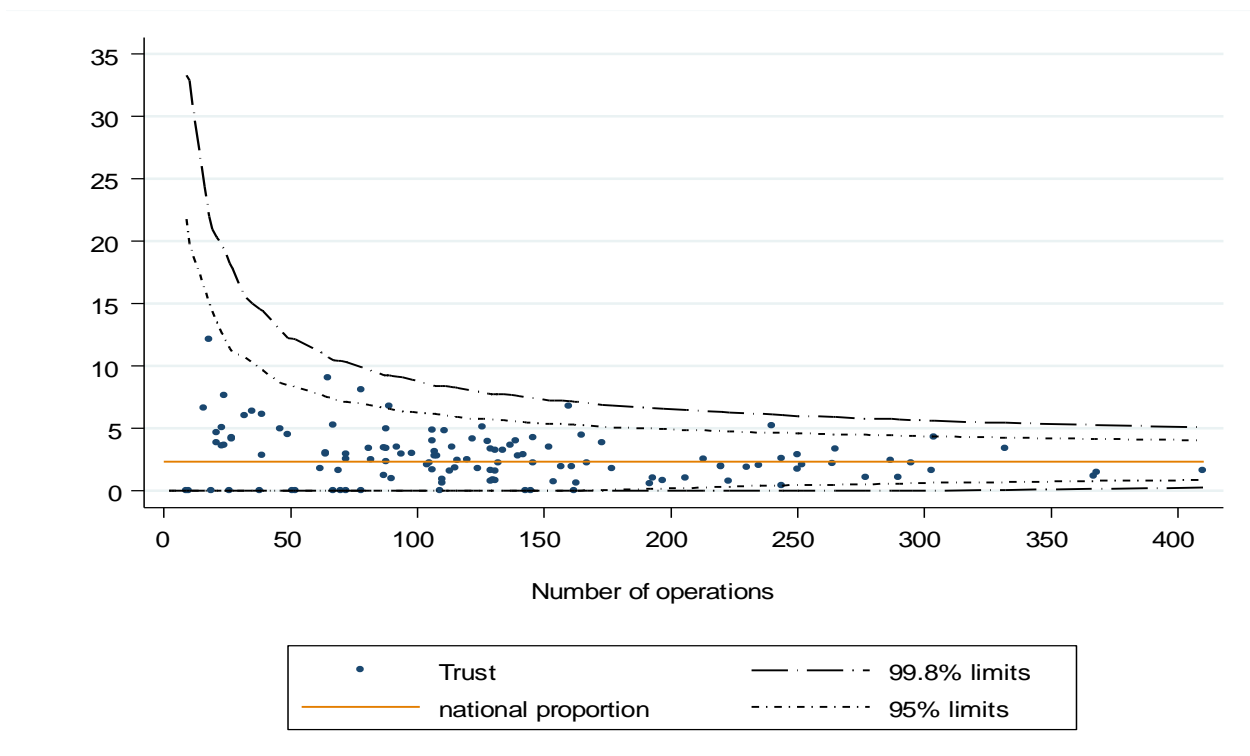
If the outcomes of an NHS trust fell outside the outer limits, there could be a systematic reason for the higher or lower rate, and they would be flagged as an outlier for further investigation. In this report, outliers are managed according to the outlier policy of the Vascular Society, drawn up using guidance from the Department of Health. It can be found at

<http://www.vsqip.org.uk/wp/wp-content/uploads/2013/07/National-Vascular-Registry-Outlier-Policy.pdf>.

All the NHS trusts had a risk adjusted rate of death/stroke within 30 days that fell within the expected range given the number of procedures performed. They all fell within the outer 99.8% control limits.

The data related to the funnel plot can be found in the table that starts on page 43.

**Figure 7: Funnel plot of risk-adjusted rate of stroke/death within 30 days of a carotid endarterectomy, with NHS trusts/ Health Boards shown in comparison to the national average**



**Cause of death during the inpatient stay and within 30-days of surgery**

In Round 5, 28 (0.5%) of 5723 patients were reported to have died during their hospital stay. The primary cause of death was recorded for all 28 these. Among these patients, 27 died within 30-days of the operation.

Overall, there were 44 patients who died within 30 days of the procedure, the causes of which are presented in Table 10 below.

**Table 9: Cause of inpatient death**

<b>Q15.7 and Q15.7b</b> Cause of death	<b>Round 3</b> (40/5292 cases)	<b>Round 4</b> (31/5759 cases)	<b>Round 5</b> (28/5723 cases)
MI	7 (0.1%)	7 (0.1%)	5 (0.1%)
Bleeding	2 (0.04%)	0 (0%)	0 (0%)
Stroke	13 (0.2%)	16 (0.3%)	14 (0.2%)
Other	18 (0.3%)	8 (0.1%)	9 (0.2%)

**Table 10: Cause of death up to 30 days post surgery**

<b>Q15.7b and Q18.1b</b> Cause of death	<b>Round 3</b> (42/5180 cases)	<b>Round 4</b> (48/5723 cases)	<b>Round 5</b> (44/5571 cases)
Myocardial infarct	6 (0.1%)	9 (0.2%)	8 (0.1%)
Bleeding	3 (0.1%)	0 (0%)	0 (0%)
Stroke	15 (0.3%)	23 (0.4%)	21 (0.4%)
Other	17 (0.3%)	10 (0.2%)	10 (0.2%)
Not known	1 (0.02%)	6 (0.1%)	5 (0.1%)



## Stroke during the inpatient stay and post-discharge

A stroke during a patient's inpatient stay was reported for 75/5723 (1.3%) cases. Among the 62 patients in whom the side of the stroke was reported, 46 (74%) patients experienced an ipsilateral stroke.

The time the stroke occurred was known for 67/75 (89%) of cases.

**Table 11: Stroke experienced during inpatient stay**

Q15.3 Stroke experienced during inpatient stay following CEA	Round 3	Round 4	Round 5
	National N (%)	National N (%)	National N (%)
Stroke during procedure (woke up with Stroke)	33 (0.6%)	24 (0.4%)	24 (0.4%)
Stroke experienced ≤ 24 hours of undergoing CEA	41 (0.8%)	35 (0.6%)	27 (0.5%)
Stroke experienced > 24 hours of undergoing CEA and prior to discharge	16 (0.3%)	18 (0.3%)	16 (0.3%)
Stroke experienced after CEA, but with no date given.	15 (0.3%)	6 (0.1%)	8(0.1%)

The severity of the stroke (Rankin score) was known for 61 (82%) of the 75 patient strokes. Among these, the distribution of severity was:

- 28/61 (46%) had scores of 0-2
- 11/61 (18%) had a score of 3
- 22/61 (36%) had scores of 4-5

Strokes were reported after discharge in three ways:

- Where stroke was the primary cause of death
- Where the patient was re-admitted for stroke
- Where stroke was reported at post-hospital discharge follow-up assessment

When only those cases for which discharge follow-up data were available are considered, the stroke rate for the duration of the follow up period was 2.0% (111/5572). The 30-day stroke rate was 1.8% (103/5572).

**Other postoperative outcomes****Table 12: Other specified post-operative complications**

	<b>Round 3</b> (5292 cases)	<b>Round 4</b> (5759 cases)	<b>Round 5</b> (5723 cases)
<b>Complication specified</b>	<b>National N (%)</b>	<b>National N (%)</b>	<b>National N (%)</b>
Amaurosis fugax	1 (0.0%)	1 (0.0%)	4 (0.1%)
Heart failure	38 (0.7%)	25 (0.4%)	9 (0.2%)
Urinary complications	37 (0.7%)	51 (0.9%)	43 (0.8%)
Cardiac arrest	9 (0.2%)	3 (0.1%)	6 (0.1%)
Fitting	10 (0.2%)	9 (0.2%)	9 (0.2%)
Occlusion of the operated carotid	4 (0.1%)	3 (0.1%)	3 (0.1%)
Respiratory complications	50 (0.9%)	53 (0.9%)	45 (0.8%)
Thromboembolism related to the treated carotid artery	8 (0.2%)	13 (0.2%)	11 (0.2%)
Post-operative hypertension	67 (1.3%)	51 (0.9%)	81 (1.4%)

There were 133/5409 (2%) patients (394 missing) who were reported as being re-admitted within 30-days of their carotid endarterectomy. The complications reported as leading to these readmissions were:

- 18/133 (14%) stroke
- 14/133 (11%) cardiac-related
- 11/133 (8%) respiratory
- 94/133 (71%) other

NB: The percentages may not add up to 100 as multiple reasons could be selected.

The following section presents NHS trust level information on the overall speed of symptom to surgery. The time is described using the median value for the group of patients within a single NHS trust.

The plot on the following page (Figure 8) shows the summary symptom to procedure time measures for all NHS trusts within Round 5 that had 10 or more symptomatic cases with exact symptom and procedure dates. The median time is represented by a black dot. The inter-quartile ranges (IQRs) are shown by horizontal green lines. Any upper quartile line that is red indicates that the upper quartile value is above 100 days. This typically occurs when the number of patients with exact symptom and procedure dates for the NHS trust was relatively small.

The vertical red line in the graph represents the current NICE Guideline of 14 days from symptom to procedure.

Please note that the graph needs to be studied in conjunction with the table on page 32, which includes how many patients this median and IQR is based upon, and how many cases were identified in HES within Round 5 for each trust.

Figure 8 shows that there is considerable variation among NHS trusts in the median time to surgery. The median was 14 days for 62 organisations, but for a few NHS trusts the median exceeded 20 days.

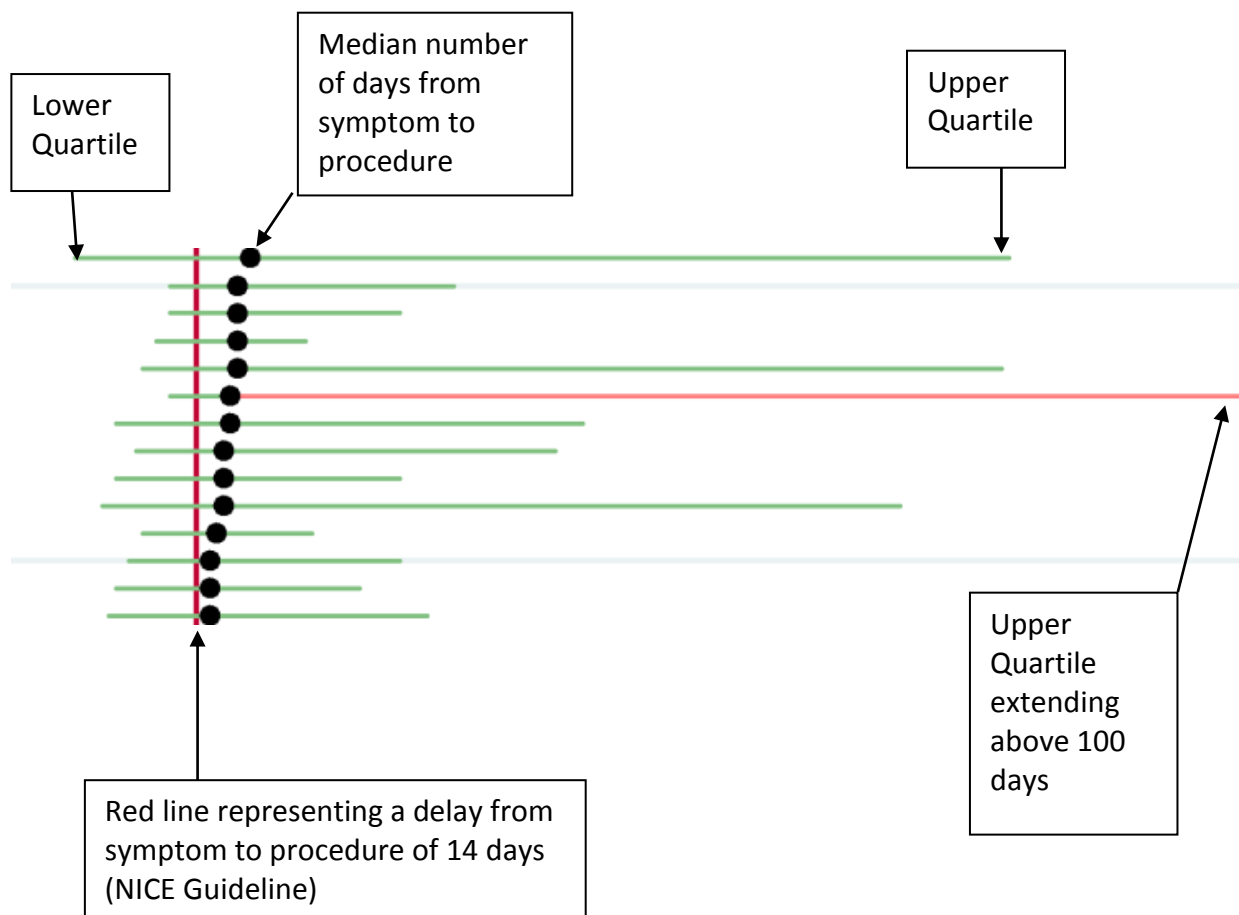
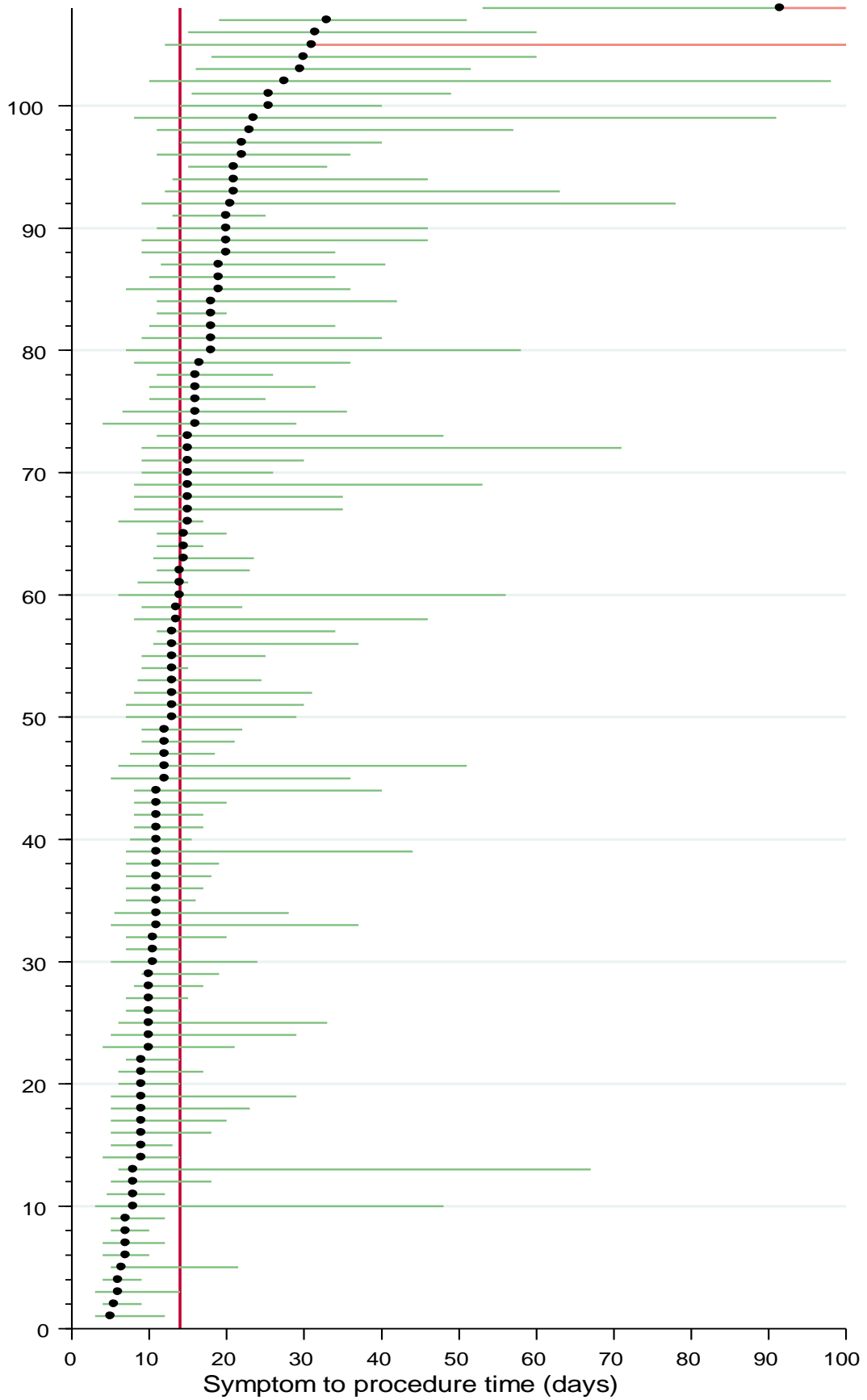


Figure 8: Median time (and inter-quartile range) from symptom to procedure by NHS trust






## Participation in the audit

### NHS trust case-ascertainment

There is concern amongst many healthcare professionals regarding the accuracy of HES data, and this was examined further in an Organisational Audit of Vascular Surgical Services in 2009. We asked trusts to self-report the number of CEAs they had performed in that year, and a reasonable association was found between the self-reported data and that obtained from HES. However, HES is the only national data available with which to compare.




















From Round 3 onwards a traffic light system has been used to illustrate trust's contribution of cases compared to HES. Red indicates that the trust has submitted 75% or fewer of their cases compared to HES. Amber indicates that the trust has submitted between 76% and 90%. Green indicates that the trust has submitted 91% or more of their cases compared to HES. We have capped the green category at 110% as this probably indicates a HES coding issue within the trust.

The ,  or  in the final column is included to aid those who find it difficult to differentiate between red and green.

As the HES data are given by discharge date from hospital, the numbers in the HES comparison may differ slightly from the total number of cases included in analysis for Round 5.

A number of NHS trusts have stopped performing carotid endarterectomies since this data was collected, due to the on-going reconfiguration of vascular surgical services. Those trusts who have now stopped performing carotid endarterectomies are denoted with an asterisk (\*) and are in a grey font.

**Table 13: Case contribution to this audit compared to HES reported caseload by Trust**

Trust Name	Total Number of Cases in Round 5	Number in R5 for HES Comparison	Number of Cases in HES	% case ascertainment	
<b>East Midlands</b>					
Derby Hospitals NHS Foundation Trust	41	41	41	100%	
Kettering General Hospital NHS Foundation Trust*	4	4	6	67%	
Northampton General Hospital NHS Trust	51	53	51	104%	
Nottingham University Hospitals NHS Trust	91	91	94	97%	
Sherwood Forest Hospitals NHS Foundation Trust*	44	44	45	98%	
United Lincolnshire Hospitals NHS Trust	45	45	50	90%	
University Hospitals of Leicester NHS Trust	107	111	114	97%	
<b>East of England</b>					
Basildon and Thurrock University Hospital NHS Foundation Trust	30	32	32	100%	
Bedford Hospital NHS Trust	50	50	45	111%	
Cambridge University Hospitals NHS Foundation Trust	102	105	105	100%	
Colchester Hospital University NHS Foundation Trust	51	52	51	102%	
East and North Hertfordshire NHS Trust	46	46	47	98%	
Ipswich Hospital NHS Trust*	23	23	21	110%	
Mid Essex Hospital Services NHS Trust	43	43	44	98%	
Norfolk and Norwich University Hospitals NHS Foundation Trust	91	92	92	100%	
Peterborough and Stamford Hospitals NHS Foundation Trust	16	16	25	64%	
Princess Alexandra Hospital NHS Trust	22	23	24	96%	
Southend University Hospital NHS Foundation Trust	51	52	52	100%	
West Hertfordshire Hospitals NHS Trust	36	36	50	72%	

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Trust Name	Total Number of Cases in Round 5	Number in R5 for HES Comparison	Number of Cases in HES	% case ascertainment	
<b>London</b>					
Barking, Havering And Redbridge University Hospitals NHS Foundation Trust	42	43	45	96%	✓
Barnet and Chase Farm Hospitals NHS Trust*	5	5	10	50%	✗
Barts Health NHS Trust	54	55	48	115%	◆
Guy's and St Thomas' Hospital NHS Foundation Trust	18	19	19	100%	✓
Imperial College Healthcare NHS Trust	89	90	92	98%	✓
King's College Hospital NHS Foundation Trust	137	139	132	105%	✓
Lewisham Healthcare NHS Trust*	3	3	3	100%	✓
North West London Hospitals NHS Trust	36	36	40	90%	◆
Royal Free London NHS Foundation Trust	16	16	16	100%	✓
St George's Healthcare NHS Trust	77	78	75	104%	✓
University College London Hospitals NHS Foundation Trust	46	48	50	96%	✓
<b>North East</b>					
City Hospitals Sunderland NHS Foundation Trust	48	48	51	94%	✓
County Durham and Darlington NHS Foundation Trust	56	57	57	100%	✓
Gateshead Health NHS Foundation Trust	43	43	42	102%	✓
Newcastle upon Tyne Hospitals NHS Foundation Trust	70	72	76	95%	✓
South Tees Hospitals NHS Foundation Trust	67	67	66	102%	✓
<b>North West</b>					
Aintree University Hospitals NHS Foundation Trust*	40	41	45	91%	✓
Blackpool Teaching Hospitals NHS Foundation Trust	0	0	66	0%	✗
Bolton NHS Foundation Trust	37	39	37	105%	✓
Central Manchester University Hospitals NHS Foundation Trust	75	77	78	99%	✓
Countess of Chester Hospital NHS Foundation Trust	45	46	49	94%	✓
East Lancashire Hospitals NHS Trust	84	84	88	95%	✓
Lancashire Teaching Hospitals NHS Foundation Trust	50	50	52	96%	✓
Mid Cheshire Hospitals NHS Foundation Trust*	17	17	30	57%	✗
North Cumbria University Hospitals NHS Trust	21	21	24	88%	◆
Pennine Acute Hospitals NHS Trust	114	117	120	98%	✓
Royal Liverpool and Broadgreen University Hospitals NHS Trust	64	65	64	102%	✓
Southport and Ormskirk Hospital NHS Trust*	25	25	25	100%	✓
Tameside Hospital NHS Foundation Trust	18	18	47	38%	✗
University Hospital of South Manchester NHS Foundation Trust	89	89	89	100%	✓
University Hospitals Of Morecambe Bay NHS Foundation Trust	42	42	40	105%	✓
Warrington and Halton Hospitals NHS Foundation Trust	46	47	47	100%	✓
Wirral University Teaching Hospital NHS Foundation Trust	61	61	63	97%	✓
Wrightington, Wigan And Leigh NHS Foundation Trust	47	48	52	92%	✓
<b>South Central</b>					
Buckinghamshire Healthcare NHS Trust	75	77	74	104%	✓
Milton Keynes Hospital NHS Foundation Trust*	8	8	9	89%	◆
Oxford University Hospitals NHS Trust	97	97	104	93%	✓
Portsmouth Hospitals NHS Trust	69	70	71	99%	✓
Royal Berkshire NHS Foundation Trust*	0	0	7	0%	✗
University Hospital Southampton NHS Foundation Trust	110	115	115	100%	✓
<b>South East Coast</b>					
Ashford And St Peter's Hospitals NHS Foundation Trust	70	72	70	103%	✓
Brighton and Sussex University Hospitals NHS Trust	57	58	59	98%	✓
Dartford and Gravesham NHS Trust	9	9	9	100%	✓
East Kent Hospitals University NHS Foundation Trust	73	73	73	100%	✓
East Sussex Healthcare NHS Trust	5	5	25	20%	✗
Frimley Park Hospital NHS Foundation Trust	92	93	91	102%	✓
Maidstone and Tunbridge Wells NHS Trust	8	8	18	44%	✗
Medway NHS Foundation Trust	27	27	29	93%	✓
Surrey and Sussex Healthcare NHS Trust*	24	24	25	96%	✓
Western Sussex Hospitals NHS Trust	17	18	26	69%	✗

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Trust Name	Total Number of Cases in Round 5	Number in R5 for HES Comparison	Number of Cases in HES	% case ascertainment	
<b>South West</b>					
Dorset County Hospital NHS Foundation Trust	30	31	32	97%	✓
Gloucestershire Hospitals NHS Foundation Trust	68	68	71	96%	✓
Great Western Hospitals NHS Foundation Trust	21	22	19	116%	◆
North Bristol NHS Trust	52	54	50	108%	✓
Northern Devon Healthcare NHS Trust	29	29	29	100%	✓
Plymouth Hospitals NHS Trust	36	36	36	100%	✓
Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	45	46	49	94%	✓
Royal Cornwall Hospitals NHS Trust	45	46	46	100%	✓
Royal Devon and Exeter NHS Foundation Trust	35	36	38	95%	✓
Royal United Hospital Bath NHS Trust	72	73	64	114%	◆
Salisbury NHS Foundation Trust	24	24	25	96%	✓
South Devon Healthcare NHS Foundation Trust	31	31	31	100%	✓
Taunton and Somerset NHS Foundation Trust	52	53	52	102%	✓
University Hospitals Bristol NHS Foundation Trust	43	45	45	100%	✓
<b>West Midlands</b>					
Dudley Group of Hospitals NHS Trust	83	83	84	99%	✓
Heart of England NHS Foundation Trust	47	48	46	104%	✓
Mid Staffordshire NHS Foundation Trust*	3	3	4	75%	✗
Royal Wolverhampton Hospitals NHS Trust*	40	40	39	103%	✓
Sandwell and West Birmingham Hospitals NHS Trust*	30	30	31	97%	✓
Shrewsbury and Telford Hospital NHS Trust	42	43	49	88%	◆
University Hospital Of North Staffordshire NHS Trust	44	50	46	109%	✓
University Hospitals Birmingham NHS Foundation Trust	59	60	57	105%	✓
University Hospitals Coventry and Warwickshire NHS Trust	77	79	79	100%	✓
Walsall Healthcare NHS Trust*	26	27	29	93%	✓
Worcestershire Acute Hospitals NHS Trust	42	43	63	68%	✗
<b>Yorkshire and The Humber</b>					
Bradford Teaching Hospitals NHS Foundation Trust	37	38	37	103%	✓
Calderdale and Huddersfield NHS Foundation Trust	37	37	38	97%	✓
Doncaster and Bassetlaw Hospitals NHS Foundation Trust	67	67	69	97%	✓
Hull and East Yorkshire Hospitals NHS Trust	105	106	107	99%	✓
Leeds Teaching Hospitals NHS Trust	32	33	61	54%	✗
Mid Yorkshire Hospitals NHS Trust	38	39	45	87%	◆
Scarborough and North East Yorkshire Healthcare NHS Trust*	0	0	4	0%	✗
Sheffield Teaching Hospitals NHS Foundation Trust	83	83	85	98%	✓
York Teaching Hospital NHS Foundation Trust	156	161	153	105%	✓
<b>ENGLAND TOTAL</b>	<b>4998</b>	<b>5083</b>	<b>5346</b>	<b>95%</b>	
<b>Northern Ireland</b>					
Belfast Health and Social Care Trust	143	144	140	103%	✓
Southern Health and Social Care Trust	4	4			
Western Health and Social Care Trust*	17	17	17	100%	✓
<b>NORTHERN IRELAND TOTAL</b>	<b>164</b>	<b>165</b>			
<b>Scotland</b>					
NHS Ayrshire & Arran	30	30	41	73%	✗
NHS Dumfries and Galloway	33	34	33	103%	✓
NHS Fife	13	13	13	100%	✓
NHS Forth Valley	39	40	41	98%	✓
NHS Grampian	16	16	16	100%	✓
NHS Greater Glasgow and Clyde	55	57	102	56%	✗
NHS Highland	46	47	46	102%	✓
NHS Lanarkshire	19	19	55	35%	✗
NHS Lothian	75	77	78	99%	✓
NHS Tayside	21	21	26	81%	◆
<b>SCOTLAND TOTAL</b>	<b>347</b>	<b>354</b>	<b>451</b>	<b>78%</b>	
<b>Wales</b>					

Trust Name	Total Number of Cases in Round 5	Number in R5 for HES Comparison	Number of Cases in HES	% case ascertainment	
Abertawe Bro Morgannwg University Health Board	103	105	142	74%	X
Aneurin Bevan Health Board	55	55	71	77%	◆
Betsi Cadwaladr University Health Board	34	36	43	84%	◆
Cardiff and Vale University Health Board	0	0	37	0%	X
Cwm Taf University Health Board	22	24	26	92%	✓
<b>WALES TOTAL</b>	<b>214</b>	<b>220</b>	<b>319</b>	<b>69%</b>	<b>X</b>
<b>UK TOTAL</b>	<b>5723</b>	<b>5822</b>			

\* Please see note regarding trusts that have stopped performing CEA on page 27..

## Regional participation and results

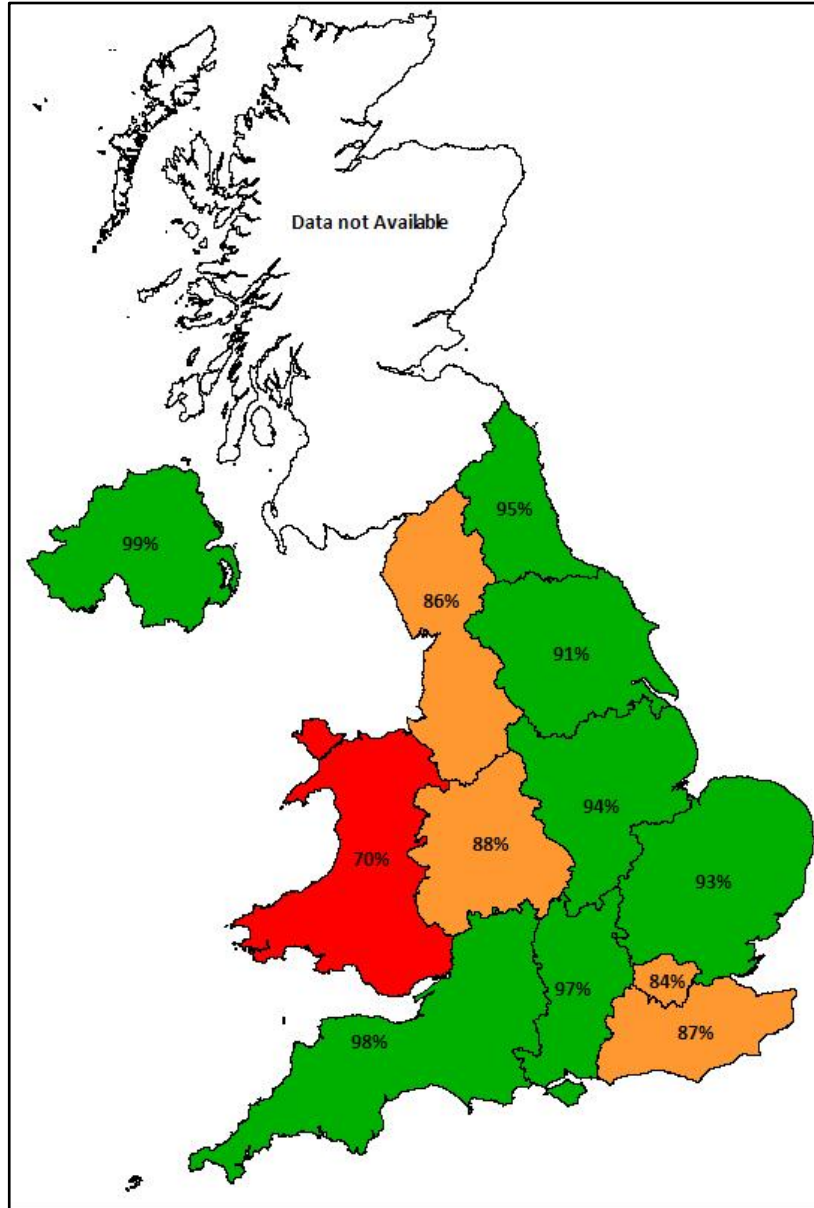
**Table 14: Case contribution to this audit compared to HES reported caseload by SHA**

Region	ROUND 1 (Operations 1 <sup>st</sup> Dec 2005 to 31 <sup>st</sup> Dec 2007)	ROUND 2 (Operation dates: 1 <sup>st</sup> Jan 2008 to 30 <sup>th</sup> Sept 2009)	Round 3 (Operation dates: 1 <sup>st</sup> Oct 2009 to 30 <sup>th</sup> Sept 2010)	Round 4 (Operation dates: 1 <sup>st</sup> Oct 2010 to 30 <sup>th</sup> Sept 2011)	Round 5 (Operation dates: 1 <sup>st</sup> Oct 2011 to 30 <sup>th</sup> Sept 2012)	
	Total Round 1 cases as recorded by HES (based on contributing trusts only)	Round 2 cases as recorded by HES (based on contributing trusts only)	Round 3 cases as recorded by HES (based on contributing trusts only)	Round 4 cases as recorded by HES	Round 5 cases as recorded by HES	Round 5 cases contributed to this audit (% of HES cases)
East Midlands	404	477	382	405	401	389 (97%)
East of England	641	477	586	556	588	570 (97%)
London	918	1017	584	597	531	532 (100.2%)
North East	545	483	265	283	292	287 (98%)
North West	1079	1421	1008	1077	1016	887 (87%)
South Central	163	649	370	392	380	367 (97%)
South East Coast	373	579	321	358	425	387 (91%)
South West	1047	972	584	577	587	594 (101%)
W Midlands	985	1032	619	602	527	506 (96%)
Yorkshire and The Humber	901	923	538	519	599	564 (94%)
<b>ENGLAND TOTAL</b>	<b>7056</b>	<b>8345</b>	<b>5257</b>	<b>5366</b>	<b>5346</b>	<b>5083 (95%)</b>
Northern Ireland	324	252	182	154		
Scotland	793	822	494	395	451	354 (78%)
Wales	530	601	328	362	319	220 (69%)
<b>UK TOTAL</b>	<b>8703</b>	<b>10,020</b>	<b>6261</b>	<b>6277</b>		

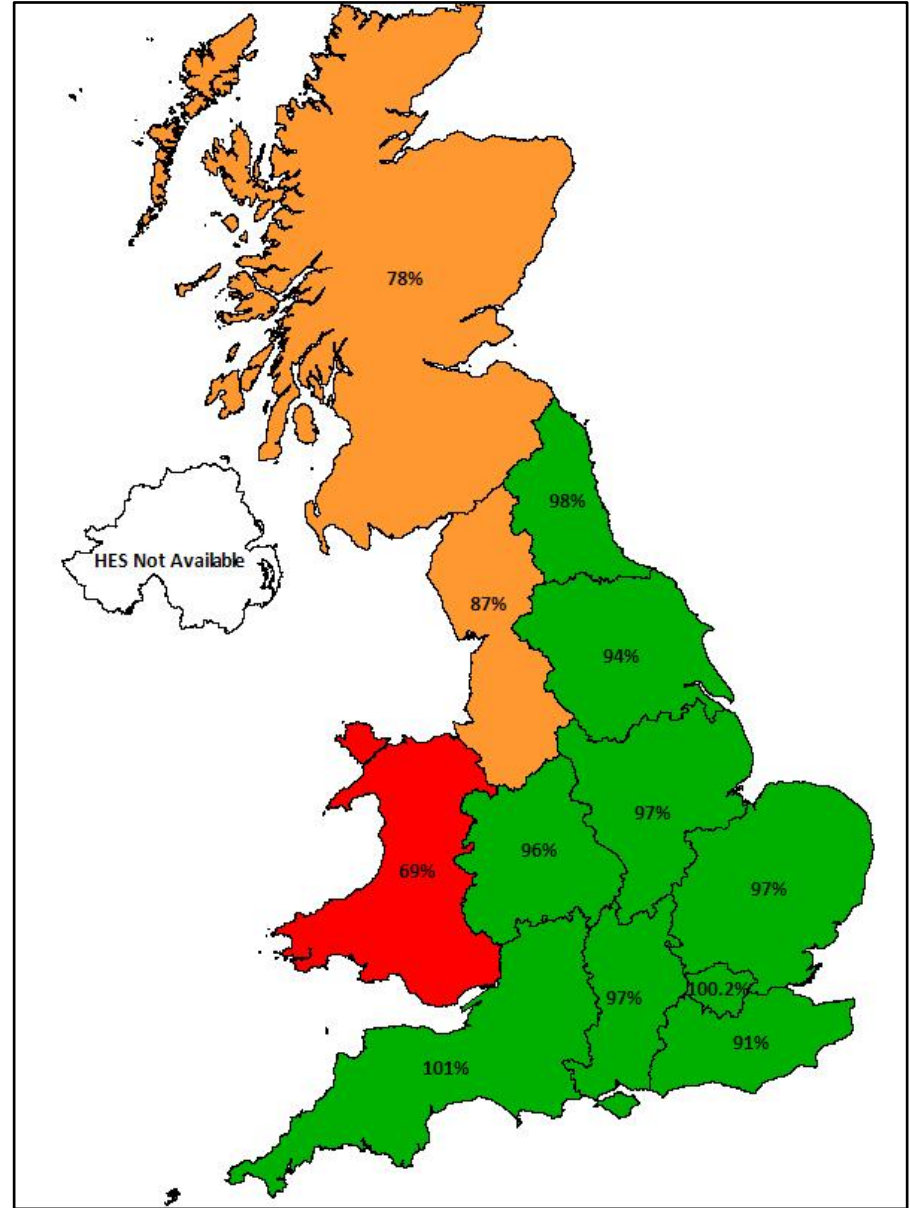


Map of the Percentage of Cases Submitted to the Audit in Rounds 4 and 5 compared to HES

Round 4



Round 5



UK Carotid Endarterectomy Clinical Audit Round 5 report

Trust name	All cases in the audit	HES Comparator	Cases in HES	Symptomatic cases	Time from index symptom to referral (A to B on Figure 1)			Time from referral to surgery (B to C on Figure 1)			Time from symptom to surgery (A to C on Figure 1)				Number in symptom to procedure plot
					Patients with exact symptom and referral dates	Patients referred within 7 days of symptom	Median delay and IQR from symptom to referral	Patients with exact referral and operation dates	Patients receiving surgery within 7 days of referral	Median delay and IQR from referral to surgery	Patients with exact symptom and operation dates	Patients receiving surgery within 2 days of symptom that triggered referral	Patients receiving surgery within 14 days of symptom that triggered referral	Median delay and IQR from index symptom to surgery	
<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> (70%)	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> (51%)	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> (3%)	<b>2471</b> (56%)	<b>13(7, 28)</b>	
<b>EAST MIDLANDS</b>															
Derby Hospitals NHS Foundation Trust	41	41	41	41	30	26(87%)	2(2, 6)	41	18(44%)	8(2, 28)	31	2(6%)	25(8%1)	9(4, 14)	15
Kettering General Hospital NHS Foundation Trust*	4	4	6	3	2	0(0)	60(31, 89)	3	1(33%)	29(7, 139)	2	0(0%)	0(0%)	78(60, 96)	**
Northampton General Hospital NHS Trust	51	53	51	45	37	28(76%)	2(1, 7)	45	27(60%)	6(4, 21)	41	1(2%)	25(61%)	10(4, 21)	23
Nottingham University Hospitals NHS Trust	91	91	94	83	76	66(87%)	3(2, 5)	83	76(92%)	3(1, 5)	76	4(5%)	68(89%)	7(4, 10)	7
Sherwood Forest Hospitals NHS Foundation Trust*	44	44	45	35	33	29(88%)	2(1, 4)	35	16(46%)	9(6, 15)	35	0(0%)	24(69%)	11(7, 19)	38
United Lincolnshire Hospitals NHS Trust	45	45	50	40	32	15(47%)	8(3, 19)	40	26(65%)	4(2, 9)	32	4(13%)	15(47%)	16(7, 36)	75
University Hospitals of Leicester NHS Trust	107	111	114	102	95	67(71%)	3(1, 10)	102	65(64%)	5(3, 11)	97	0(0%)	69(71%)	9(6, 17)	21
<b>EAST OF ENGLAND</b>															
Basildon and Thurrock University Hospital NHS Foundation Trust	30	32	32	27	25	19(76%)	4(1, 7)	27	13(48%)	8(5, 13)	25	0(0%)	17(68%)	13(9, 15)	54
Bedford Hospital NHS Trust	50	50	45	36	35	22(63%)	5(3, 15)	36	10(28%)	16(7, 33)	35	1(3%)	11(31%)	23(11, 57)	98
Cambridge University Hospitals NHS Foundation Trust	102	105	105	84	80	55(69%)	4(2, 10)	84	21(25%)	14(8, 33)	82	1(1%)	22(27%)	21(13, 46)	94
Colchester Hospital University NHS Foundation Trust	51	52	51	46	41	31(76%)	3(1, 6)	46	16(35%)	15(6, 40)	43	1(2%)	18(42%)	18(7, 58)	81
East and North Hertfordshire NHS Trust	46	46	47	39	39	29(74%)	4(2, 8)	39	26(67%)	4(2, 9)	39	2(5%)	24(62%)	9(5, 29)	19
Ipswich Hospital NHS Trust*	23	23	21	19	18	11(61%)	6(0, 9)	19	2(11%)	28(14, 60)	18	0(0%)	2(11%)	30(18, 60)	104
Mid Essex Hospital Services NHS Trust	43	43	44	19	18	16(89%)	3(2, 6)	19	9(47%)	11(5, 23)	18	0(0%)	9(50%)	16(10, 25)	76
Norfolk and Norwich University Hospitals NHS Foundation Trust	91	92	92	77	67	51(76%)	4(2, 7)	77	50(65%)	6(4, 13)	69	0(0%)	45(65%)	11(7, 17)	36

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Trust name	All cases in the audit	HES Comparator	Cases in HES	Symptomatic cases	Time from index symptom to referral (A to B on Figure 1)			Time from referral to surgery (B to C on Figure 1)			Time from symptom to surgery (A to C on Figure 1)				Number in symptom to procedure plot
					Patients with exact symptom and referral dates	Patients referred within 7 days of symptom	Median delay and IQR from symptom to referral	Patients with exact referral and operation dates	Patients receiving surgery within 7 days of referral	Median delay and IQR from referral to surgery	Patients with exact symptom and operation dates	Patients receiving surgery within 2 days of symptom that triggered referral	Patients receiving surgery within 14 days of symptom that triggered referral	Median delay and IQR from index symptom to surgery	
					N	N (%)	Med (IQR)	N	N (%)	Med (IQR)	N	N (%)	N (%)	Med (IQR)	
<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> (70%)	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> (51%)	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> (3%)	<b>2471</b> (56%)	<b>13(7, 28)</b>	
Peterborough and Stamford Hospitals NHS Foundation Trust	16	16	25	15	10	8(80%)	3(1, 7)	15	6(40%)	24(3, 71)	10	2(20%)	5(50%)	16(4, 29)	74
Princess Alexandra Hospital NHS Trust	22	23	24	18	14	10(71%)	4(2, 8)	18	8(44%)	11(3, 23)	15	0(0%)	7(47%)	15(6, 17)	66
Southend University Hospital NHS Foundation Trust	51	52	52	44	42	38(90%)	3(1, 5)	44	40(91%)	4(3, 6)	44	2(5%)	39(89%)	7(5, 10)	9
West Hertfordshire Hospitals NHS Trust	36	36	50	26	22	16(73%)	4(2, 9)	26	11(42%)	9(3, 11)	22	0(0%)	14(64%)	12(9, 21)	48
<b>LONDON</b>															
Barking, Havering and Redbridge University Hospitals NHS Foundation Trust	42	43	45	39	31	18(58%)	7(5, 11)	39	22(56%)	6(4, 12)	32	0(0%)	16(50%)	15(11, 20)	65
Barnet and Chase Farm Hospitals NHS Trust*	5	5	10	4	4	1(25%)	17(9, 25)	4	2(50%)	7(5, 8)	4	0(0%)	1(25%)	22(15, 32)	**
Barts Health NHS Trust	54	55	48	35	27	22(81%)	2(1, 5)	35	29(83%)	3(1, 7)	27	3(11%)	22(81%)	5(3, 12)	1
Guy's and St Thomas' Hospital NHS Foundation Trust	18	19	19	14	11	7(64%)	7(4, 10)	14	8(57%)	7(4, 11)	12	0(0%)	6(50%)	14(9, 15)	61
Imperial College Healthcare NHS Trust	89	90	92	78	58	41(71%)	3(0, 8)	78	47(60%)	6(3, 15)	61	2(3%)	40(66%)	9(5, 23)	18
King's College Hospital NHS Foundation Trust	137	139	132	113	94	66(70%)	4(1, 11)	113	79(70%)	4(2, 10)	95	7(7%)	65(68%)	8(5, 18)	12
Lewisham Healthcare NHS Trust*	3	3	3	1	1	0(0%)	42(42, 42)	1	1(100%)	7(7, 7)	1	0(0%)	0(0%)	49(49, 49)	**
North West London Hospitals NHS Trust	36	36	40	23	23	20(87%)	2(1, 3)	23	15(65%)	5(3, 22)	23	1(4%)	15(65%)	8(6, 67)	13
Royal Free London NHS Foundation Trust	16	16	16	14	11	10(91%)	2(1, 4)	14	10(71%)	5(3, 8)	11	0(0%)	10(91%)	9(5, 13)	14
St George's Healthcare NHS Trust	77	78	75	75	62	54(87%)	3(1, 6)	75	59(79%)	5(3, 7)	63	1(2)	54(86%)	7(5, 12)	10
University College London Hospitals NHS Foundation Trust	46	48	50	43	42	40(95%)	2(1, 3)	43	35(81%)	2(1, 6)	42	5(12%)	37(88%)	6(4, 9)	2

## UK Carotid Endarterectomy Clinical Audit Round 5 report

Trust name	All cases in the audit	HES Comparator	Cases in HES	Symptomatic cases	Time from index symptom to referral (A to B on Figure 1)			Time from referral to surgery (B to C on Figure 1)			Time from symptom to surgery (A to C on Figure 1)				Number in symptom to procedure plot	
					Patients with exact symptom and referral dates	Patients referred within 7 days of symptom	Median delay and IQR from symptom to referral	Patients with exact referral and operation dates	Patients receiving surgery within 7 days of referral	Median delay and IQR from referral to surgery	Patients with exact symptom and operation dates	Patients receiving surgery within 2 days of symptom that triggered referral	Patients receiving surgery within 14 days of symptom that triggered referral	Median delay and IQR from index symptom to surgery		
																N
<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> (70%)	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> (51%)	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> (3%)	<b>2471</b> (56%)	<b>13(7, 28)</b>		
<b>NORTH EAST</b>																
City Hospitals Sunderland NHS Foundation Trust	48	48	51	44	43	22(51%)	7(2, 20)	44	19(43%)	10(6, 23)	43	1(2%)	21(49%)	15(11, 48)	73	
County Durham and Darlington NHS Foundation Trust	56	57	57	53	48	33(69%)	5(2, 11)	53	23(43%)	9(6, 14)	48	1(2%)	28(58%)	13(9, 25)	53	
Gateshead Health NHS Foundation Trust	43	43	42	43	42	26(62%)	6(3, 14)	43	25(58%)	7(6, 9)	42	0(0%)	22(52%)	14(11, 23)	62	
Newcastle upon Tyne Hospitals NHS Foundation Trust	70	72	76	57	52	31(60%)	5(2, 13)	57	23(40%)	10(6, 21)	52	2(4%)	21(40%)	16(10, 32)	77	
South Tees Hospitals NHS Foundation Trust	67	67	66	67	61	55(90%)	3(2, 5)	67	34(51%)	7(6, 13)	64	0(0%)	44(69%)	10(8, 17)	29	
<b>NORTH WEST</b>																
Aintree University Hospitals NHS Foundation Trust*	40	41	45	36	27	21(78%)	1(0, 5)	36	23(64%)	5(3, 10)	27	4(15%)	22(81%)	6(3, 14)	3	
Blackpool Teaching Hospitals NHS Foundation Trust	0	0	66	No data												
Bolton NHS Foundation Trust	37	39	37	32	26	18(69%)	5(4, 18)	32	15(47%)	10(6, 48)	27	0(0%)	13(48%)	15(9, 71)	72	
Central Manchester University Hospitals NHS Foundation Trust	75	77	78	65	38	24(63%)	3(0, 21)	65	18(28%)	19(6, 57)	38	1(3%)	15(39%)	21(9, 78)	92	
Countess of Chester Hospital NHS Foundation Trust	45	46	49	34	25	18(72%)	2(1, 12)	34	12(35%)	10(6, 20)	29	2(7%)	18(62%)	10(6, 33)	26	
East Lancashire Hospitals NHS Trust	84	84	88	60	57	52(91%)	0(0, 3)	60	17(28%)	18(7, 28)	57	5(9%)	23(40%)	20(9, 34)	88	
Lancashire Teaching Hospitals NHS Foundation Trust	50	50	52	45	42	22(52%)	7(2, 18)	45	11(24%)	13(8, 17)	42	0(0%)	11(26%)	22(14, 40)	97	
Mid Cheshire Hospitals NHS Foundation Trust*	17	17	30	17	16	7(44%)	10(3, 13)	17	5(29%)	23(7, 42)	17	0(0%)	3(18%)	33(19, 51)	107	

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					N	N (%)	Med (IQR)	N	N (%)	Med (IQR)	N	N (%)	N (%)	Med (IQR)	
<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> (70%)	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> (51%)	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> (3%)	<b>2471</b> (56%)	<b>13(7, 28)</b>	
North Cumbria University Hospitals NHS Trust	21	21	24	15	15	8(53%)	5(3, 24)	15	11(73%)	6(2, 13)	15	0(0%)	10(67%)	11(7, 44)	39
Pennine Acute Hospitals NHS Trust	114	117	120	95	91	58(64%)	4(2, 14)	94	48(51%)	7(2, 38)	91	4(4%)	49(54%)	14(6, 56)	60
Royal Liverpool and Broadgreen University Hospitals NHS Trust	64	65	64	56	48	33(69%)	4(2, 9)	56	42(75%)	6(4, 8)	48	0(0%)	35(73%)	10(7, 15)	28
Southport and Ormskirk Hospital NHS Trust*	25	25	25	25	24	14(58%)	6(4, 12)	25	13(52%)	7(4, 14)	24	0(0%)	13(54%)	13(11, 37)	56
Tameside Hospital NHS Foundation Trust	18	18	47	16	10	9(90%)	4(2, 5)	16	5(31%)	16(7, 30)	11	0(0%)	4(36%)	18(11, 20)	84
University Hospital of South Manchester NHS Foundation Trust	89	89	89	72	39	25(64%)	6(2, 16)	72	33(46%)	11(4, 29)	42	4(10%)	23(55%)	13(7, 29)	50
University Hospitals Of Morecambe Bay NHS Foundation Trust	42	42	40	37	33	28(85%)	1(0, 3)	37	19(51%)	7(2, 53)	33	6(18%)	21(64%)	8(3, 48)	6
Warrington and Halton Hospitals NHS Foundation Trust	46	47	47	39	34	21(62%)	6(3, 13)	39	20(51%)	7(4, 14)	37	1(3%)	18(49%)	15(8, 35)	67
Wirral University Teaching Hospital NHS Foundation Trust	61	61	63	57	52	42(81%)	3(1, 6)	57	16(28%)	18(5, 33)	53	2(4%)	23(43%)	19(7, 36)	86
Wrightington, Wigan And Leigh NHS Foundation Trust	47	48	52	39	34	18(53%)	5(0, 27)	39	0(0%)	90(40, 126)	34	0(0%)	0(0%)	92(53, 140)	108
<b>SOUTH CENTRAL</b>															
Buckinghamshire Healthcare NHS Trust	75	77	74	55	48	38(79%)	4(2, 6)	55	27(49%)	8(5, 13)	48	3(6%)	34(71%)	11(8, 16)	40
Milton Keynes Hospital NHS Foundation Trust*	8	8	9	8	8	3(38%)	14(5, 18)	8	4(50%)	12(7, 33)	8	0(0%)	3(38%)	26(11, 50)	*
Oxford University Hospitals NHS Trust	97	97	104	75	62	32(52%)	7(1, 14)	75	31(41%)	9(5, 22)	64	1(2%)	27(42%)	18(9, 40)	82
Portsmouth Hospitals NHS Trust	69	70	71	56	52	40(77%)	3(1, 7)	56	15(27%)	15(7, 53)	52	1(2%)	18(35%)	21(12, 63)	93

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<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> (70%)	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> (51%)	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> (3%)	<b>2471</b> (56%)	<b>13(7, 28)</b>	
Royal Berkshire NHS Foundation Trust*	0	0	7		No data										
University Hospital Southampton NHS Foundation Trust	110	115	115	82	79	55(70%)	3(2, 8)	82	20(24%)	12(8, 16)	79	0(0%)	33(42%)	16(11, 26)	78
<b>SOUTH EAST COAST</b>															
Ashford and St Peter's Hospitals NHS Foundation Trust	70	72	70	65	57	40(70%)	3(1, 10)	65	34(52%)	7(3, 15)	59	6(10%)	34(58%)	11(5, 37)	34
Brighton and Sussex University Hospitals NHS Trust	57	58	59	54	39	36(92%)	3(1, 4)	54	31(57%)	7(5, 11)	39	1(3%)	30(77%)	9(7, 14)	22
Dartford and Gravesham NHS Trust	9	9	9	8	8	4(50%)	9(3, 17)	8	3(38%)	12(7, 18)	8	0(0%)	2(25%)	25(13, 29)	**
East Kent Hospitals University NHS Foundation Trust	73	73	73	58	48	40(83%)	3(1, 5)	58	51(88%)	2(1, 4)	49	9(18%)	45(92%)	6(4, 9)	4
East Sussex Healthcare NHS Trust	5	5	25	5	5	2(40%)	8(5, 10)	5	1(20%)	24(17, 36)	5	0(0)	1(20%)	27(24, 44)	**
Frimley Park Hospital NHS Foundation Trust	92	93	91	74	59	43(73%)	3(2, 11)	74	50(68%)	5(1, 12)	60	5(8%)	43(72%)	9(5, 20)	17
Maidstone and Tunbridge Wells NHS Trust	8	8	18	5	4	1(25%)	22(10, 153)	5	2(40%)	8(3, 10)	4	0(0%)	1(25%)	24(14, 189)	**
Medway NHS Foundation Trust	27	27	29	25	23	17(74%)	4(2, 8)	25	11(44%)	8(4, 21)	23	1(4%)	13(57%)	13(7, 30)	51
Surrey and Sussex Healthcare NHS Trust*	24	24	25	23	21	18(86%)	3(1, 4)	23	16(70%)	6(4, 12)	22	0(0%)	18(82%)	11(7, 14)	32
Western Sussex Hospitals NHS Trust	17	18	26	13	12	6(50%)	9(5, 17)	13	2(15%)	10(8, 14)	12	0(0%)	5(42%)	19(12, 41)	79
<b>SOUTH WEST</b>															
Dorset County Hospital NHS Foundation Trust	30	31	32	30	29	24(83%)	2(1, 5)	30	18(60%)	7(2, 29)	29	3(10%)	15(52%)	10(5, 29)	24
Gloucestershire Hospitals NHS Foundation Trust	68	68	71	64	59	44(75%)	3(2, 8)	64	35(55%)	7(4, 12)	60	0(0%)	41(68%)	11(7, 18)	37

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<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> (70%)	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> (51%)	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> (3%)	<b>2471</b> (56%)	<b>13(7, 28)</b>	
Great Western Hospitals NHS Foundation Trust	21	22	19	20	18	15(83%)	2(1, 6)	20	9(45%)	8(5, 11)	19	0(0%)	15(79%)	10(7, 14)	27
North Bristol NHS Trust	52	54	50	50	49	30(61%)	6(4, 13)	50	43(86%)	5(2, 6)	49	1(2%)	31(63%)	11(8, 17)	41
Northern Devon Healthcare NHS Trust	29	29	29	28	22	15(68%)	5(3, 14)	28	18(64%)	6(5, 10)	22	0(0%)	15(68%)	11(8, 20)	43
Plymouth Hospitals NHS Trust	36	36	36	32	32	31(97%)	3(1, 6)	32	14(44%)	8(4, 14)	32	1(3%)	19(59%)	12(8, 19)	47
Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	45	46	49	42	35	23(66%)	4(2, 10)	42	17(40%)	12(5, 27)	36	1(3%)	17(47%)	17(8, 36)	80
Royal Cornwall Hospitals NHS Trust	45	46	46	44	41	31(76%)	4(2, 7)	44	35(80%)	4(3, 7)	41	1(2%)	31(76%)	9(6, 14)	20
Royal Devon and Exeter NHS Foundation Trust	35	36	38	34	32	23(72%)	2(0, 9)	34	15(44%)	9(2, 33)	34	2(6%)	19(56%)	12(5, 36)	45
Royal United Hospital Bath NHS Trust	72	73	64	53	48	39(81%)	3(1, 7)	53	37(70%)	4(2, 8)	48	3(6%)	40(83%)	8(5, 12)	11
Salisbury NHS Foundation Trust	24	24	25	19	16	11(69%)	5(1, 9)	19	9(47%)	8(3, 14)	16	1(6%)	10(63%)	11(6, 28)	25
South Devon Healthcare NHS Foundation Trust	31	31	31	29	27	15(56%)	6(2, 24)	29	9(31%)	14(6, 20)	27	2(7%)	11(41%)	22(11, 36)	96
Taunton and Somerset NHS Foundation Trust	52	53	52	49	43	34(79%)	4(2, 7)	49	30(61%)	6(3, 10)	43	0(0%)	31(72%)	11(8, 17)	42
University Hospitals Bristol NHS Foundation Trust	43	45	45	37	33	26(79%)	4(1, 7)	37	15(41%)	10(6, 20)	33	2(6%)	19(58%)	13(9, 25)	55
<b>WEST MIDLANDS</b>															
Dudley Group of Hospitals NHS Trust	83	83	84	59	56	39(70%)	5(3, 11)	59	30(51%)	7(4, 23)	57	0(0%)	27(47%)	15(8, 53)	69
Heart of England NHS Foundation Trust	47	48	46	40	38	27(71%)	1(0, 8)	40	16(40%)	9(5, 34)	38	1(3%)	24(63%)	11(8, 40)	44
Mid Staffordshire NHS Foundation Trust*	3	3	4	2	2	1(50%)	8(2, 13)	2	1(50%)	12(7, 16)	2	0(0%)	1(50%)	19(9, 29)	**
Royal Wolverhampton Hospitals NHS Trust*	40	40	39	30	29	23(79%)	3(2, 6)	30	16(53%)	7(5, 8)	30	0(0%)	21(70%)	11(7, 20)	33

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<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> (70%)	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> (51%)	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> (3%)	<b>2471</b> (56%)	<b>13(7, 28)</b>	
Sandwell and West Birmingham Hospitals NHS Trust*	30	30	31	29	27	14(52%)	7(3, 10)	29	8(28%)	10(7, 35)	29	0(0%)	13(45%)	18(11, 42)	85
Shrewsbury and Telford Hospital NHS Trust	42	43	49	38	34	24(71%)	3(2, 8)	38	21(55%)	7(2, 12)	34	2(6%)	21(62%)	11(5, 24)	31
University Hospital Of North Staffordshire NHS Trust	44	50	46	43	37	22(59%)	3(0, 32)	43	11(26%)	20(6, 42)	38	1(3%)	13(34%)	24(8, 91)	99
University Hospitals Birmingham NHS Foundation Trust	59	60	57	29	21	16(76%)	4(2, 7)	29	4(14%)	16(12, 26)	21	0(0%)	5(24%)	21(15, 33)	95
University Hospitals Coventry and Warwickshire NHS Trust	77	79	79	71	60	42(70%)	5(2, 11)	71	32(45%)	9(5, 29)	62	3(5%)	35(56%)	14(8, 46)	58
Walsall Healthcare NHS Trust*	26	27	29	24	22	9(41%)	16(3, 68)	24	7(29%)	15(6, 57)	23	1(4%)	7(30%)	31(12, 109)	105
Worcestershire Acute Hospitals NHS Trust	42	43	63	41	37	24(65%)	6(2, 9)	41	27(66%)	6(3, 9)	37	0(0%)	23(62%)	10(9, 19)	30
<b>YORKSHIRE AND THE HUMBER</b>															
Bradford Teaching Hospitals NHS Foundation Trust	37	38	37	33	31	23(74%)	4(1, 12)	33	22(67%)	6(4, 10)	31	1(3%)	23(74%)	9(5, 18)	16
Calderdale and Huddersfield NHS Foundation Trust	37	37	38	36	35	28(80%)	4(2, 6)	36	16(44%)	8(6, 11)	35	0(0%)	21(60%)	12(9, 22)	49
Doncaster and Bassetlaw Hospitals NHS Foundation Trust	67	67	69	61	54	34(63%)	4(2, 10)	61	31(51%)	7(6, 10)	54	0(0%)	33(61%)	14(9, 22)	59
Hull and East Yorkshire Hospitals NHS Trust	105	106	107	100	97	42(43%)	13(3, 42)	100	39(39%)	13(6, 36)	98	4(4%)	32(33%)	28(10, 98)	102
Leeds Teaching Hospitals NHS Trust	32	33	61	28	24	16(67%)	5(1, 14)	28	22(79%)	4(3, 7)	24	0(0%)	17(71%)	7(5, 22)	5
Mid Yorkshire Hospitals NHS Trust	38	39	45	35	35	22(63%)	5(2, 12)	35	15(43%)	9(7, 18)	35	0(0%)	15(43%)	18(10, 34)	83
Scarborough and North East Yorkshire Healthcare NHS Trust*	0	0	4	No data											



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																N
<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> (70%)	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> (51%)	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> (3%)	<b>2471</b> (56%)	<b>13(7, 28)</b>		
Sheffield Teaching Hospitals NHS Foundation Trust	83	83	85	76	68	38(56%)	6(3, 15)	76	14(18%)	17(9, 35)	68	0(0%)	15(22%)	26(16, 49)	101	
York Teaching Hospital NHS Foundation Trust	156	161	153	130	112	85(76%)	4(2, 7)	130	114(88%)	3(2, 4)	113	8(7%)	88(78%)	7(4, 12)	8	
<b>NORTHERN IRELAND</b>																
Belfast Health and Social Care Trust	143	144	140	122	113	67(59%)	6(3, 16)	122	66(54%)	7(4, 20)	114	2(2%)	56(49%)	15(8, 35)	68	
Southern Health and Social Care Trust	4	4		4	3	3(100%)	2(0, 6)	4	3(75%)	6(5, 10)	3	0(0%)	3(100%)	8(5, 11)	**	
Western Health and Social Care Trust*	17	17	17	14	14	8(57%)	7(2, 13)	14	6(43%)	11(6, 24)	14	0(0%)	5(36%)	19(10, 34)	87	
<b>WALES</b>																
Abertawe Bro Morgannwg University Health Board	103	105	142	91	83	52 (63%)	5(2, 11)	91	48 (53%)	7(3, 23)	85	6 (7%)	47 (55%)	12(6, 51)	46	
Aneurin Bevan Health Board	55	55	71	50	41	32 (78%)	3(0, 7)	50	8 (16%)	16(9, 37)	42	0 (0%)	17 (40%)	20(11, 46)	90	
Betsi Cadwaladr University Health Board	34	36	43	33	30	12 (40%)	15(2, 28)	33	10 (30%)	14(7, 41)	32	0 (0%)	6 (19%)	32(15, 60)	106	
Cardiff and Vale University Health Board	0	0	37					No Data								
Cwm Taf University Health Board	22	24	26	20	19	11 (58%)	6(3, 14)	20	9 (45%)	9(4, 13)	19	0 (0%)	9 (47%)	15(9, 26)	70	
<b>SCOTLAND</b>																
NHS Ayrshire & Arran	30	30	41	27	25	13(52%)	7(3, 18)	27	14(52%)	7(5, 15)	25	0(0%)	15(60%)	13(11, 34)	57	
NHS Dumfries and Galloway	33	34	33	31	20	12(60%)	6(4, 13)	31	6(19%)	15(8, 26)	20	0(0%)	5(25%)	26(14, 40)	100	
NHS Fife	13	13	13	13	12	8(67%)	6(3, 16)	13	3(23%)	17(8, 27)	13	0(0%)	6(46%)	20(9, 46)	89	
NHS Forth Valley	39	40	41	31	27	22(81%)	5(1, 7)	31	12(39%)	9(3, 30)	27	3(11%)	15(56%)	13(8, 31)	52	
NHS Grampian	16	16	16	16	15	8(53%)	6(3, 16)	16	13(81%)	6(2, 7)	16	0(0%)	12(75%)	11(7, 16)	35	
NHS Greater Glasgow and Clyde	55	57	102	54	46	24(52%)	7(3, 17)	54	28(52%)	7(5, 10)	49	4(8%)	24(49%)	15(9, 30)	71	
NHS Highland	46	47	46	37	31	11(35%)	14(6, 29)	37	6(16%)	13(9, 19)	32	0(0%)	7(22%)	30(16, 52)	103	

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Trust name	All cases in the audit	HES Comparator	Cases in HES	Symptomatic cases	Time from index symptom to referral (A to B on Figure 1)			Time from referral to surgery (B to C on Figure 1)			Time from symptom to surgery (A to C on Figure 1)				Number in symptom to procedure plot
					Patients with exact symptom and referral dates	Patients referred within 7 days of symptom	Median delay and IQR from symptom to referral	Patients with exact referral and operation dates	Patients receiving surgery within 7 days of referral	Median delay and IQR from referral to surgery	Patients with exact symptom and operation dates	Patients receiving surgery within 2 days of symptom that triggered referral	Patients receiving surgery within 14 days of symptom that triggered referral	Median delay and IQR from index symptom to surgery	
<b>National</b> <i>Median per Trust</i>	<b>5723</b> 44	<b>5822</b>		<b>4941</b> 37	<b>4342</b> 33	<b>3018</b> <b>(70%)</b>	<b>4(2, 10)</b>	<b>4940</b> 37	<b>2502</b> <b>(51%)</b>	<b>7(4, 17)</b>	<b>4419</b> 34	<b>154</b> <b>(3%)</b>	<b>2471</b> <b>(56%)</b>	<b>13(7, 28)</b>	
NHS Lanarkshire	19	19	55	18	15	8(53%)	7(6, 14)	18	6(33%)	11(7, 16)	15	0(0%)	5(33%)	20(13, 25)	91
NHS Lothian	75	77	78	75	67	49(73%)	4(3, 10)	75	26(35%)	10(6, 15)	68	2(3%)	34(50%)	15(11, 24)	63
NHS Tayside	21	21	26	21	16	12(75%)	5(3, 7)	21	10(48%)	8(7, 10)	16	0(0%)	8(50%)	15(11, 17)	64

\* Please see note regarding NHS trusts that have stopped performing carotid endarterectomy on page 27.

UK Carotid Endarterectomy Clinical Audit Round 5 report

Region	Total number of cases reported in Round 5	HES Comparator	Cases in HES	Symptomatic cases	Time from index symptom to referral (A to B on Figure 1)			Time from referral to surgery (B to C on Figure 1)			Time from symptom to surgery (A to C on Figure 1)			
					Total cases with exact symptom and referral dates	Total cases referred within 7 days of symptom	Median delay and IQR from symptom to referral	Total cases with exact referral and operation dates	Total cases receiving surgery within 7 days of referral	Median delay and IQR from referral to surgery	Total cases with exact symptom and operation dates	Total cases receiving surgery within 2 days of symptom that triggered referral	Total cases receiving surgery within 14 days of symptom that triggered referral	Median delay and IQR from index symptom to surgery
					N	N (%)	Med (IQR)	N	N (%)	Med (IQR)	N	N (%)	N (%)	Med (IQR)
<b>National</b>	<b>5723</b>	<b>5781</b>		<b>4941</b>	<b>4342</b>	<b>3018(70%)</b>	<b>4(2,10)</b>	<b>4940</b>	<b>2502(51%)</b>	<b>7(4,17)</b>	<b>4419</b>	<b>154(3%)</b>	<b>2471(56%)</b>	<b>13(7,28)</b>
East Midlands	383	389	401	349	305	231(76%)	3(1, 7)	349	229(66%)	5(2, 11)	314	11(4%)	226(72%)	9(5, 17)
East of England	561	570	588	450	411	306(74%)	4(2, 8)	450	212(47%)	8(4, 21)	420	9 (2%)	213(51%)	14(7, 29)
London	523	532	531	439	364	279(77%)	3(1, 7)	439	307(70%)	5(2, 9)	371	19 (5%)	266(72%)	8(5, 15)
North East	284	287	292	264	246	167(68%)	5(2, 9)	264	124(47%)	8(6, 14)	249	4 (2%)	136(55%)	13(9, 24)
North West	875	887	1016	740	611	418(68%)	4(1, 11)	739	308(42%)	11(5, 29)	625	29 (5%)	301(48%)	15(8, 41)
South Central	359	367	380	276	249	168(67%)	4(2, 10)	276	97(35%)	11(6, 20)	251	5(2%)	115(46%)	16(10, 33)
South East Coast	382	387	425	330	276	207(75%)	3(1, 8)	330	201(61%)	6(2, 12)	281	22 (8%)	192(68%)	10(6, 20)
South West	583	594	587	531	484	361(75%)	4(2, 8)	531	304(57%)	7(4, 13)	489	17 (3%)	314(64%)	11(7, 22)
West Midlands	493	506	527	406	363	241(66%)	4(2, 11)	406	173(43%)	9(5, 25)	371	8 (2%)	190(51%)	14(8, 40)
Yorkshire and The Humber	555	564	599	499	456	288(63%)	5(2, 13)	499	273(55%)	7(3, 16)	458	13 (3%)	244(53%)	14(7, 33)

UK Carotid Endarterectomy Clinical Audit Round 5 report

Region	Total number of cases reported in Round 5	HES Comparator	Cases in HES	Symptomatic cases	Time from index symptom to referral (A to B on Figure 1)			Time from referral to surgery (B to C on Figure 1)			Time from symptom to surgery (A to C on Figure 1)			
					Total cases with exact symptom and referral dates	Total cases referred within 7 days of symptom	Median delay and IQR from symptom to referral	Total cases with exact referral and operation dates	Total cases receiving surgery within 7 days of referral	Median delay and IQR from referral to surgery	Total cases with exact symptom and operation dates	Total cases receiving surgery within 2 days of symptom that triggered referral	Total cases receiving surgery within 14 days of symptom that triggered referral	Median delay and IQR from index symptom to surgery
	N	N	N	N	N	N (%)	Med (IQR)	N	N (%)	Med (IQR)	N	N (%)	N (%)	Med (IQR)
National	5723	5781		4941	4342	3018(70%)	4(2,10)	4940	2502(51%)	7(4,17)	4419	154(3%)	2471(56%)	13(7,28)
ENGLAND	4998	5083	5346	4284	3765	2666(71%)	4(2, 9)	4283	2228(52%)	7(4,17)	3829	137 (4%)	2197(57%)	12(7, 27)
NORTHERN IRELAND	164	165		140	130	78(60%)	6(3, 16)	140	75(54%)	7(4, 20)	131	2 (2%)	64(49%)	15(8, 34)
SCOTLAND	347	354	451	323	274	167(61%)	6(3, 13)	323	124(38%)	9(6, 16)	281	9 (3%)	131(47%)	16(11, 30)
WALES	214	220	319	194	173	107(62%)	5(1, 14)	194	75(39%)	10(5, 32)	178	6 (3%)	79(44%)	18(9, 46)

## UK Carotid Endarterectomy Clinical Audit Round 5 Report

Trust Name	Total CEAs	Total CEAs with outcomes	% Stroke and/or death <i>unadjusted</i>	% Stroke and/or death <i>Adjusted</i>	Status
<b>EAST MIDLANDS</b>					
Derby Hospitals NHS Foundation Trust	110	110	0.9%	0.6%	▲
Kettering General Hospital NHS Foundation Trust*	73	72	2.8%	2.9%	▲
Northampton General Hospital NHS Trust	128	128	3.9%	3.9%	▲
Nottingham University Hospitals NHS Trust	265	265	3.4%	3.3%	▲
Sherwood Forest Hospitals NHS Foundation Trust*	108	107	2.8%	2.8%	▲
United Lincolnshire Hospitals NHS Trust	91	88	2.3%	2.3%	▲
University Hospitals of Leicester NHS Trust	368	368	1.4%	1.5%	▲
<b>EAST OF ENGLAND</b>					
Basildon and Thurrock University Hospital NHS Foundation Trust	65	62	1.6%	1.7%	▲
Bedford Hospital NHS Trust	131	129	1.6%	1.6%	▲
Cambridge University Hospitals NHS Foundation Trust	293	290	1.0%	1.0%	▲
Colchester Hospital University NHS Foundation Trust	131	131	0.8%	0.8%	▲
East and North Hertfordshire NHS Trust	90	90	1.1%	1.0%	▲
Ipswich Hospital NHS Trust*	83	78	0.0%	0.0%	▲
Mid Essex Hospital Services NHS Trust	106	106	3.8%	4.0%	▲
Norfolk and Norwich University Hospitals NHS Foundation Trust	288	287	2.4%	2.4%	▲
Peterborough and Stamford Hospitals NHS Foundation Trust	39	39	2.6%	2.8%	▲
Princess Alexandra Hospital NHS Trust	88	88	3.4%	3.4%	▲
Southend University Hospital NHS Foundation Trust	157	157	1.9%	1.9%	▲
West Hertfordshire Hospitals NHS Trust	109	108	2.8%	2.8%	▲
<b>LONDON</b>					
Barking, Havering And Redbridge University Hospitals NHS Trust	119	113	1.8%	1.6%	▲
Barnet and Chase Farm Hospitals NHS Trust*	66	64	3.1%	2.9%	▲
Barts Health NHS Trust	140	140	2.9%	2.8%	▲
Ealing Hospital NHS Trust*	6	0	0.0%	0.0%	▲
Epsom and St Helier University Hospitals NHS Trust*	3	3	0.0%	0.0%	▲
Guy's and St Thomas' Hospital NHS Foundation Trust	65	65	9.2%	9.0%	▲
Hillingdon Hospitals NHS Foundation Trust*	23	23	4.3%	3.6%	▲
Imperial College Healthcare NHS Trust	307	304	4.3%	4.3%	▲
King's College Hospital NHS Foundation Trust	283	277	1.1%	1.1%	▲
Lewisham Healthcare NHS Trust*	24	24	4.2%	3.6%	▲
North West London Hospitals NHS Trust	89	89	6.7%	6.8%	▲
Royal Free London NHS Trust	43	38	0.0%	0.0%	▲
St George's Healthcare NHS Trust	198	197	1.0%	0.8%	▲
University College London Hospitals NHS Foundation Trust	137	137	3.6%	3.6%	▲
Whipps Cross University Hospital NHS Trust* (now part of Barts Health NHS Trust)	4	4	0.0%	0.0%	▲
Whittington Hospital NHS Trust*	2	2	0.0%	0.0%	▲

## UK Carotid Endarterectomy Clinical Audit Round 5 report

Trust Name	Total CEAs	Total CEAs with outcomes	% Stroke and/or death unadjusted	% Stroke and/or death Adjusted	Status
<b>NORTH EAST</b>					
City Hospitals Sunderland NHS Foundation Trust	139	139	3.6%	4.0%	▲
County Durham and Darlington NHS Foundation Trust	157	145	0.0%	0.0%	▲
Gateshead Health NHS Foundation Trust	81	81	3.7%	3.4%	▲
Newcastle upon Tyne Hospitals NHS Foundation Trust	230	230	1.7%	1.8%	▲
South Tees Hospitals NHS Foundation Trust	192	192	0.5%	0.5%	▲
<b>NORTH WEST</b>					
Aintree University Hospitals NHS Foundation Trust*	123	122	4.1%	4.2%	▲
Blackpool Teaching Hospitals NHS Foundation Trust	9	9	0.0%	0.0%	▲
Bolton NHS Foundation Trust	109	109	0.0%	0.0%	▲
Central Manchester University Hospitals NHS Foundation Trust	223	223	0.9%	0.8%	▲
Countess of Chester Hospital NHS Foundation Trust	143	143	0.0%	0.0%	▲
East Lancashire Hospitals NHS Trust	252	252	2.0%	2.1%	▲
Lancashire Teaching Hospitals NHS Foundation Trust	152	152	3.3%	3.5%	▲
Mid Cheshire Hospitals NHS Foundation Trust*	69	69	1.4%	1.6%	▲
North Cumbria University Hospitals NHS Trust	68	67	0.0%	0.0%	▲
Pennine Acute Hospitals NHS Trust	367	367	1.1%	1.1%	▲
Royal Liverpool and Broadgreen University Hospitals NHS Trust	142	142	2.8%	2.9%	▲
Southport and Ormskirk Hospital NHS Trust*	67	67	6.0%	5.2%	▲
Tameside Hospital NHS Foundation Trust	71	70	0.0%	0.0%	▲
The Walton Centre NHS Foundation Trust*	21	21	4.8%	4.6%	▲
University Hospital of South Manchester NHS Foundation Trust	295	295	2.0%	2.2%	▲
University Hospitals Of Morecambe Bay NHS Foundation Trust	131	131	3.1%	3.2%	▲
Warrington and Halton Hospitals NHS Foundation Trust	146	146	2.1%	2.2%	▲
Wirral University Teaching Hospital NHS Foundation Trust	172	167	2.4%	2.2%	▲
Wrightington, Wigan And Leigh NHS Foundation Trust	114	114	3.5%	3.5%	▲
<b>SOUTH CENTRAL</b>					
Buckinghamshire Healthcare NHS Trust	247	244	2.9%	2.6%	▲
Hampshire Hospitals NHS Foundation Trust*	10	10	0.0%	0.0%	▲
Milton Keynes Hospital NHS Foundation Trust*	23	23	4.3%	5.1%	▲
Oxford University Hospitals NHS Trust	253	250	2.8%	2.9%	▲
Portsmouth Hospitals NHS Trust	235	235	2.1%	2.0%	▲
Royal Berkshire NHS Foundation Trust*	26	26	0.0%	0.0%	▲
University Hospital Southampton NHS Foundation Trust	303	303	1.7%	1.6%	▲
<b>SOUTH EAST COAST</b>					
Ashford And St Peter's Hospitals NHS Foundation Trust	132	132	2.3%	2.2%	▲
Brighton and Sussex University Hospitals NHS Trust	124	124	1.6%	1.7%	▲
Dartford and Gravesham NHS Trust	19	19	0.0%	0.0%	▲
East Kent Hospitals University NHS Foundation Trust	220	220	1.8%	2.0%	▲

## UK Carotid Endarterectomy Clinical Audit Round 5 report

Trust Name	Total CEAs	Total CEAs with outcomes	% Stroke and/or death unadjusted	% Stroke and/or death Adjusted	Status
East Sussex Healthcare NHS Trust	22	18	11.1%	12.1%	▲
Frimley Park Hospital NHS Foundation Trust	213	213	2.3%	2.5%	▲
Maidstone and Tunbridge Wells NHS Trust	32	32	6.3%	6.0%	▲
Medway NHS Foundation Trust	92	92	3.3%	3.5%	▲
Surrey and Sussex Healthcare NHS Trust*	88	87	1.1%	1.2%	▲
Western Sussex Hospitals NHS Trust	89	87	3.4%	3.4%	▲
<b>SOUTH WEST</b>					
Dorset County Hospital NHS Foundation Trust	88	88	5.7%	5.0%	▲
Gloucestershire Hospitals NHS Foundation Trust	193	193	1.0%	1.0%	▲
Great Western Hospitals NHS Foundation Trust	54	52	0.0%	0.0%	▲
North Bristol NHS Trust	112	110	0.9%	0.9%	▲
Northern Devon Healthcare NHS Trust	79	78	7.7%	8.1%	▲
Plymouth Hospitals NHS Trust	124	120	2.5%	2.5%	▲
Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	176	160	6.9%	6.8%	▲
Royal Cornwall Hospitals NHS Trust	161	161	1.9%	1.9%	▲
Royal Devon and Exeter NHS Foundation Trust	126	126	4.8%	5.1%	▲
Royal United Hospital Bath NHS Trust	176	165	4.2%	4.4%	▲
Salisbury NHS Foundation Trust	72	72	0.0%	0.0%	▲
South Devon Healthcare NHS Foundation Trust	82	82	2.4%	2.5%	▲
Taunton and Somerset NHS Foundation Trust	153	146	4.1%	4.2%	▲
University Hospitals Bristol NHS Foundation Trust	134	134	3.0%	3.2%	▲
<b>WEST MIDLANDS</b>					
Dudley Group of Hospitals NHS Foundation Trust	244	244	0.4%	0.4%	▲
Heart of England NHS Foundation Trust	154	154	0.6%	0.7%	▲
Mid Staffordshire NHS Foundation Trust*	27	27	3.7%	4.1%	▲
Royal Wolverhampton Hospitals NHS Trust*	111	111	4.5%	4.8%	▲
Sandwell and West Birmingham Hospitals NHS Trust*	106	106	4.7%	4.8%	▲
Shrewsbury and Telford Hospital NHS Trust	130	129	3.1%	3.3%	▲
University Hospital of North Staffordshire NHS Trust	106	106	1.9%	1.7%	▲
University Hospitals Birmingham NHS Foundation Trust	173	173	4.0%	3.8%	▲
University Hospitals Coventry and Warwickshire NHS Trust	210	206	1.0%	1.0%	▲
Walsall Healthcare NHS Trust*	93	64	3.1%	3.1%	▲
Worcestershire Acute Hospitals NHS Trust	162	162	0.0%	0.0%	▲
<b>YORKSHIRE AND THE HUMBER</b>					
Bradford Teaching Hospitals NHS Foundation Trust	129	129	0.8%	0.7%	▲
Calderdale and Huddersfield NHS Foundation Trust	115	115	1.7%	1.8%	▲
Doncaster and Bassetlaw Hospitals NHS Foundation Trust	180	177	1.7%	1.8%	▲
Hull and East Yorkshire Hospitals NHS Trust	240	240	5.0%	5.2%	▲
Leeds Teaching Hospitals NHS Trust	113	107	2.8%	3.1%	▲

## UK Carotid Endarterectomy Clinical Audit Round 5 report

Trust Name	Total CEAs	Total CEAs with outcomes	% Stroke and/or death <i>unadjusted</i>	% Stroke and/or death <i>Adjusted</i>	Status
Mid Yorkshire Hospitals NHS Trust	110	105	1.9%	2.2%	▲
Northern Lincolnshire and Goole Hospitals NHS Foundation Trust*	27	27	3.7%	4.3%	▲
Scarborough and North East Yorkshire Healthcare NHS Trust*	21	21	4.8%	3.8%	▲
Sheffield Teaching Hospitals NHS Foundation Trust	223	220	1.8%	1.9%	▲
York Teaching Hospital NHS Foundation Trust	345	332	3.6%	3.4%	▲
<b>NORTHERN IRELAND</b>					
Belfast Health and Social Care Trust	411	410	1.7%	1.6%	▲
Southern Health and Social Care Trust	25	16	6.3%	6.6%	▲
Western Health and Social Care Trust*	50	49	4.1%	4.5%	▲
<b>SCOTLAND</b>					
NHS Ayrshire & Arran	72	72	2.8%	2.5%	▲
NHS Dumfries and Galloway	98	98	3.1%	3.0%	▲
NHS Fife	40	39	5.1%	6.1%	▲
NHS Forth Valley	107	104	1.9%	2.1%	▲
NHS Grampian	52	35	5.7%	6.4%	▲
NHS Greater Glasgow and Clyde	130	130	0.8%	0.8%	▲
NHS Highland	159	116	2.6%	2.4%	▲
NHS Lanarkshire	46	46	4.3%	4.9%	▲
NHS Lothian	250	250	1.6%	1.7%	▲
NHS Tayside	66	51	0.0%	0.0%	▲
<b>WALES</b>					
Abertawe Bro Morgannwg University Health Board	267	264	2.3%	2.2%	▲
Aneurin Bevan Health Board	170	163	0.6%	0.6%	▲
Betsi Cadwaladr University Health Board	131	131	1.5%	1.6%	▲
Cardiff and Vale University Health Board	24	24	8.3%	7.6%	▲
Cwm Taf University Health Board	94	94	3.2%	2.9%	▲

\* Please see note regarding trusts that have stopped performing CEA on page 27.








## Comparison of delays in the pathway by region

The maps on the following pages illustrate improvements in waiting times for CEA between Round 4 and Round 5. These maps are colour coded and show the variation across the ten English Strategic Health Authorities, Northern Ireland, Scotland and Wales.

The first set of maps show the median delay by region of the three main time points in the pathway from symptom to procedure:

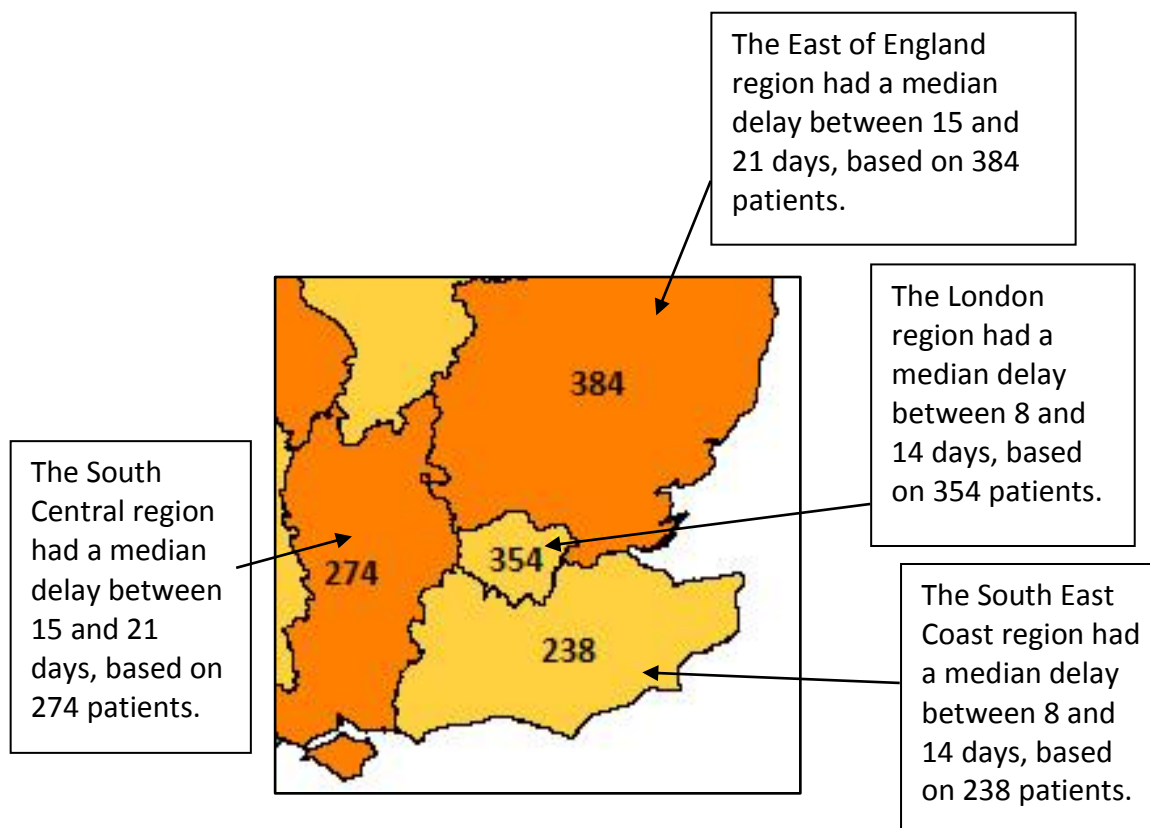
- The median number of days from symptom to referral.
- The median number of days from referral to procedure.
- The median number of days from symptom to procedure.

The maps are colour coded in colours ranging from a light yellow (optimum time) to a dark brown (least optimal time). These colours represent the category the region is in. The same colours are used in each map. The key is shown below:

Median Delays from Symptom to Procedure	
	1 to 7 days
	8 to 14 days
	15 to 21 days
	22 to 28 days
	29 to 35 days

In each set of maps the Round 4 map is shown on the left and Round 5 on the right, to see improvements over time.

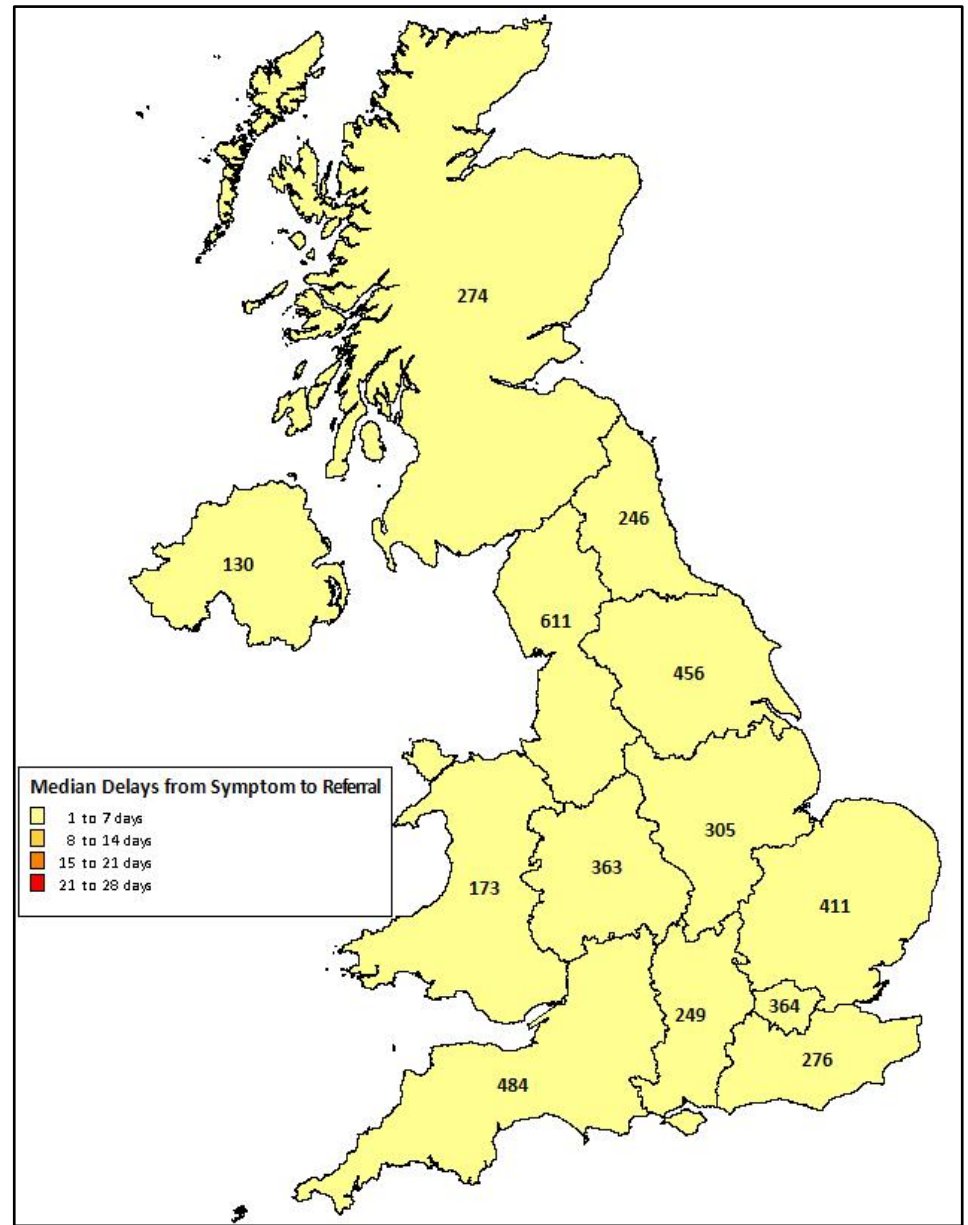
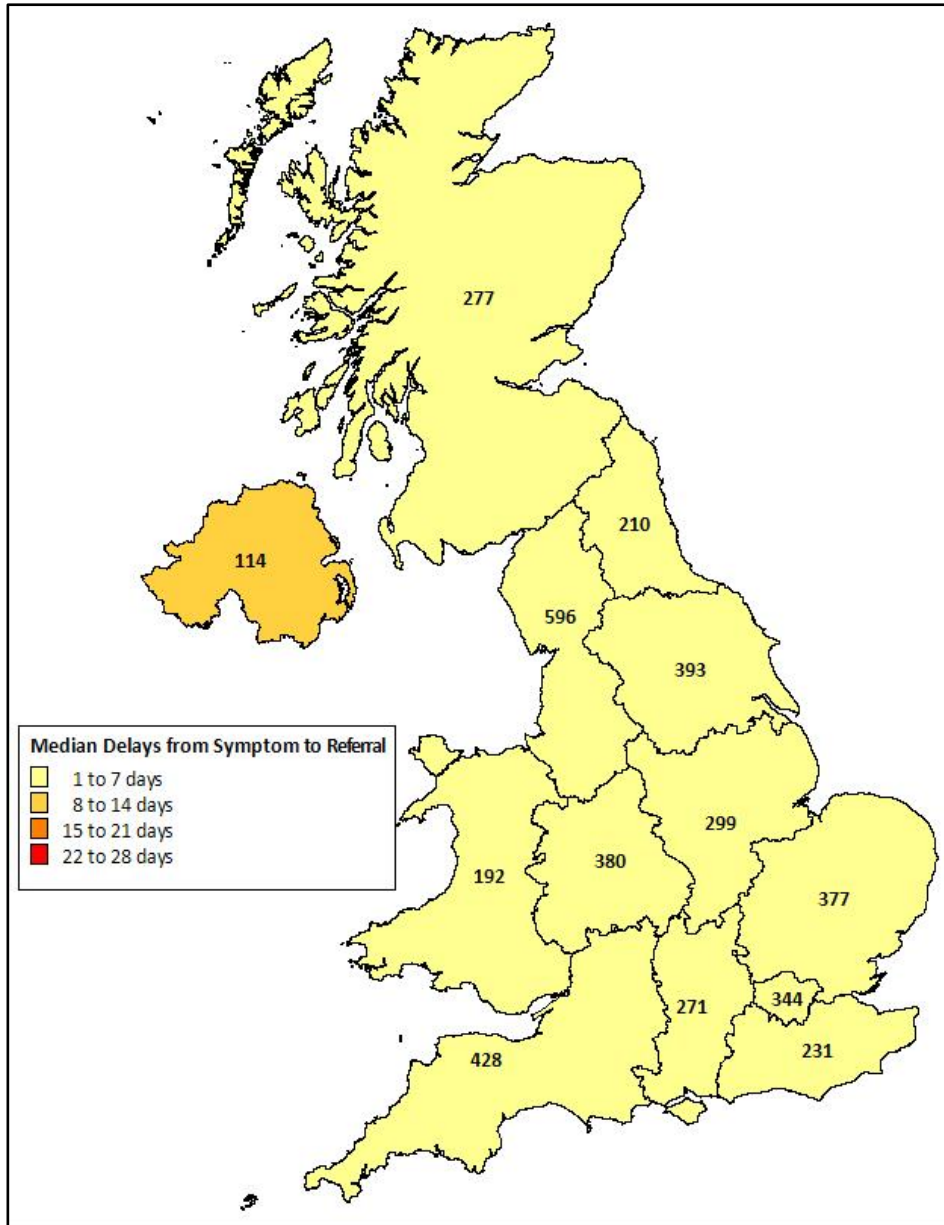
The number inside each region is the number of patients this median is based upon. For example, in the image below it is possible to see that:



# Median Delays from Symptom to Referral

## Round 4

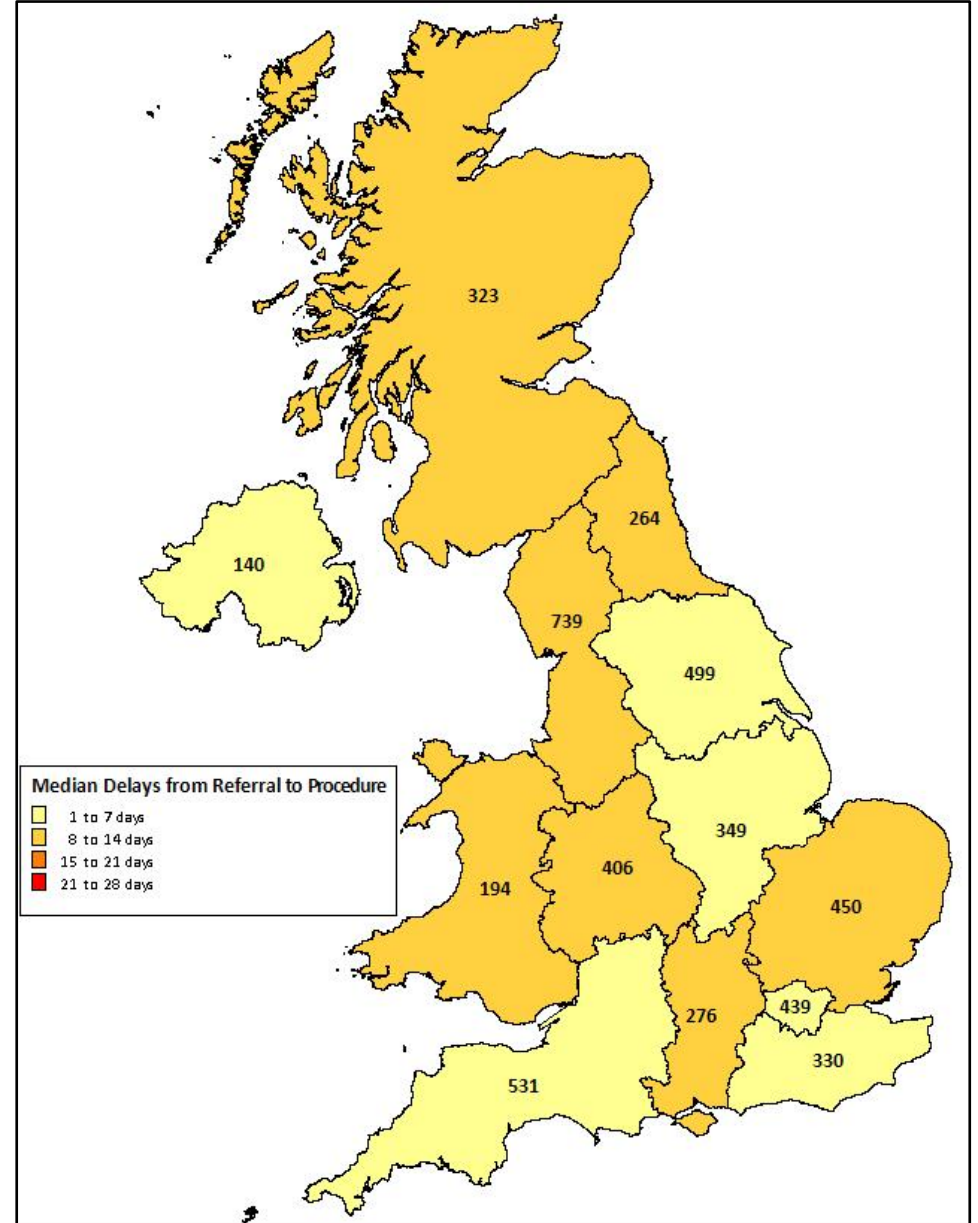
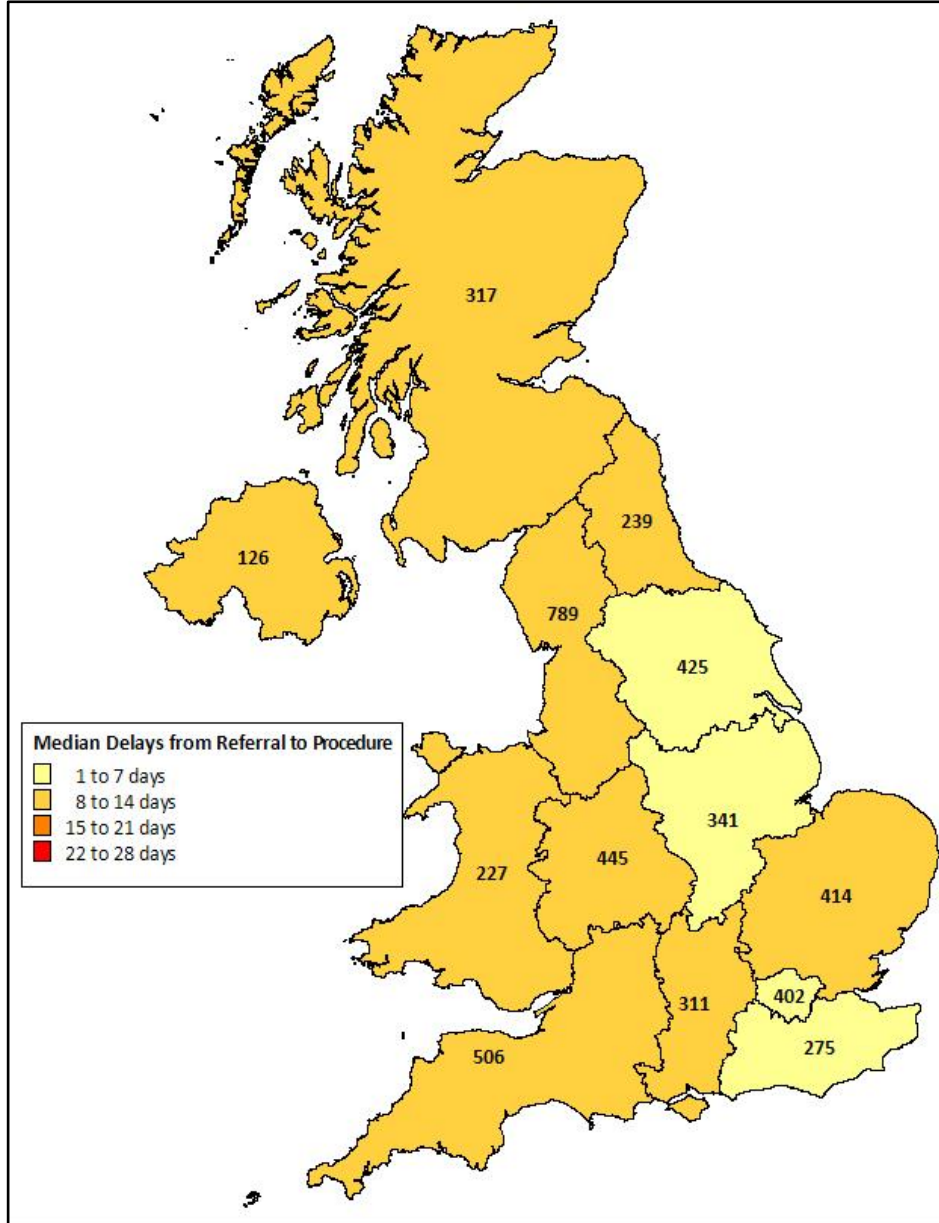
## Round 5



Round 4

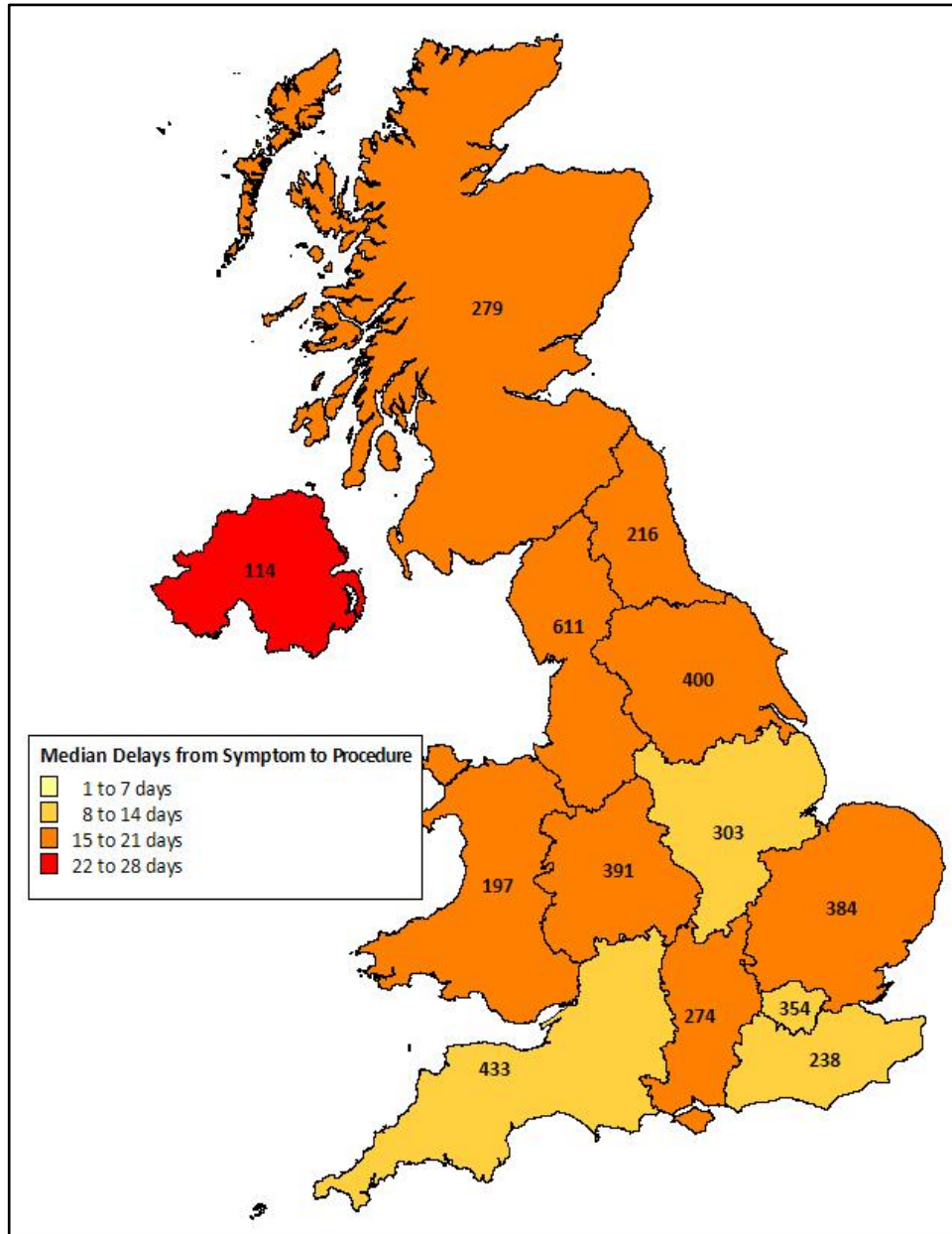
Median Delays from Referral to Procedure

Round 5

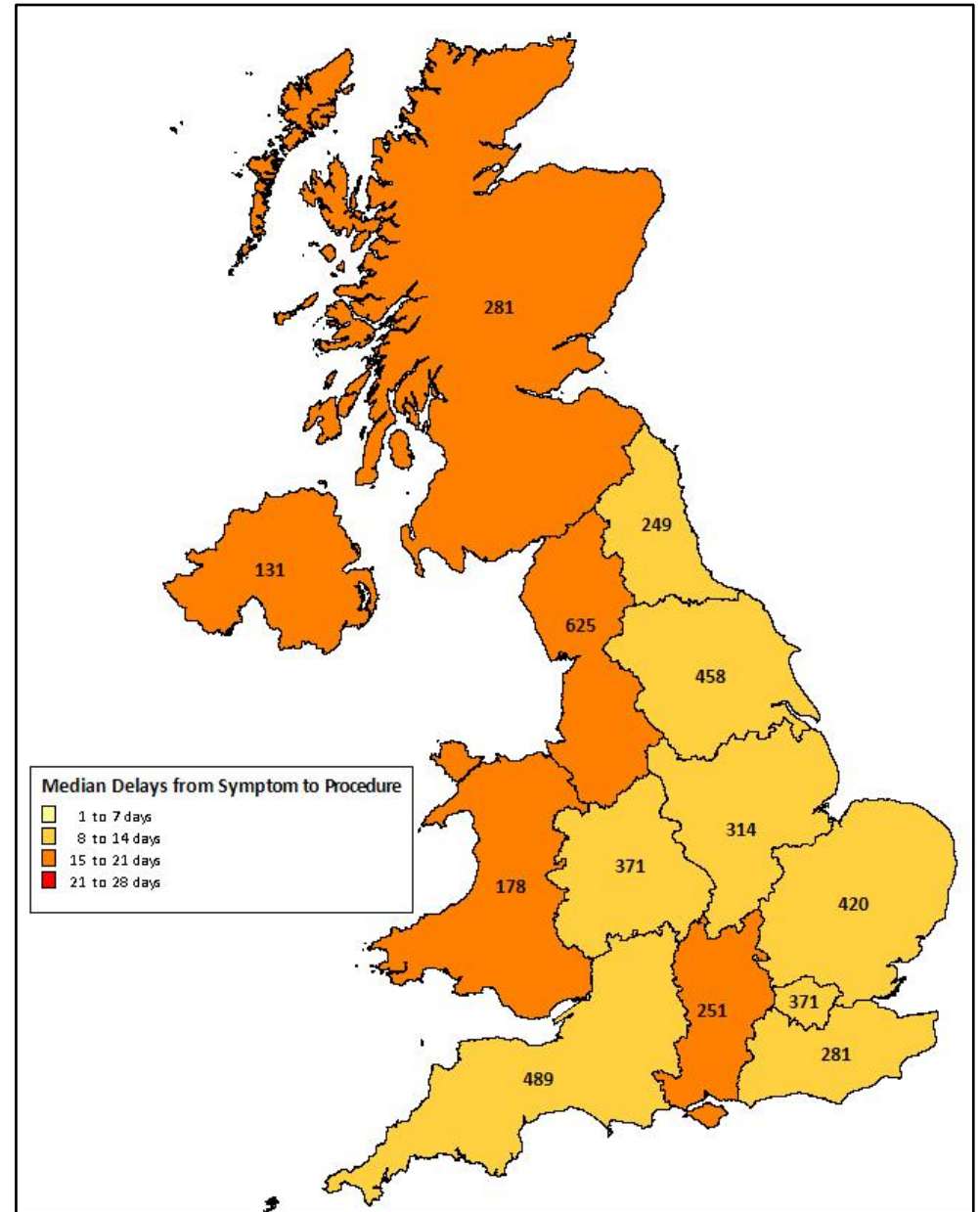


## Median Delays from Symptom to Procedure

Round 4



Round 5

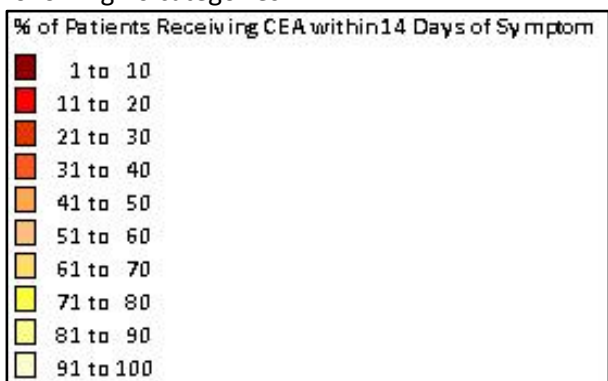


## Comparison of patients reaching standards in the pathway by region

The following set of maps show the percentage of patients per region that reached the following standards:

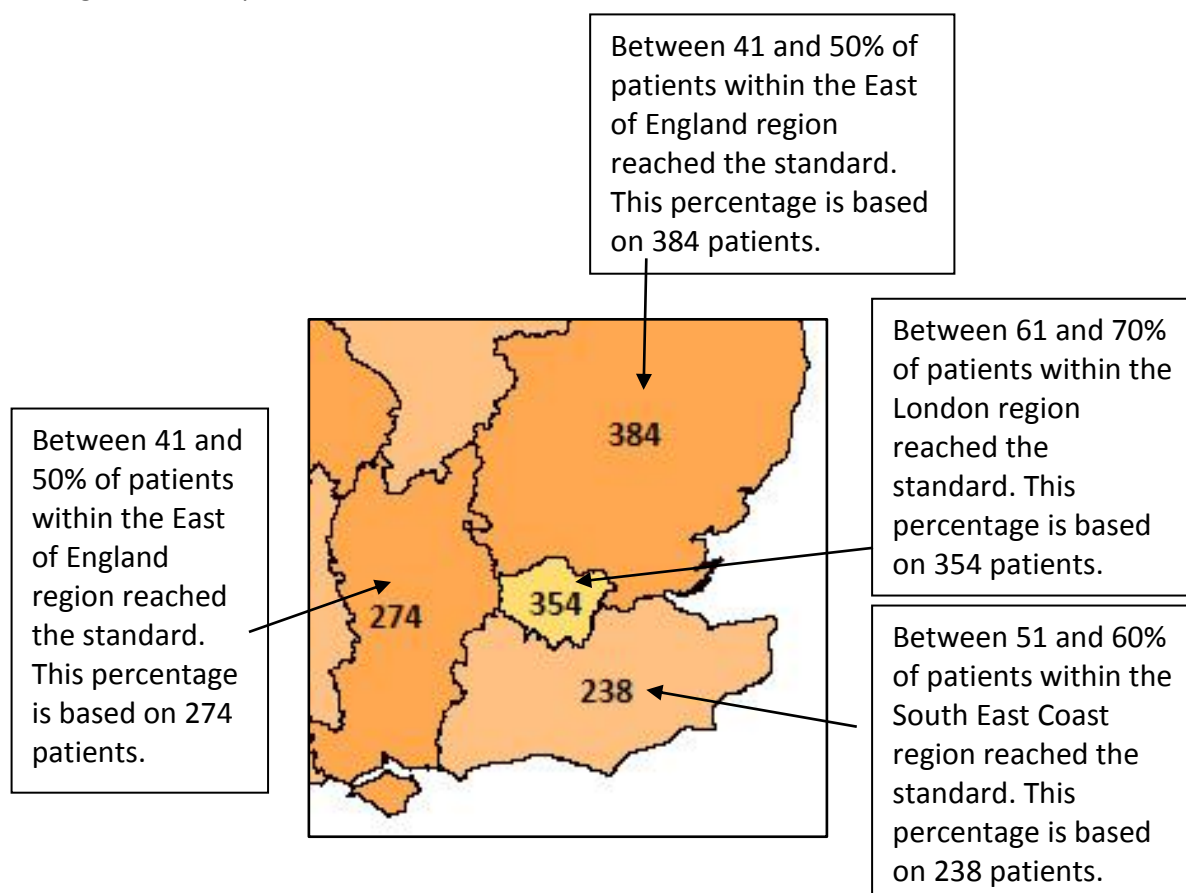
- Symptom to referral within 7 days.
- Referral to procedure within 7 days.
- Overall symptom to procedure within 14 days.

The maps are also colour coded, but this time from white to dark brown, and are broken down into the following 10 categories:



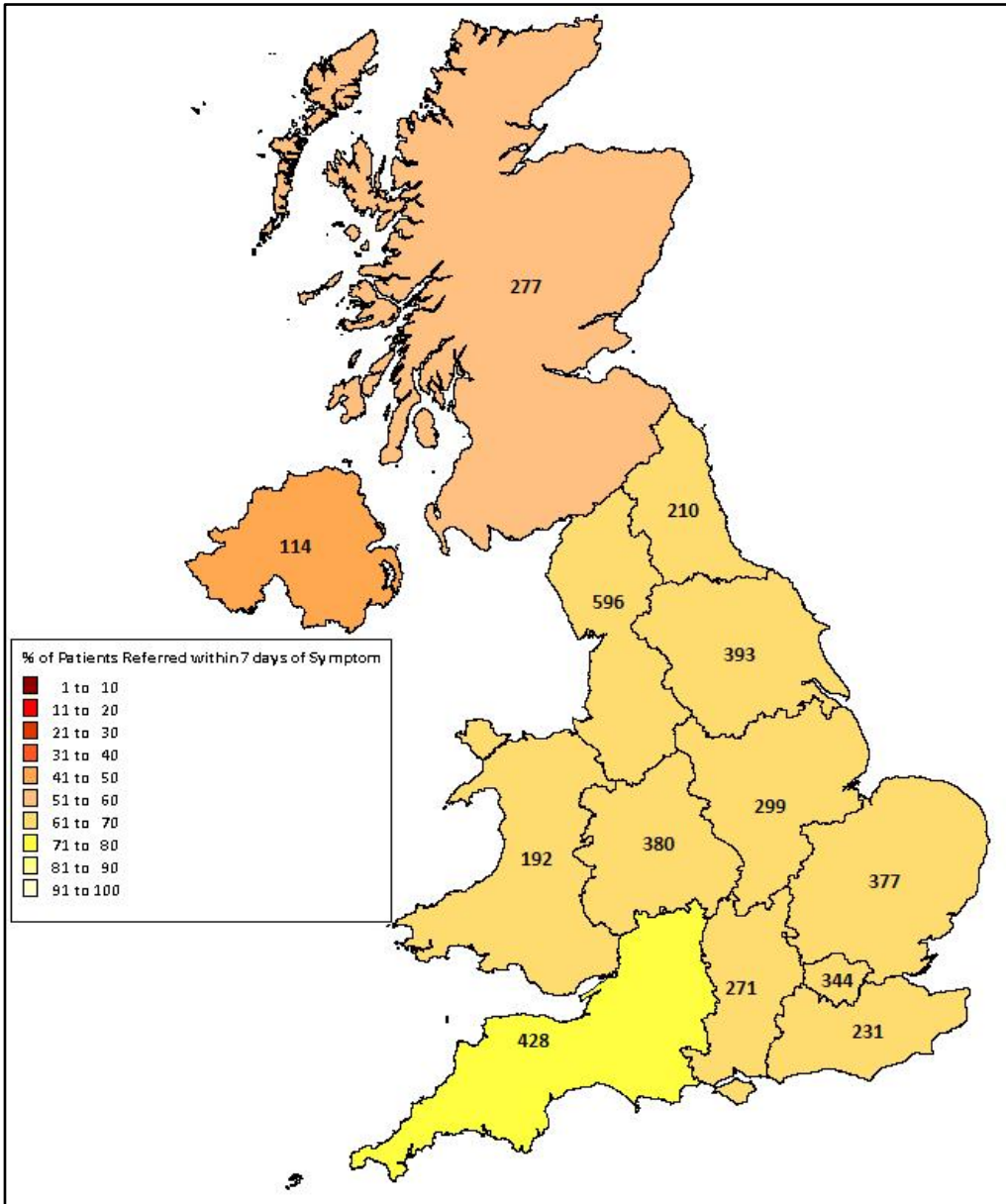
The same colours are used for each map. In each set of maps the Round 4 map is shown on the left and Round 5 on the right, to see improvements over time.

Again, the number inside each region is the number of patients this median is based upon. For example, in the image below it is possible to see that:

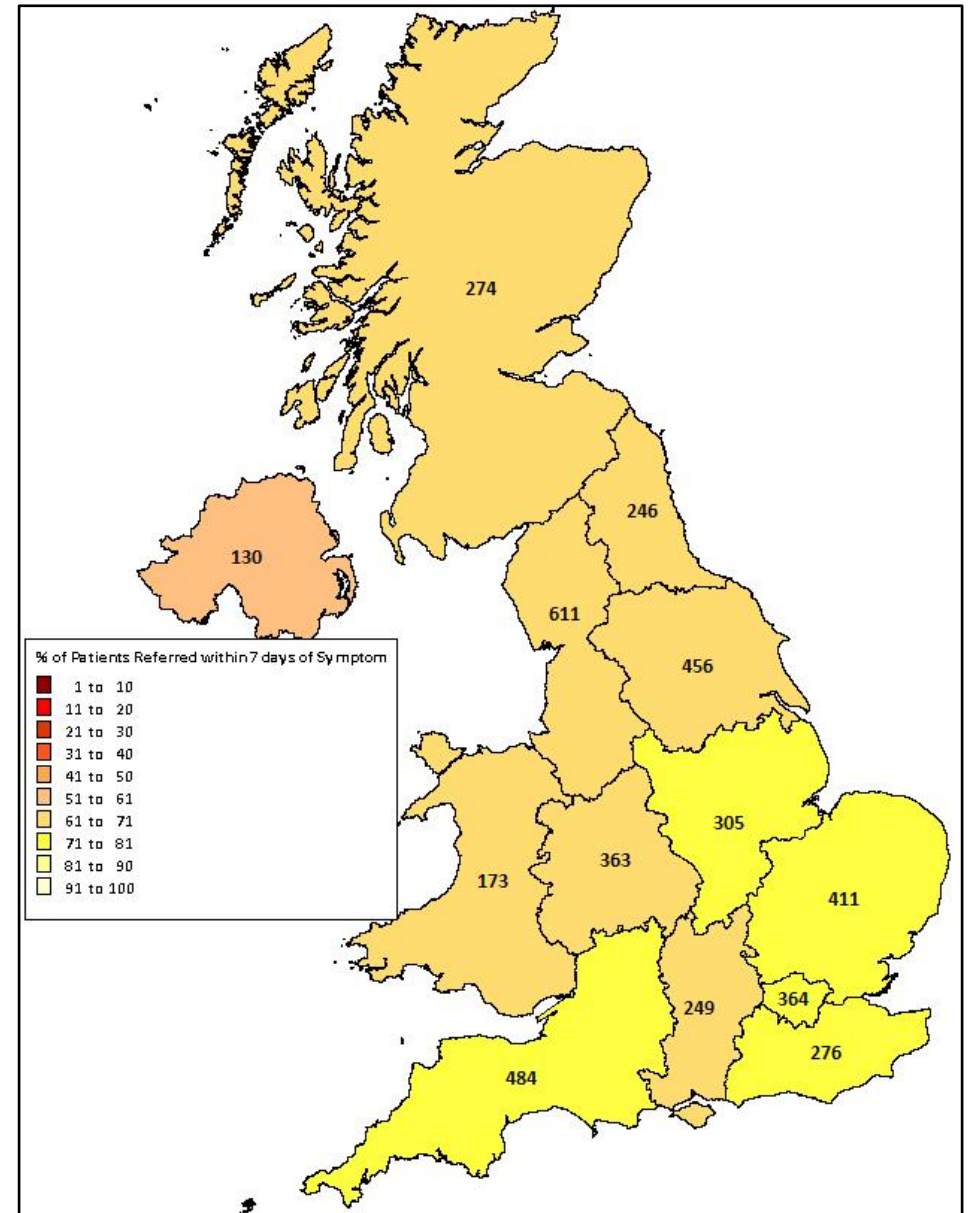


## Delays from Symptom to Referral

### Round 4

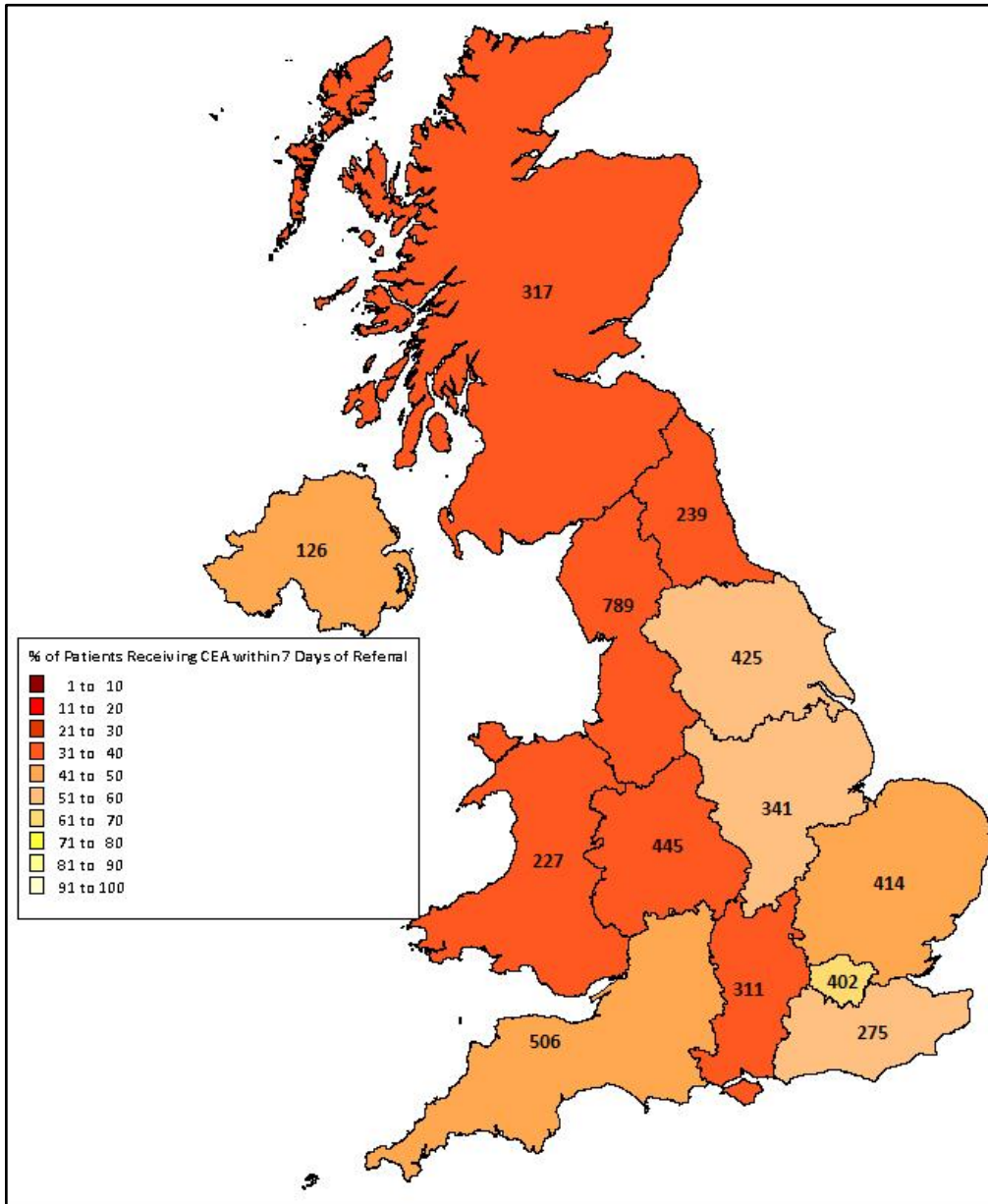


### Round 5

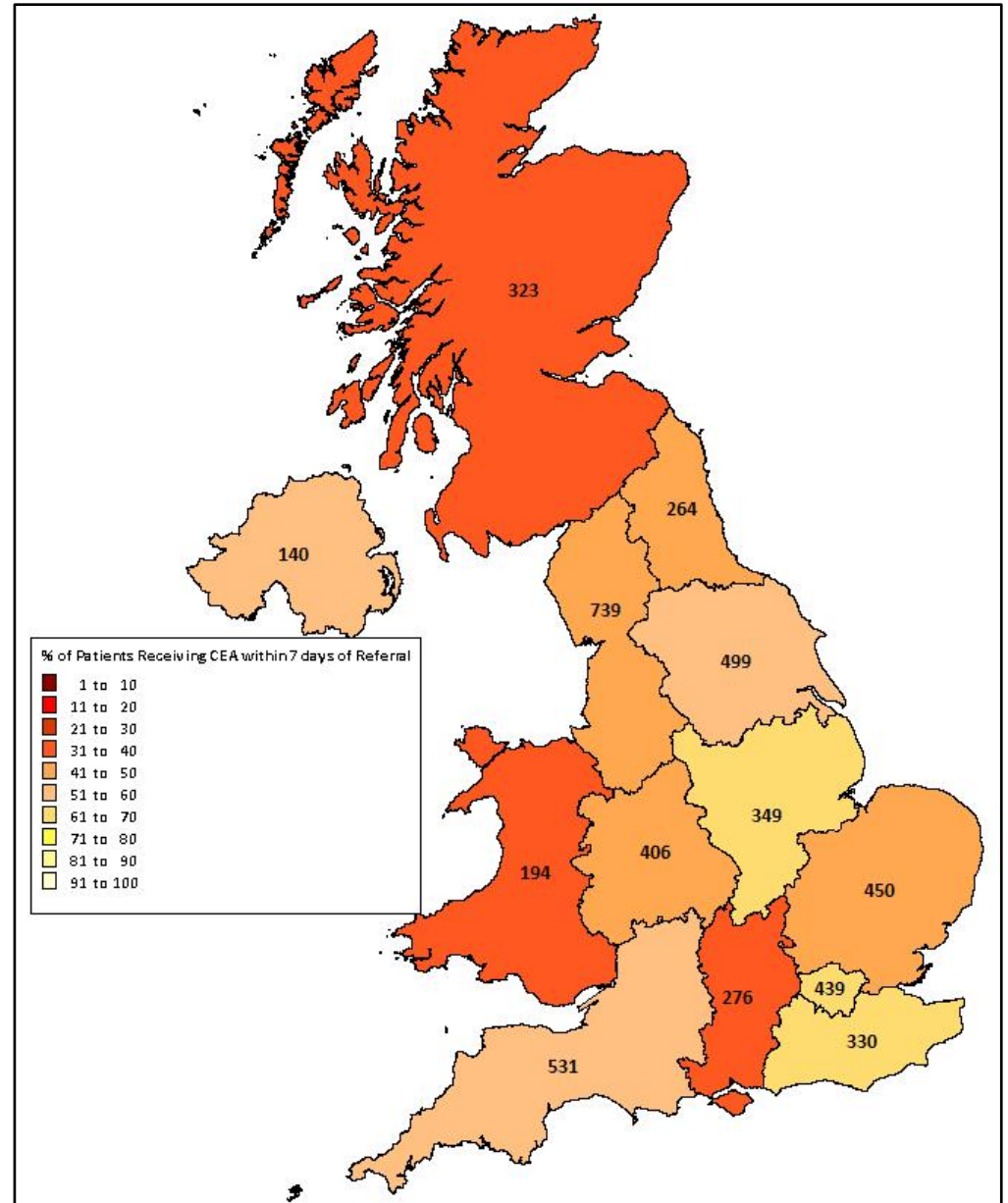


## Delays from Referral to Procedure

**Round 4**



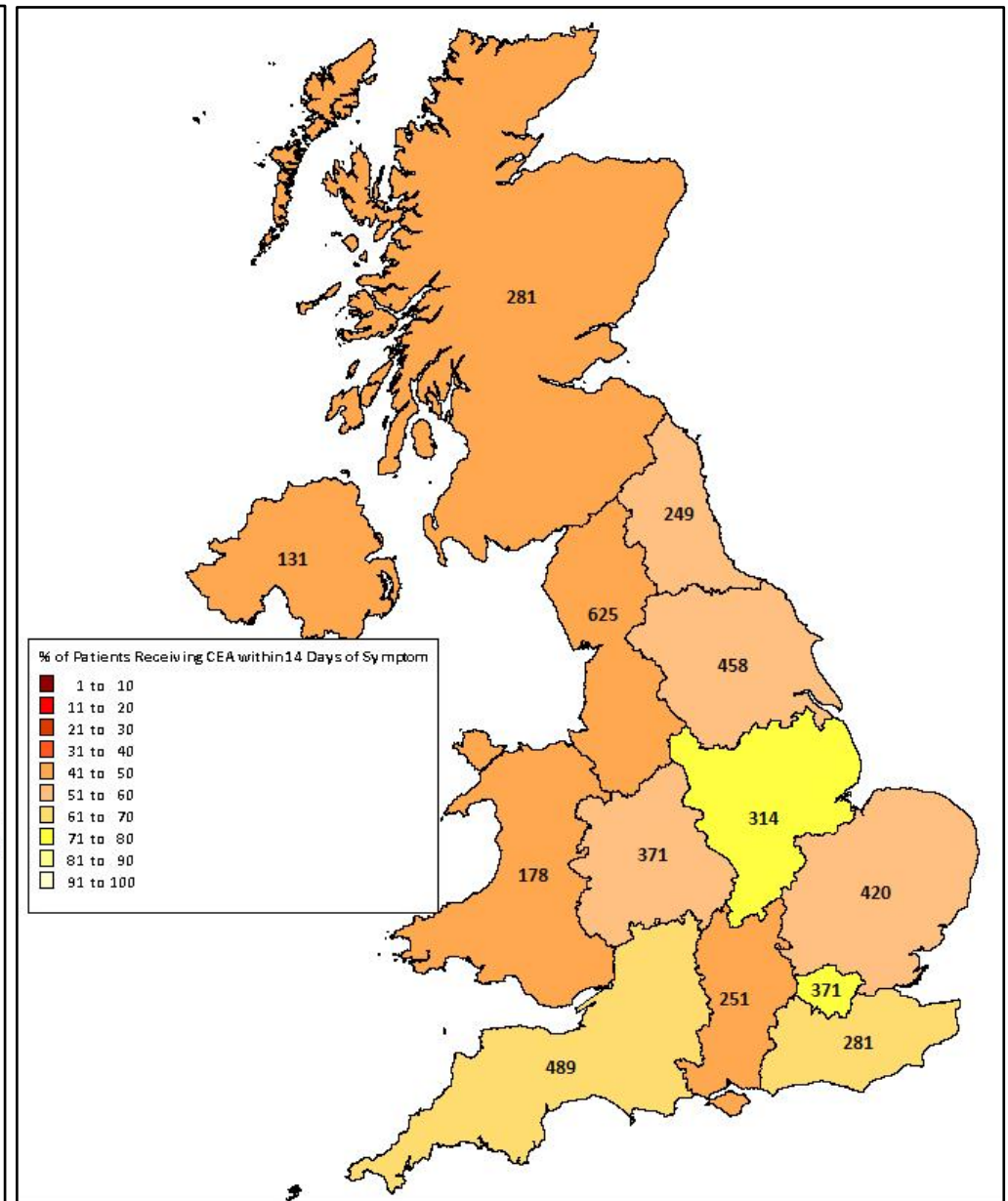
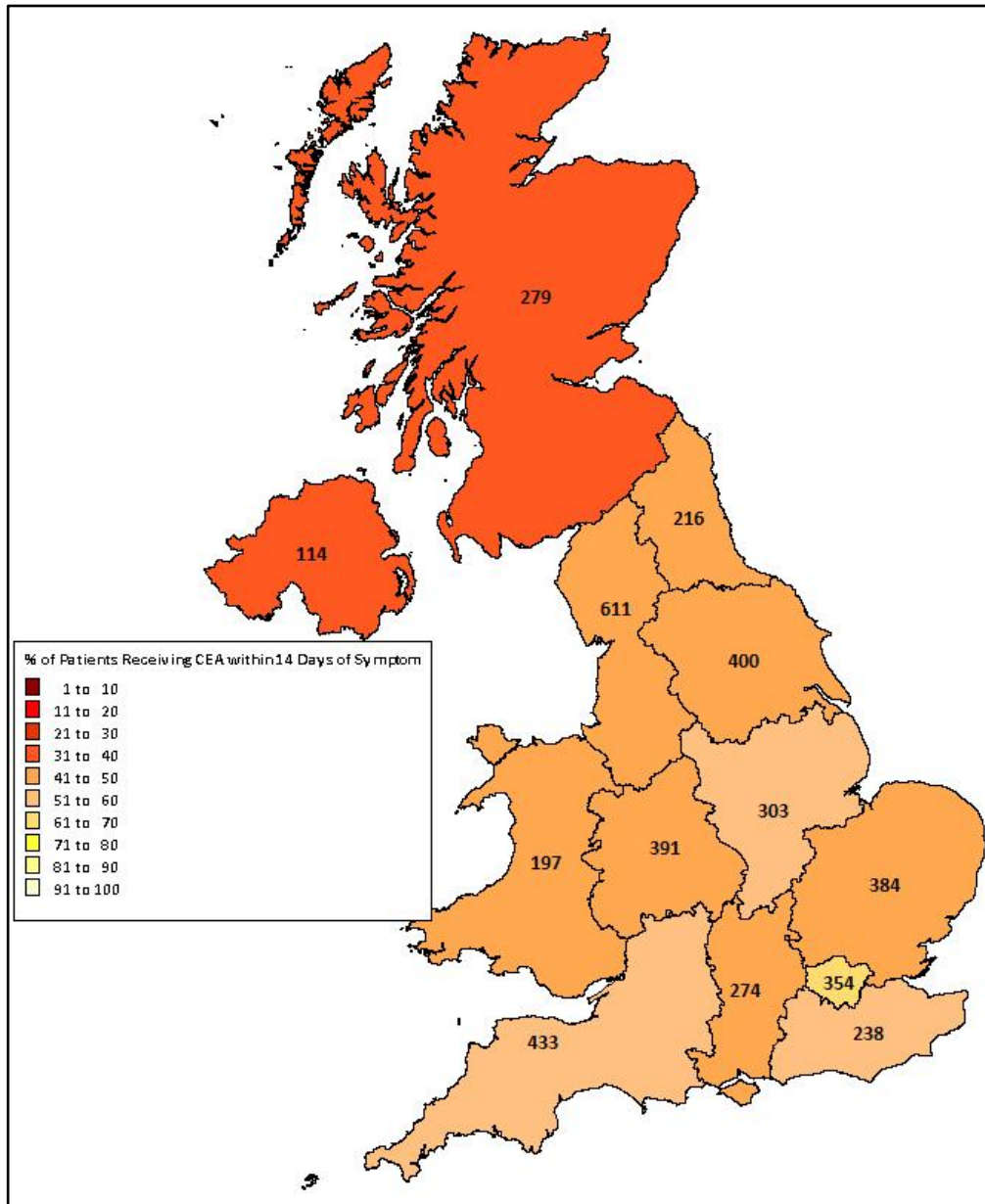
**Round 5**



Round 4

Delays from Symptom to Procedure

Round 5





## References

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## Appendices

### Appendix 1: Glossary

Amaurosis fugax	Transient loss of vision in one eye due to an interruption of blood flow to the retina.
Asymptomatic Patient	A patient who does not yet show any outward signs or symptoms of plaque.
Carotid Endarterectomy (CEA)	Carotid Endarterectomy is a surgical procedure in which build-up is removed from the carotid artery.
Carotid Stenosis	Abnormal narrowing of the neck artery to the brain.
Cranial Nerve Injury (CNI)	Damage to one of the 12 nerves supplying the head and neck.
Electrocardiogram (ECG)	An ECG records the electrical activity of the heart, and can be used to detect abnormal heart rhythms and is sometimes carried out before operations.
Hospital Episode Statistics (HES)	HES is the national statistical data warehouse for England regarding the care provided by NHS hospitals and for NHS hospital patients treated elsewhere. There are equivalent agencies in Northern Ireland, Scotland and Wales but in this report, the term HES is used generically to describe data that are collected by any of these national agencies.
Inter-quartile range (IQR)	Once the data are arranged in ascending order, this is the central 50% of all values and is otherwise known as the 'middle fifty' or IQR.
Median	The median is the middle value in the data set; 50% of the values are below this point and 50% are above this point.
Myocardial Infarct (MI)	Otherwise known as a Heart Attack, MI involves the interruption of the blood supply to part of the heart muscle.
Occluded artery	An artery that has become blocked and stops blood flow.
Plaque	Scale in an artery made of fat, cholesterol and other substances. This hard material builds up on the artery wall and can cause narrowing or blockage of an artery or a piece may break off causing a blockage in another part of the arterial circulation.
Strategic Health Authority (SHA)	An organisation, accountable to government, that assesses the health needs of local people and ensures that local health services are commissioned and provided to meet those needs.
Stroke	A brain injury caused by a sudden interruption of blood flow with symptoms that last for more than 24 hours.
Symptomatic	A patient showing symptoms is known to be symptomatic.
Transient ischaemic attack (TIA)	A "mini-stroke" where the blood supply to the brain is briefly interrupted and recovers within 24 hours.
Trust or Health Board	A public sector corporation that contains a number of hospitals, clinics and health provisions. For example, there were 4 hospitals in the trust and 3 trusts in the SHA.
Vascular Society of Great Britain and Ireland (VSGBI)	The VSGBI is a registered charity founded to relieve sickness and to preserve, promote and protect the health of the public by advancing excellence and innovation in vascular health, through education, audit and research. The VSGBI represents and provides professional support for over 600 members and focuses on non-cardiac vascular disease.

## Appendix 2: Proforma

### APPENDIX 1: Proforma Phase 1 [Symptom to hospital discharge]

#### Section 1: Demographics

- 1.1 Date procedure was undertaken: \_\_\_\_\_ [DD/MM/YYYY]  
[Date entered should be from 1<sup>st</sup> Dec 2005 onwards]
- 1.1a Was this procedure successfully completed? Yes  Abandoned  [Tick 1 option only]  
[If Yes, go to 1.2] [If Abandoned, 1.1b **must be completed**]  
[NB This form still needs to be completed even if the procedure was abandoned]
- 1.1b If procedure was *Abandoned*, give reason: \_\_\_\_\_
- 1.2 RCP surgeon code: \_\_\_\_\_ [On the web tool, this field is filled automatically if an individual login was used to access the web tool. If a 'unit admin' login was used, the relevant code must be selected from a drop down menu] [3 digits]
- 1.2a GMC Number: \_\_\_\_\_ [On the web tool, this field is filled automatically once Q1.2 is filled] [7 digits]
- 1.3 Hospital name: \_\_\_\_\_ [On the web tool, this field is filled automatically if the surgeon or radiologists performs carotid procedures at 1 hospital only, otherwise the relevant hospital name must be selected manually from a drop down menu] [Describes hospital where the procedure was performed]
- 1.4 RCP Hospital code: \_\_\_\_\_ [On the web tool, this field is filled automatically] once Q1.3 [3 digits]
- 1.5 Date of birth: \_\_\_\_\_ [DD/MM/YYYY]
- 1.6a Patient code: \_\_\_\_\_ [Describes a random number (up to 3 digits) that you give to the patient for anonymity]
- 1.6b Patient hospital number: \_\_\_\_\_  
[On the web tool, this field is visible to hospital staff only] [Describes the identifier that is on the patient's local hospital records]
- 1.7 Gender: Male  Female  [Tick 1 option only]
- 1.9 Ethnicity: [Tick 1 option only]

White	<input type="radio"/>	British, Irish, Any other white background
Mixed	<input type="radio"/>	White and Black Caribbean, White and Black African, White and Asian, Any other Mixed background
Asian or Asian British	<input type="radio"/>	Indian, Pakistani, Bangladeshi, Any other Asian background
Black or Black British	<input type="radio"/>	Caribbean, African, Any other Black background
Chinese or other ethnic group	<input type="radio"/>	Chinese, Any other

- 1.10 Which of the following procedures was performed? [Tick 1 option only]  
Surgical carotid endarterectomy  Angioplasty/stent  Combined CEA and angioplasty/stent   
[If Surgical carotid endarterectomy is selected, ignore 13.1 to 13.1b and 13.10 to 13.12]  
[If Angioplasty/stent is selected, ignore 12.3a and 13.4 to 13.9]  
[If Combined CEA & angioplasty/stent is selected, ignore 13.1 to 13.2a]
- 1.11 Date patient was admitted to this Hospital in **this episode** of care: \_\_\_\_\_  
[DD/MM/YYYY] [Date entered CANNOT be after date of procedure (1.1) but can be EQUAL to date of procedure (1.1)]

#### Section 2: Risk Factors

- 2.1 Diagnosed Diabetic: Yes  No  [Tick 1 option only]
- 2.2 Any current symptoms of or treatment for ischaemic heart disease or congestive heart failure?  
Yes  No  [Tick 1 option only]

- 2.3 Known peripheral arterial vascular disease (symptoms or previous intervention) Yes  No
- 2.4 Pre-operative blood pressure (e.g. taken on day or prior to surgery or in clinic):
- Systolic BP (mmHg): [            ] [Min= 20, Max=350]  
 Diastolic BP (mmHg): [            ] [Min= 20, Max=350]

**Section 3: Referral to surgeons**

- 3.1 Date of referral to team under whose care surgery or angioplasty/stenting was undertaken: \_\_\_\_\_  
 [DD/MM/YYYY] [Date entered can be from 1<sup>st</sup> Dec 2003 onwards but CANNOT be after date of procedure (1.1)]
- 3.1a Date patient was first seen by team under whose care surgery or angioplasty/stenting was undertaken:  
 [DD/MM/YYYY] [Date entered can be from 1<sup>st</sup> Dec 2003 onwards but CANNOT be after date of procedure (1.1)]
- 3.2 Who referred the patient to the team under whose care surgery or angioplasty/stenting was undertaken?  
 [Tick 1 option only]
- General Practitioner  Neurologist  Stroke Physician  Radiologist   
 Care of the Elderly Consultant  Vascular Surgeon  Cardiologist/Cardiothoracic surgeon   
 Ophthalmology  Self referral  Other Surgeon  Other   
 [If NOT Other, go to 3.3] [If Other, 3.2a must be completed]
- 3.2a If answered *Other* to 3.2, specify: \_\_\_\_\_
- 3.3 Was the patient referred from another Trust? Yes  No  [Tick 1 option only]

**Section 4: Indications that triggered referral**

- 4.1 Was the patient symptomatic for carotid disease? Yes  No  [Tick 1 option only]  
 [If 'No', ignore 4.1a to 4.1d and 7.1.]  
 [If 'Yes', ignore 4.1e and 4.1a or 4.1b and 4.1c must be completed]
- 4.1a If 'Yes', give the **date** the patient experienced the symptom that triggered referral for surgery or angioplasty/stent:  
 \_\_\_\_\_ [DD/MM/YYYY] [If date is given, go to 4.1c]  
 [Date entered can be from 1<sup>st</sup> Dec 2000 onwards but CANNOT be after date of procedure (1.1)]  
 Date not known  [If this option is selected 4.1b must be completed]
- 4.1b If *Date Not known*, estimate the time between the date the patient experienced the symptom and the date that the initial referral for surgery or angioplasty/stent was made: [Tick 1 option only]
- 1-2 days  3-7 days  8-14 days  15-21 days  22-28 days  >28 days
- 4.1c What was the symptom that triggered referral for surgery or angioplasty/stent? [Tick 1 option only]  
 [NB only the INDEX symptom is required even if the patient had other symptoms]
- Amaurosis fugax  Transient ischaemic attack  Stroke   
 Chronic cerebral hypoperfusion  Other   
 [If Other is selected, 4.1d must be completed]
- 4.1d If answered *Other* to 4.1c, specify: \_\_\_\_\_
- 4.1e If 'No' to 4.1, is CEA or angioplasty/stent being undertaken prior to major surgery (e.g. CABG) or as part of randomised trial? [Tick 1 option only]
- Major surgery (e.g. CABG)  Randomised trial  Neither of these

**Section 5: DIAGNOSTIC carotid imaging** [i.e. Imaging that identified ICA stenosis requiring treatment]

- 5.1 Date of the initial DIAGNOSTIC carotid imaging that identified ICA stenosis requiring treatment: \_\_\_\_\_ [DD/MM/YYYY]  
[Date entered can be from 1<sup>st</sup> Dec 2003 onwards but CANNOT be after date of procedure (1.1)]
- 5.2 Specify imaging modalities used on date given in 5.1: [Select at least 1 option]  
Duplex  MR angiogram  Catheter angiogram  CT angiogram  Other or Not documented
- 5.2a Grade of ipsilateral carotid stenosis (based on **NASCET** criteria): [Tick 1 option only]  
[Describes measurement used to identify suitability for intervention]  
<50%  50%-69%  70%-89%  90%-99%  Occluded
- 5.2b Grade of contralateral carotid stenosis (based on **NASCET** criteria): [Tick 1 option only]  
Not done  <50%  50%-69%  70%-89%  90%-99%  Occluded
- 5.3 Has the patient had further pre-operative carotid imaging after initial scan, to confirm diagnosis? [Tick 1 option only]  
Yes  No  [If No, go to 6.1] [If Yes, 5.3a **must be completed**]
- 5.3a Date patient had further pre-operative carotid imaging after initial scan, to confirm diagnosis: \_\_\_\_\_ [DD/MM/YYYY] [Date entered **MUST** be **BEFORE** date of procedure (1.1)]
- 5.3b Specify imaging modalities used on date given in 5.3a: [Select at least 1 option]  
Duplex  MR angiogram  Catheter angiogram  CT angiogram  Other or Not documented
- 5.3c If answered Yes to 5.3, specify grade of ipsilateral carotid stenosis (based on **NASCET** criteria):  
<50%  50%-69%  70%-89%  90%-99%  Occluded
- 5.3d If answered Yes to 5.3, did the patient have a string sign (with a collapsed ICA)? Yes  No
- 5.3e If answered Yes to 5.3, specify grade of contralateral carotid stenosis (based on **NASCET** criteria): [Tick 1 option only]  
Not done  <50%  50%-69%  70%-89%  90%-99%  Occluded

**Section 6: Most recent carotid imaging prior to undergoing this surgery or angioplasty/stent**

- 6.1 Has the patient had further pre-operative carotid imaging to confirm patency immediately prior to surgery or angioplasty/stent?  
Yes  No  [If No, go to 7.1] [If Yes, 6.1a **must be completed**]
- 6.1a If answered Yes to 6.1, give date of pre-operative imaging to confirm patency prior to surgery or angioplasty/stent:  
\_\_\_\_\_ [DD/MM/YYYY] [Date entered **MUST** be **ON** or **BEFORE** date of procedure (1.1)]

**Section 7: Function prior to undergoing this surgery or angioplasty/stent**

- 7.1 Give date of the most recent ISCHAEMIC event prior to surgery or angioplasty/stent: \_\_\_\_\_  
[DD/MM/YYYY]  
[Date entered can be from 1<sup>st</sup> Dec 2003]
- 7.2 Rankin score immediately pre-operatively or prior to angioplasty/stent: [Tick 1 option only]  
0  Asymptomatic  
1  Non-disabling symptoms no interference with lifestyle  
2  Minor disability some restriction in lifestyle but does not interfere with patient's capacity to look after self  
3  Moderate disability symptoms significantly interfere with lifestyle or prevent totally independent existence  
4  Moderately severe symptoms prevent independent existence but patient does not need attention 24hrs  
5  Severely disabled totally dependent day and night

### Section 8: Previous carotid interventional procedures

- 8.1 Previous ipsilateral carotid surgery: Yes  No  *[Tick 1 option only]*
- 8.2 Previous ipsilateral carotid angioplasty or stent: Yes  No  *[Tick 1 option only]*

### Section 9: Tests prior to undergoing this surgery or angioplasty/stent

- 9.1 Creatinine: [ ] (mmol/L) *[Min=5 Max=1000]*

### Section 10: Drug therapy prior to undergoing this surgery or angioplasty/stent

- 10.1 Was the patient on anti-platelet/thrombotic treatment prior to surgery or angioplasty/stent? Yes  No   
*[If No, go to 10.3] [If Yes, 10.2 must be completed]*
- 10.2 Which of the following drugs was the patient taking prior to surgery or angioplasty/stent: *[Select at least 1 option]*  
 Aspirin  Clopidogrel  Dipyridamole  Warfarin  Other   
*[If Aspirin is NOT selected, ignore 10.2a & 10.2b] [If Clopidogrel is NOT selected, ignore 10.2c & 10.2d]*  
*[If Dipyridamole is NOT selected, ignore 10.2e & 10.2f] [If Warfarin is NOT selected, ignore 10.2g & 10.2h]*
- 10.2a Was ASPIRIN stopped prior to surgery or angioplasty/stent? Yes  No  *[If No, ignore 10.2b]*
- 10.2b If ASPIRIN was stopped, specify the number of days it was stopped prior to surgery or angioplasty/stent:  
 [ ] *[Days]*
- 10.2c Was CLOPIDOGREL stopped prior to surgery or angioplasty/stent? Yes  No  *[If No, ignore 10.2d]*
- 10.2d If CLOPIDOGREL was stopped, specify the number of days it was stopped prior to surgery or angioplasty/stent  
 [ ] *[Days]*
- 10.2e Was DIPYRIDAMOLE stopped prior to surgery or angioplasty/stent? Yes  No  *[If No, ignore 10.2f]*
- 10.2f If DIPYRIDAMOLE was stopped, specify the number of days it was stopped prior to surgery or angioplasty/stent:  
 [ ] *[Days]*
- 10.2g Was WARFARIN stopped prior to surgery or angioplasty/stent? Yes  No  *[If No, ignore 10.2h]*
- 10.2h If WARFARIN was stopped, specify the number of days it was stopped prior to surgery or angioplasty/stent:  
 [ ] *[Days]*
- 10.3 Was the patient on statin therapy prior to surgery or angioplasty/stent? Yes  No  *[Tick 1 option only]*
- 10.4 Was the patient on beta-blockers therapy prior to surgery or angioplasty/stent? Yes  No   
*[Tick 1 option only]*

### Section 11: Delay to surgery or angioplasty/stent

- 11.1 If elapsed time between the symptom that triggered referral and surgery or angioplasty/stent is **greater than 2 weeks**, specify reason(s):  
*[Select at least 1 option] [If Other is NOT selected, ignore 11.1a]*

Delay in presentation	<input type="checkbox"/>	Limited availability of surgeon	<input type="checkbox"/>	Other	<input type="checkbox"/>
Delay in referral	<input type="checkbox"/>	Limited availability of anaesthetist	<input type="checkbox"/>		
Delay in carotid imaging	<input type="checkbox"/>	Limited availability of radiologist	<input type="checkbox"/>		
Patient cancellation/delay - unfit	<input type="checkbox"/>	Lack of operating time	<input type="checkbox"/>		
Patient cancellation/delay – patient choice	<input type="checkbox"/>	Other case took priority	<input type="checkbox"/>		

11.1a If answered *Other* in 11.1, specify:

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## Section 12: Procedure details

- 12.1 Which carotid artery was treated? Left  Right  *[Tick 1 option only]*
- 12.2 Start time: [ : ] *[Hours:Minutes]*
- 12.3 Finish time: [ : ] *[Hours:Minutes]*
- 12.3a If length of procedure is <1hour or >3hours, give reason: \_\_\_\_\_
- 12.4 Grade of most senior surgeon in theatre: *[Tick 1 option only]* *[If NOT Specialist registrar, go to 12.5]*  
Consultant  Non consultant career grade  Specialist registrar
- 12.4a If most senior surgeon in theatre was *Specialist registrar*, specify year of training: *[Tick 1 option only]*  
Year 1  Year 2  Year 3  Year 4  Year 5
- 12.5 Was this a joint consultant operation with two consultant surgeons operating together? Yes  No
- 12.6 Type of surgery: Elective  Unplanned/Emergency  *[Tick 1 option only]*
- 12.7 Type of anaesthetic used during surgery? General  Local/Blocks   
Started with LA, switched to GA
- 12.8 Grade of most senior anaesthetist in theatre: *[Tick 1 option only]* *[If NOT Specialist registrar, go to 13.1]*  
Consultant  Non consultant career grade  Specialist registrar
- 12.8a If most senior anaesthetist in theatre was *Specialist registrar*, specify year of training: *[Tick 1 option only]*  
Year 1  Year 2  Year 3  Year 4  Year 5

**Section 13: Specific procedure data** [Complete Q13.1 to Q13.1b and 13.10 to 13.12 ONLY if the patient had angioplasty/stent]

13.1 If angioplasty/stent only performed was conventional was surgery an option? Yes  No   
*[Tick 1 option only]*

13.1a Whose care was the patient under when they underwent angioplasty/stent? *[If NOT Other, go to 13.2]*  
 Vascular surgeon  Neurosurgeon  Radiologist  Stroke Physician  Other

13.1b If answered *Other* to 13.1a, specify: \_\_\_\_\_

13.2 Was this patient in a stenting versus surgery clinical trial? Yes  No

13.2 If the patient was in a stenting versus surgery trial were they in ICSS or ACST-2? ICSS  ACST-2

13.3 Pathology: *[Select at least 1 option]* *[If NOT Other, ignore 13.3a]*  
 Atherosclerosis  Post endarterectomy restenosis  Post radiotherapy  Other

13.3a If answered *Other* to 13.3, specify: \_\_\_\_\_

13.4 Was a carotid shunt used? Yes  No  Attempted and abandoned  *[Tick 1 option only]*

13.5 Type of endarterectomy: Standard  Eversion  *[Tick 1 option only]*

13.6 Was a carotid patch used? Yes  No  *[Tick 1 option only]*

13.7 Were distal tacking sutures used? Yes  No  *[Tick 1 option only]*

13.8 Was heart surgery undertaken synchronously? Yes  No  *[Tick 1 option only]*

13.9 Which of the following completion assessment techniques were used? *[Select at least 1 option]*  
*[If 'None', go to 14.1] [If NOT 'None', select at least 1 option]*  
 None  Angiography  Duplex scan  Angioscopy  Hand-held Doppler

13.10 Site of angioplasty/stenting: *[Select at least 1 option]*  
 Carotid bifurcation (including proximal ICA)  Distal ICA (below base of skull)   
 Common Carotid artery  External Carotid artery

13.11 Procedure details: Angioplasty alone  Stent Cerebral protection device   
*[Select at least 1 option] [If Stent is NOT selected, ignore 13.11a & 13.11b]*  
*[If Cerebral protection device is NOT selected, ignore 13.11c & 13.11d]*

13.11a If answered *Stent* to 13.11, specify type: *[Select at least 1 option]* *[If NOT Other, ignore 13.11b]*  
 Abbott XAct  Abbott Acculink  Bard Vivax  Boston Scientific Wallstent   
 Boston Scientific NEX stent  Cordis Precise  Invatec Cristallo  Medtronic Exponent   
 Other

13.11b If answered *Other* to 13.11a, specify: \_\_\_\_\_

13.11c If answered *Cerebral protection device* to 13.11, specify type: *[Tick 1 option only]* *[If NO Other, ignore 13.11d]*  
 Filter  Flow reversal  Proximal occlusion (MoMa)  Distal occlusion (PercuSurge)  Other

13.11d If answered *Other* to 13.11c, specify: \_\_\_\_\_

13.12 Grade of most senior radiologist performing intervention: *[Tick 1 option only]*  
 Consultant  Non consultant career grade  Specialist registrar



### Section 14: Destination post-operatively or post angioplasty/stent

- 14.1 Time spent in recovery area: *[Tick 1 option only]*  
 None  <4 hours  >4 ≤ 12 hours  >12 hours
- 14.2 Where was the patient admitted post-operatively or post angioplasty/stent (after any period in recovery)?  
 Intensive care unit  High dependency unit  Ward  PACU   
*[Tick 1 option only]*

### Section 15: Complications during inpatient stay

- 15.1 Did the patient suffer any complications during inpatient stay? Yes  No  *[If No, go to 15.6]*

- 15.1a If answered 'Yes to 15.1', which of the following complications did the patient experience?

*[Select at least 1 option]*

Myocardial Infarct	<input type="checkbox"/>	Cranial nerve injury (includes neuropraxia)	<input type="checkbox"/>	Occlusion of treated carotid artery	<input type="checkbox"/>
Stroke	<input type="checkbox"/>	Heart Failure (includes cardiac arrhythmia)	<input type="checkbox"/>	Respiratory	<input type="checkbox"/>
TIA	<input type="checkbox"/>	Urinary	<input type="checkbox"/>	Thromboembolism related to the treated carotid artery	<input type="checkbox"/>
Amaurosis fugax	<input type="checkbox"/>	Cardiac arrest	<input type="checkbox"/>	Post-intervention hypertension	<input type="checkbox"/>
Bleeding	<input type="checkbox"/>	Fit	<input type="checkbox"/>	Other	<input type="checkbox"/>

*[If Myocardial infarct is NOT selected, ignore 15.2][If Stroke is NOT selected, ignore 15.3, 15.3a, 15.3b, 15.3c & 15.3d]*

*[If TIA is NOT selected, ignore 15.4]*

*[If Cranial nerve injury is NOT selected, ignore 15.5 & 15.5a]*

*[If Other is NOT selected, ignore 15.1b]*

- 15.1b If answered 'Other' to 15.1a, specify: \_\_\_\_\_

- 15.2 If the patient experienced a *myocardial infarct*, specify timing: *[Tick 1 option only]*

≤24hrs of undergoing procedure   
 >24hrs after undergoing procedure and prior to discharge

- 15.3 If the patient experienced a *stroke*, specify timing: *[Tick 1 option only]*

During procedure (woke up with a stroke)   
 ≤24hrs of undergoing procedure   
 >24hrs after undergoing procedure and prior to discharge

*[If During procedure (woke up with stroke) OR ≤24hrs of undergoing procedure ignore 15.3a]*

*[If >24hrs of undergoing procedure and prior to discharge 15.3a must be completed]*

- 15.3a If patient experienced a stroke >24hrs after undergoing procedure and prior to discharge, give date patient of stroke: \_\_\_\_\_ *[DD/MM/YYYY]* *[Date entered MUST be AFTER date of procedure (1.1)]*

- 15.3b Side of stroke: Side on which this procedure was done  Contralateral side  *[Tick 1 option only]*

- 15.3c Severity of stroke: *[Tick 1 option only]*

- 0  Asymptomatic  
 1  Non-disabling symptoms no interference with lifestyle  
 2  Minor disability some restriction in lifestyle but does not interfere with patient's capacity to look after self  
 3  Moderate disability symptoms significantly interfere with lifestyle or prevent totally independent existence  
 4  Moderately severe symptoms prevent independent existence but patient does not need attention 24hrs  
 5  Severely disabled totally dependent day and night

- 15.3d Give date the assessment in 15.3c was made: \_\_\_\_\_  
*[DD/MM/YYYY]* *[Date entered must be on or after date procedure was undertaken (1.1)]*

- 15.4 If patient experienced *TIA*, specify timing:  
 ≤24hrs of undergoing procedure  >24hrs after undergoing procedure and prior to discharge

- 15.5 If patient experienced *cranial nerve injury*, specify date injury was found: \_\_\_\_\_ *[DD/MM/YYYY]*

*[Date entered must be on or after date procedure was undertaken (1.1)]*

15.5a Affected cranial nerve (or branch): *[Select at least 1 option]*

Hypoglossal  Facial  Glossopharyngeal  Vagus  Recurrent laryngeal

15.6 Did the patient return to theatre for ANY reason during hospital stay? Yes  No  *'No', go to 15.7]*

15.6a If answered Yes to 15.6, specify reason patient returned to theatre: *[Select at least 1 option]* *[If NOT Other, go to 15.7]*

Bleeding  Stroke  Thromboembolism related to the treated carotid artery  Other

15.6b If answered *Other* to 15.6a, specify: \_\_\_\_\_

15.7 Did the patient die during inpatient stay? Yes  No  *[Tick 1 option only]* *[If No, go to 16.1]*

15.7a If answered Yes to 15.7, give the date that the patient died: \_\_\_\_\_ *[DD/MM/YYYY]*  
*[Date entered must be equal to or greater than 1.1 (date of procedure)]*

15.7b Specify PRIMARY cause of death: Myocardial Infarct  Bleeding  Stroke  Other   
*[If NOT Other, complete 17.1. Then 18.1 to 21.1a DO NOT need to be completed]*  
*[If Other, 15.7c must be completed]*

15.7c If answered *Other* to 15.7b, specify: \_\_\_\_\_

## Section 16: Discharge data

16.1 Date patient was discharged by team under whose care surgery or angioplasty/stent was performed:  
\_\_\_\_\_ *[DD/MM/YYYY]* *[MUST be on or after date of procedure (1.1)]*

16.2 Date patient was discharged from hospital: \_\_\_\_\_ *[DD/MM/YYYY]*  
*[MUST be on or after date of procedure (1.1)]*

16.3 Discharge Destination: Home  Care Home  Other Hospital  Other   
*[If NOT 'Other' go to 16.4]*

16.3a If answered *Other* to 16.3, specify: \_\_\_\_\_

16.4 What was the Rankin score at hospital discharge? *[Tick 1 option only]*

- 0  Asymptomatic
- 1  Non-disabling symptoms no interference with lifestyle
- 2  Minor disability some restriction in lifestyle but does not interfere with patient's capacity to look after self
- 3  Moderate disability symptoms significantly interfere with lifestyle or prevent totally independent existence
- 4  Moderately severe symptoms prevent independent existence but patient does not need attention 24hrs
- 5  Severely disabled totally dependent day and night

## Section 17: Phase 1 Data entry

17.1 Who completed Phase 1? *[Tick 1 option only]*

Surgeon  Specialist Registrar (Surgical)  Basic surgical trainee  Nurse

Audit personnel  Radiologist  Specialist Registrar (Radiological)  Other

*[If Other, 17.1a must be completed]*

*[If NOT Other, go to 18.1]*

17.1a If answered *Other* to 17.1, specify: \_\_\_\_\_

## Phase 2 [30-day survival/Follow-up assessment]

### Section 18: Patient status at 30days after undergoing procedure

- 18.1 Did the patient die following discharge (up to 30 days after undergoing this procedure)? Yes  No   
*[If No, go to 19.1]*
- 18.1a If answered Yes to 18.1, give date patient died: \_\_\_\_\_ *[DD/MM/YYYY]*  
*[Date entered must be equal to or greater than 16.2 (date patient was discharged from hospital)]*
- 18.1b Cause of death: Myocardial infarct  Bleeding  Stroke  Other  Unknown   
*[Tick 1 option only] [If NOT Other, go to 21.1]*
- 18.1c If answered *Other* to 18.1b, specify: \_\_\_\_\_ *[Go to 21.1]*

### Section 19: Follow-up attendance

- 19.1 Was the patient offered a post-discharge follow-up appointment? Yes  No  *[If No, go to 21.1]*
- 19.2 If answered Yes to 19.1, did the patient attend post-operative follow-up appointment?  
Yes  No  *[Tick 1 option only] [If No, go to 21.1]*
- 19.2a If answered Yes to 19.2, give date of post-discharge follow-up assessment: \_\_\_\_\_ *[DD/MM/YYYY]*  
*[Date entered must be ON or AFTER date of procedure (1.1)]*
- 19.2b Form of follow-up: \_\_\_\_\_ *[Tick 1 option only]*  
Patient seen in OPD (own Trust)  Patient seen in OPD (other Trust)  Telephone follow-up   
Postal follow-up
- 19.3 Specify specialty of professional that assessed the patient: \_\_\_\_\_ *[Select at least 1 option]*  
Surgeon  Neurologist  Stroke Physician  Care of the Elderly Consultant   
Cardiologist/Cardiothoracic surgeon  Other  *[If NOT Other, go to 20.1]*
- 19.3a If answered *Other* to 19.3, specify specialty: *[e.g. Vascular SpR]* \_\_\_\_\_

## Section 20: Post-operative follow-up data

- 20.1 Was the patient re-admitted for a complication <30days after operation and after hospital discharge?  
Yes  No  *[If No, go to 20.2]*
- 20.1a If answered Yes to 20.1, give date patient was re-admitted: \_\_\_\_\_ *[DD/MM/YYYY]*  
*[Date entered must be equal to or greater than 16.2 (date patient was discharged from hospital)]*
- 20.1b Specify reason for re-admission: Stroke  Cardiac  Respiratory  Other  *[Select at least 1 option] [If 'No', go to 20.2]*
- 20.1 c If answered *Other* to 20.1b, specify: \_\_\_\_\_
- 20.2 Was evidence of cranial nerve injury found at follow-up (that was NOT identified prior to discharge)? Yes  No   
*[If 'No', go to 20.3]*
- 20.2a If answered Yes to 20.2, which nerve (or branch) was affected? *[Select at least 1 option]*  
Hypoglossal  Facial  Glossal pharyngeal  Vagus  Recurrent laryngeal
- 20.3 Has the patient had a stroke **since discharge**? Yes  No  *[If No, go to 20.4]*
- 20.3a If answered Yes to 20.3 give date patient experienced stroke (if exact date is not known, give best estimate):  
*[Date entered must be EQUAL to or GREATER than 16.2 (date patient was discharged from hospital)]*
- 20.4 Rankin score at this visit (follow-up): *[Tick 1 option only]*  
0  Asymptomatic  
1  Non-disabling symptoms no interference with lifestyle  
2  Minor disability some restriction in lifestyle but does not interfere with patient's capacity to look after self  
3  Moderate disability symptoms significantly interfere with lifestyle or prevent totally independent existence  
4  Moderately severe symptoms prevent independent existence but patient does not need attention 24hrs  
5  Severely disabled totally dependent day and night
- 20.5 What drug therapy is the patient on post-operatively? *[Select at least 1 option]*  
Anti-platelet/thrombotic  Statin  Beta-blockers  *[If NOT Anti-platelet/thrombotic, go to 21.1]*
- 20.5a If answered *Anti-platelet/thrombotic* to 20.5, specify drug(s): *[Select at least 1 option] [If NOT Other, go to 21.1]*  
Aspirin  Clopidogrel  Dipyridamole  Warfarin  Other
- 20.5b If answered *Other* to 20.5a, specify: \_\_\_\_\_

## Section 21: Phase 2 Data entry

- 21.1 Who completed Phase 2? *[Tick 1 option only]*  
Surgeon  Specialist Registrar (surgical)  Basic surgical trainee  Nurse   
Audit personnel  Radiologist  Specialist Registrar (radiological)  Other   
*[If NOT Other, ignore 21.1a]*
- 21.1a If answered *Other* to 21.1, please specify: \_\_\_\_\_

### Appendix 3: Table of Participation

Country	Region	Trust name	Consultant Name
England	East Midlands	Derby Hospitals NHS Foundation Trust	Mr Kumar Abayasekara
			Mr Amir El-Tahir
			Mr Sreevalsan Kappadath
			Mr Muthu Lingam
			Mr John Quarmby
			Mr Timothy Rowlands
		Kettering General Hospital NHS Foundation Trust	Mr Salem Al-Hamali
			Mr Avtar Brar
		Northampton General Hospital NHS Trust	Mr Vijay Bahal
			Mr Avtar Brar
			Mr Robert Hicks
			Mr Sreevalsan Kappadath
			Mr Gabor Libertiny
			Mr David Ratliff
		Nottingham University Hospitals NHS Trust	Mr Bruce Braithwaite
			Mrs Sadhana Chandrasekar
			Mr Shane MacSweeney
			Mr Akin Oluwole
			Mr William Tennant
		Sherwood Forest Hospitals NHS Foundation Trust	Mr Irfan Akhtar
			Mr Rakesh Kapur
			Mr Khalid Makhdoomi
		United Lincolnshire Hospitals NHS Trust	Mr Nityanand Arya
			Mr Paul Dunning
			Mr Peter Lee Chong
			Mr Jayarama Mohan
		University Hospitals of Leicester NHS Trust	Mr Matthew Bown
			Professor Nick London
			Mr Mark McCarthy
			Mr Akhtar Nasim
			Professor Ross Naylor
			Mr Robert Sayers
	East of England	Basildon and Thurrock University Hospital NHS Foundation Trust	Mr Vijay Gadhvi
			Mr Taleb Jeddy
			Mr Jay Menon
		Bedford Hospital NHS Trust	Mr Arindam Chaudhuri
			Mr Tapan Mehta
			Mr Nadim Noor
			Mr Paul Tisi
		Cambridge University Hospitals NHS Foundation Trust	Mr Jonathan Boyle
			Mr Patrick Coughlin
			Mr Michael Gaunt
			Mr Manj Gohel
			Mr Paul Hayes
			Mr Peter Kirkpatrick
			Mr Kevin Varty
		Colchester Hospital University NHS Foundation Trust	Mr Abdusalam Abu-Own
			Mr Chris Backhouse

Country	Region	Trust name	Consultant Name
			Mr Sohail Chosky
			Mr Adam Howard
			Mr Isam Osman
		East and North Hertfordshire NHS Trust	Mr Shah Md Golam Kibria
			Mr Matt Metcalfe
			Mr Sadasivam Selvakumar
		Ipswich Hospital NHS Trust	Mr Abdusalam Abu-Own
			Mr Isam Osman
			Mr Fahed Youssef
		Mid Essex Hospital Services NHS Trust	Mr Tom Browne
			Mr Ioannis Panayiotopoulos
			Mr Ioannis Prionidis
		Norfolk and Norwich University Hospitals NHS Foundation Trust	Mr Matthew Armon
			Mr Rob Brightwell
			Mr James Clarke
			Miss Felicity Meyer
			Mr Darren Morrow
			Miss Yvonne Wilson
		Peterborough and Stamford Hospitals NHS Foundation Trust	Mr Brandon Krijgsman
			Mr John Kuriakose
			Mr Peter Taylor
		Princess Alexandra Hospital NHS Trust	Mr Ahmed Abidia
			Mr Jonathan Refson
		Southend University Hospital NHS Foundation Trust	Mr James Brown
			Mr Matthew Jakeways
		West Hertfordshire Hospitals NHS Trust	Mr Tahir Bhatti
			Mr Mustapha Halawa
			Mr Sanjeev Sarin
	London	Barking, Havering And Redbridge University Hospitals NHS Trust	Mr Timothy Cheatle
			Mr Julian Coker
			Mr Sabu Jacob
			Mr Gabriel Sayer
			Mr Shukri Shami
			Mr Raghu Vindlacheruvu
		Barnet and Chase Farm Hospitals NHS Trust	Mr Hamish Hamilton
			Mr Nicholas Law
		Barts Health NHS Trust	Professor Karim Brohi
			Mr James Crinnion
			Mr Harpaul Flora
			Mr Vijay Gadhvi
			Mr Martin Griffiths
			Mr Constantinos Kyriakides
			Mr Wayne Sapsford
			Mr Nigel Tai
			Mr Michael Walsh
		Guy's and St Thomas' Hospital NHS Foundation Trust	Miss Rachel Bell
			Mr Tom Carrell
			Mr Bijan Modarai
			Mr Peter Taylor

Country	Region	Trust name	Consultant Name
			Mr Mark Tyrrell
			Mr Hany Zayed
		Imperial College Healthcare NHS Trust	Mr Colin Bicknell
			Professor Nicholas Cheshire
			Professor Saroj Das
			Professor Alun Davies
			Mr Ian Franklin
			Mr George Geroulakos
			Mr Richard Gibbs
			Mr Michael Jenkins
			Mr Morgan McMonagle
			Mr Maziar Mireskandari
			Professor Nigel Standfield
			Mr John Wolfe
		King's College Hospital NHS Foundation Trust	Mr Michael Dialynas
			Mr Andrew McIrvine
			Mr Hisham Rashid
			Mr Mark Tyrrell
			Mr Domenico Valenti
		Lewisham Healthcare NHS Trust	Mr Edmund Chaloner
			Mr Aaron B J Sweeney
		North West London Hospitals NHS Trust	Professor Saroj Das
			Mr George Geroulakos
			Mr David Greenstein
			Mr Syed Tahir Hussain
			Miss Sophie Renton
		Royal Free Hampstead NHS Trust	Mr Daryll Baker
			Mr Richard Bird
			Miss Meryl Davis
			Mr Hamish Hamilton
			Mr Alexander Loh
			Miss Fiona Myint
			Miss Janice Tsui
			Mr Alan Wilson
		St George's Healthcare NHS Trust	Mr Stephen Black
			Mr Josh Derodra
			Mr Robert Hinchliffe
			Mr Keith Jones
			Mr Ian Loftus
			Mr Tom Loosemore
			Mr Sudip Ray
			Professor Matt Thompson
		University College London Hospitals NHS Foundation Trust	Mr Obiekezie Agu
			Mr Christopher Bishop
			Professor Peter Harris
			Mr Toby Richards
	North East	City Hospitals Sunderland NHS Foundation Trust	Mr Ben Banerjee
			Mr Andrew Brown
			Mr Paul Dunlop
			Mr Klaus Overbeck
			Mr Shanmugam Vetrivel

Country	Region	Trust name	Consultant Name
		County Durham and Darlington NHS Foundation Trust	Mr Nigel Corner
			Mr Philip Davey
			Mr Ian Hawthorn
			Mr Gareth Tervit
		Gateshead Health NHS Foundation Trust	Mr Hamdy Ashour
			Mr Vish Bhattacharya
			Mr Ahmed Mudawi
		Newcastle upon Tyne Hospitals NHS Foundation Trust	Mr Michael Clarke
			Mr Sreevalsan Kappadath
			Mr David Lambert
			Mr Tim Lees
			Professor Gerard Stansby
			Ms Lucy Wales
			Mr Michael Wyatt
		South Tees Hospitals NHS Foundation Trust	Miss Monica Hansrani
			Mr Reza Mofidi
			Mr Kurian Mylankal
			Mr Ian Nichol
			Mr Andrew Parry
	North West	Aintree University Hospitals NHS Foundation Trust	Mr Jos Joseph
			Mr Jonathan Smout
			Mr Francesco Torella
		Bolton NHS Foundation Trust	Mr Graeme H Ferguson
			Mr Madu Onwudike
		Central Manchester University Hospitals NHS Foundation Trust	Mr David Murray
			Mr Ferdinand Serracino-Inglott
			Mr John Smyth
		Countess of Chester Hospital NHS Foundation Trust	Mr Sameh Dimitri
			Mr Maher Hamish
		East Lancashire Hospitals NHS Trust	Mr Haytham Al-Khaffaf
			Mr Simon Hardy
			Mr Asad Rahi
			Mr Robert Salaman
		Lancashire Teaching Hospitals NHS Foundation Trust	Miss Susan Drinkwater
			Mr Anselm Egun
			Mr George Thomson
		Mid Cheshire Hospitals NHS Foundation Trust	Mr Magdi Hanafy
		North Cumbria University Hospitals NHS Trust	Mr Thomas Joseph
			Mr Theophilus Ojimba
		Pennine Acute Hospitals NHS Trust	Mr Nile Allaf
			Mr Matthew Hadfield
			Mr Riza Ibrahim
			Mr Manmohan Madan
			Mr Taohid Oshodi
			Mr Graham Riding
			Mr Raashid Shahbazi
			Mr Gerard Williams
		Royal Liverpool and Broadgreen University Hospitals NHS Trust	Mr John Brennan
			Mr Robert Fisher



Country	Region	Trust name	Consultant Name
			Mr David Jones
			Mr Jagjeeth Naik
			Mr Jonathan Smout
			Mr Rao Vallabhaneni
		Southport and Ormskirk Hospital NHS Trust	Mr David Jones
		Tameside Hospital NHS Foundation Trust	Mr Leszek Wolowczyk
		University Hospital of South Manchester NHS Foundation Trust	Professor Mohamed Baguneid
			Mr Jonathan Ghosh
			Professor Charles McCollum
			Mr Mark Welch
		University Hospitals Of Morecambe Bay NHS Foundation Trust	Mr John Abraham
			Mr Moatasiem Bukhari
			Mr John Calvey
			Mr Mark Tomlinson
			Mr Paul Wilson
		Warrington and Halton Hospitals NHS Foundation Trust	Mr Andrew Paul Moody
			Mr Thomas Nicholas
			Mr Oladeji Olojugba
			Mr Nee Teo
		Wirral University Teaching Hospital NHS Foundation Trust	Mr Stephen Blair
			Mr Colin Chan
			Mr Ramasubramanyan Chandrasekar
			Mr Leith Williams
		Wrightington, Wigan And Leigh NHS Foundation Trust	Mr Mohideen Jameel
			Mr John Mosley
			Mr Ramanathan Shivalingam
	South Central	Buckinghamshire Hospitals NHS Trust	Mr Patrick Lintott
			Mr Andrew Northeast
		Milton Keynes Hospital NHS Foundation Trust	Miss Debbie Phillips
			Mr Simon Ray-Chaudhuri
		Oxford University Hospitals NHS Trust	Mr Christopher Darby
			Professor Alison Halliday
			Mr Ashok Handa
			Miss Linda Hands
			Mr Jeremy Perkins
		Portsmouth Hospitals NHS Trust	Mr Andras Palffy
			Mr Simon Payne
			Mr Mark Pemberton
		University Hospital Southampton NHS Foundation Trust	Mr Stephen Baxter
			Mr Gareth Morris
			Mr Kurian Mylankal
			Mr Mike Phillips
			Professor Cliff Shearman
			Mr Nicholas Wilson
	South East Coast	Ashford And St Peter's Hospitals NHS Foundation Trust	Mr Tahir Ali
			Mr Neil Browning
			Mr Marcus Cleanthis
			Mr Kieran Dawson

Country	Region	Trust name	Consultant Name
		Brighton and Sussex University Hospitals NHS Trust	Mr Michael Brooks
			Mr Matthew Button
			Mr Mario Caruana
			Mr Karim El Sakka
			Mr Mahmoud Salman
			Mr Syed Yusuf
		Dartford and Gravesham NHS Trust	Mr Andrew McIrvine
		East Kent Hospitals University NHS Foundation Trust	Mr Robert Insall
			Mr Thomas Rix
			Mr Jawaharlal Senaratne
		East Sussex Healthcare NHS Trust	Mr George Evans
		Frimley Park Hospital NHS Foundation Trust	Mr Patrick Chong
			Mr David Gerrard
			Mr Peter Leopold
			Ms Catharine McGuinness
			Mr Peter Rutter
			Ms Sabine Sonnenberg
			Mr Richard Wilson
		Maidstone and Tunbridge Wells NHS Trust	Mr Mark Tyrrell
		Medway NHS Foundation Trust	Mr Samuel Andrews
			Miss Ginny Bowbrick
			Mr Waleed Edrees
		Surrey and Sussex Healthcare NHS Trust	Mr Nicholas Hopkins
		Western Sussex Hospitals NHS Trust	Mr David Beattie
			Mr Hany Hafez
	South West	Dorset County Hospital NHS Foundation Trust	Mr Nicolas Lagattolla
			Mr Robin Windhaber
		Gloucestershire Hospitals NHS Foundation Trust	Mr Richard Bulbulia
			Mr David Cooper
			Mr Jonothan Earnshaw
			Mr Nick Matharu
			Mr Keith Poskitt
			Miss Caroline Rodd
			Mr Mark Whyman
		Great Western Hospitals NHS Foundation Trust	Mr Ravinder Singh Ranger
		North Bristol NHS Trust	Mr Antony Baker
			Mr David Mitchell
			Mr Bill Neary
			Mr Andrew Weale
		Northern Devon Healthcare NHS Trust	Mr John V Taylor
			Mr David Williams
		Plymouth Hospitals NHS Trust	Mr Simon Ashley
			Mr Jamie Barwell
			Mr Francis Dix
			Surg Cdr Cris Parry
		Royal Bournemouth and Christchurch Hospitals NHS Foundation Trust	Mr Christopher Lee
			Mr Dynesh Rittoo
			Mr Lasantha Wijesinghe
		Royal Cornwall Hospitals NHS Trust	Mr Jonathan Davies
			Mr Damian Kelleher
			Mr Graham Riding

Country	Region	Trust name	Consultant Name
			Mr Kenneth Woodburn
		Royal Devon and Exeter NHS Foundation Trust	Mr David Birchley
			Mr Andrew Robert Cowan
	West Midlands		Mr John F Thompson
		Royal United Hospital Bath NHS Trust	Mr John Budd
			Professor Michael Horrocks
			Mr Mahesh Pai
			Ms Rebecca Winterborn
		Salisbury NHS Foundation Trust	Mr Saboor Ghauri
			Miss Sarah Hulin
			Mr Charles Ranaboldo
		South Devon Healthcare NHS Foundation Trust	Mr Ian Currie
			Mr Robert McCarthy
		Taunton and Somerset NHS Foundation Trust	Mr John Chester
			Mr Paul Eyers
			Mr Ian Hunter
			Mr Andrew Stewart
			Mr John V Taylor
			Mr David Williams
		University Hospitals of Bristol NHS Foundation Trust	Mr Marcus Brooks
			Mr Peter Lamont
			Mr Frank Smith
		Dudley Group of Hospitals NHS Trust	Mr Simon Hobbs
			Mr Ajantha Jayatunga
			Mr Zahid Khan
			Mr Rajiv Pathak
			Mr Atiq-Ur Rehman
			Miss Sandhya Shiralkar
		Heart of England NHS Foundation Trust	Mr Donald Adam
			Professor Andrew Bradbury
			Mr Martin Claridge
			Mr Mark Gannon
			Mr Harmeet Khaira
			Mr Mark Scriven
			Mr Antonius Wilmink
		Mid Staffordshire NHS Foundation Trust	Mr Brian Gwynn
		Royal Wolverhampton Hospitals NHS Trust	Mr Lionello Coen
			Mr Teodor Gardecki
			Mr Andrew Garnham
			Mr Simon Hobbs
		Sandwell and West Birmingham Hospitals NHS Trust	Mr Philip Thomas Nicholl
			Mr Saurabh Rai
			Mrs Rachel Sam
			Mr Stanley Silverman
		Shrewsbury & Telford Hospital NHS Trust	Mr Arun Balakrishnan
			Mr Robert Duffield
			Mr Antony Fox
			Mr Andrew Houghton
			Ms Catherine Merriman
			Mr Timothy Sykes
		University Hospital of North Staffordshire NHS Trust	Mr Omer Ehsan

Country	Region	Trust name	Consultant Name
			Mr Jack Fairhead
			Mr Richard Morgan
			Mr Laszlo Papp
			Mr Arun Pherwani
			Mr Julian Wong
		University Hospitals Birmingham NHS Foundation Trust	Mr Allen Edwards
			Mrs Rachel Sam
			Mr Malcolm Simms
			Mr Alok Tiwari
			Mr Rajiv Vohra
		University Hospitals Coventry and Warwickshire NHS Trust	Mr Daniel Higman
			Professor Chris Imray
			Mr Asif Mahmood
			Miss Colette Marshall
		Walsall Hospitals NHS Trust	Mr Zahid Khan
		Worcestershire Acute Hospitals NHS Trust	Mr Amarjit Atwal
			Mr Eric Grocott
			Mr Nicholas Hickey
			Mr Isaac Nyamekye
	Yorkshire and The Humber	Bradford Teaching Hospitals NHS Foundation Trust	Mr Kevin Mercer
			Mr Kevin Molloy
			Mr Nicholas Shaper
			Professor Peter Vowden
			Mr David Wilkinson
		Calderdale and Huddersfield NHS Foundation Trust	Mr Neeraj Bhasin
			Mr Duncan Parry
			Mr Narinder Sharma
		Doncaster and Bassetlaw Hospitals NHS Foundation Trust	Mr Duncan Drury
			Mr Nandan Haldipur
			Mr Jan Macierewicz
			Mr Woolagasen Pillay
			Mr Sewa Singh
			Mr Peter Tan
		Hull and East Yorkshire Hospitals NHS Trust	Mr Bankole Akomolafe
			Professor Ian Chetter
			Mr Brian Johnson
			Mr Rakesh Kapur
			Professor Peter McCollum
			Mr Paul Renwick
		Leeds Teaching Hospitals NHS Trust	Mr David Berridge
			Professor Michael Gough
			Mr David Russell
			Professor Julian Scott
			Mr Max Troxler
		Mid Yorkshire Hospitals NHS Trust	Mr Sathish Bhasker
			Mr Paul Curley
			Mr Jon Hossain
			Mr Craig Irvine
		Sheffield Teaching Hospitals NHS Foundation Trust	Professor Jonathan Beard
			Mr Peter Dominic Dodd

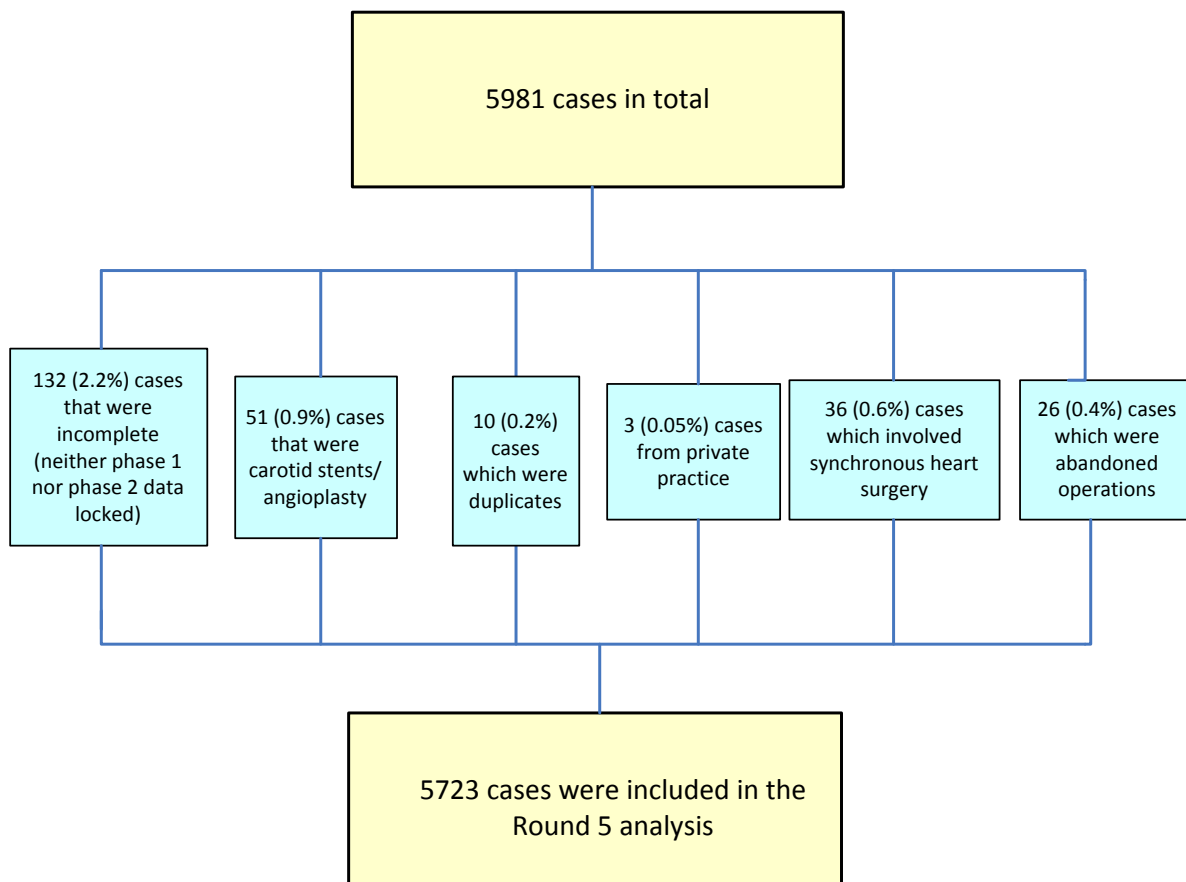
Country	Region	Trust name	Consultant Name
			Mr Robert Lonsdale
			Mr Ed Mulkern
			Mr Raj Nair
			Mr Ahmed Nassef
			Mr Shah Nawaz
		York Teaching Hospital NHS Foundation Trust	Mr Marco Baroni
			Mr Stephen Cavanagh
			Mr Alistair McCleary
			Mr Andrew Thompson
<b>Northern Ireland</b>	Eastern Health and Social Services Board	Belfast Health and Social Care Trust	Mr Robin Baker
			Mr Paul Blair
			Mr Raymond Hannon
			Mr Denis Harkin
			Mr Louis Lau
			Mr Bernard Lee
			Mr Andrew McKinley
			Miss Julie Reid
	Southern Health and Social Services Board	Southern Health and Social Care Trust	Mr Alastair Lewis
			Mr Colin Weir
	Western Health and Social Care Board	Western Health and Social Care Trust	Mr Ken McCune
			Mr Zola Mzimba
<b>Scotland</b>	NHS Ayrshire and Arran	NHS Ayrshire & Arran	Mr Steven Boom
	NHS Dumfries and Galloway	NHS Dumfries and Galloway	Mr Barun Majumder
			Mr Joseph Sathianathan
	NHS Fife	NHS Fife	Mr Alan Milne
			Ms Ruth Tootill
	NHS Forth Valley	NHS Forth Valley	Mr Richard Holdsworth
			Ms Karen Murphy
			Mr Michael Yapanis
	NHS Grampian	NHS Grampian	Mr Paul Bachoo
			Professor Julie Brittenden
			Mr Euan Munro
			Mr Michael Sharp
			Mr Andrew Tambyraja
	NHS Greater Glasgow and Clyde	NHS Greater Glasgow and Clyde	Mr Kevin Daly
			Mr David Kingsmore
			Mr Douglas Orr
	NHS Highland	NHS Highland	Mr Bernhard Wolf
	NHS Lanarkshire	NHS Lanarkshire	Mr Donald Bain
			Mr Roy Scott
	NHS Lothian	NHS Lothian	Mr Paul John Burns
			Mr Roderick Chalmers
			Mr Raymond Dawson
			Mr Simon Fraser
			Mr Dave Lewis
			Mr Zahid Raza
			Mr Andrew Tambyraja
	NHS Tayside	NHS Tayside	Mr Murray Flett
			Mr Gareth Griffiths
			Mr Alan Milne

<b>Country</b>	<b>Region</b>	<b>Trust name</b>	<b>Consultant Name</b>
			Mr Janos Nagy
<b>Wales</b>	Abertawe Bro Morgannwg University Health Board	Abertawe Bro Morgannwg University Health Board	Mr Marek Blaszczyński
			Mr Chris Davies
			Mr Louis Fligelstone
			Mr Richard Hedges
			Mr Angus Ruddle
			Mr Justin Woolgar
	Aneurin Bevan Health Board	Aneurin Bevan Health Board	Mr Richard Blackett
			Mr Peter Lewis
			Mr David McLain
			Mr Ahmed Shandall
	Betsi Cadwaladr University Health Board	Betsi Cadwaladr University Health Board	Mr Tony daSilva
			Miss Ursula Kirkpatrick
			Mr Otto Klimach
			Mr Dean Williams
	Cwm Taf University Health Board	Cwm Taf University Health Board	Mr Kevin Conway
			Mr Michael Rocker

## Appendix 4: Data Cleaning Process

### FLOW CHART OF DATA CLEANING PROCESSES

Round 5 data were collected over a period of one year and three months, from 1<sup>st</sup> October 2011 to end of 31<sup>st</sup> December 2012. A total of Round 5 cases had been submitted to the audit. Four percent of these cases (258) are not included for analysis; they were set aside by the following selection process:



Only carotid endarterectomy cases (n=5723) meeting these minimum criteria were included in the analyses

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