London Ambulance Service NHS Trust

Stroke Annual Report: 2015/16

November 2016

Produced by:

Gurkamal Virdi, Milda Rose, Scott Picton, Rachael Fothergill and Neil Thomson

✉ CARU.Enquiries@lond-amb.nhs.uk

Clinical Audit and Research Unit, Clinical and Quality Directorate, London Ambulance Service NHS Trust, 8-20 Pocock Street, London, SE1 0BW.

Contents

Key Findings

- In 2015-16, the LAS attended 12,251 patients who presented with symptoms of stroke as identified by the Face, Arm and Speech Test (FAST).
- Just over half of patients were women (52%).
- The average age was 71 years.
- The median response time for all stroke patients was 10 minutes.
- The median on-scene time was 32 minutes.
- Nearly all patients (97%) received a pre-hospital stroke care bundle consisting of a complete FAST, blood glucose measurement and blood pressure assessment.
- The majority of patients (91%) either had the stroke symptom onset time recorded or documentation that the time of onset could not be established.
- LAS staff demonstrated excellent compliance with the stroke pathway with 99% of stroke patients conveyed to the most appropriate destination for their condition.
- The median journey to hospital time was 15 minutes, which is well within the 30 minute target set by the stroke network in London.

1. Introduction

The London Ambulance Service NHS Trust (LAS) attended 12,251 patients between the 1st April 2015 and 31st March 2016 who presented with symptoms of stroke as identified by the Face, Arm and Speech Test (FAST). Stroke patients must receive a prompt response, and following a face-to-face assessment, rapid transportation to one of eight specialist hyper-acute stroke units (HASUs) in London.

As part of the on-scene assessment, LAS staff will provide the essential elements of pre-hospital care for suspected stroke patients consists of performing the FAST, and measuring the blood pressure and blood glucose. Together, they constitute a pre-hospital stroke 'care bundle'. In some instances there might be clinically justifiable reasons (such as patient refusal) why the full care bundle could not be provided and these will always be considered when the quality of patient care is assessed. The stroke care bundle is one of the NHS England mandated Ambulance Quality Indicators (AQIs) designed to measure and compare the quality of care provided by ambulance services across the country. In addition, staff must also establish the time of onset of stroke symptoms as this will help determining the continuing care delivered at hospital.

The exact treatment given at a HASU depends on the cause of the stroke and onset of symptom time. A stroke due to a blood clot can be treated with thrombolytic agents that dissolve the clot and restore blood flow to the brain. Thrombolysis is most effective when administered within 4.5 hours from the onset of stroke symptoms, with the benefits of therapy decreasing over time and the potential risk of harm increasing [1]. As such, a pre-alert call is placed for patients whose symptoms fall within this 4.5 hour 'window' to expedite their care on arrival at the HASU. Patients, whose symptoms are older than 4.5 hours, are transported under normal driving conditions. Even though these patients may no longer be eligible for some types of acute treatment, HASUs provide specialised stroke care and rehabilitation, including access to advanced radiology facilities, specialist stroke nursing, speech and occupational therapies. The evidence suggests that the London Stroke model reduces morbidity and mortality and is cost-effective [2].

This report presents information relating to the demographics of these patients, our clinical and operational performance and the use of specialist pathways available for those patients. Clinical data in this report is sourced from the LAS Patient Report Forms (PRFs), with data relating to response times taken from the Emergency Operations Centre (EOC) Call Log and the vehicle Mobile Data Terminals (MDTs).

A glossary of abbreviations and terms are included on page 10 for readers unfamiliar with the medical or operational terminology used in the ambulance service. Appendix 1 presents data for the three years previous to enable comparisons.

2. Findings

2.1. Patient demographics

Gender	n (%)
Male	5,878 (48.0%)
Female	6,373 (52.0%)

Age[2]	mean (range) in years
All patients	71 (16-110)
Male	69 (16-106)
Female	73 (16-110)

Race[1]	n (%)
White	7,559 (61.7%)
Mixed	58 (0.5%)
Asian/British Asian	864 (7.1%)
Black/Black British	958 (7.8%)
Other Race Groups	449 (3.7%)
Refused/Unable	1,500 (12.2%)
Not documented	863 (7.0%)

- Just over half of patients were female.
- The average age was 71, although male patients were on average 4 years younger than females.
- Nearly two-thirds of patients attended were of a white race origin.

2.2. Call and response information

Chief Complaint	n (%)
Stroke	5,874 (47.9%)
Unconscious / Fainting	1,261 (10.3%)
Health Care Professional admission	1,183 (9.7%)
111 transfer	1,094 (8.9%)
Falls	824 (6.7%)
Sick person	356 (2.9%)
Convulsions/fitting	385 (3.1%)
Breathing problems	339 (2.8%)
Chest pain	272 (2.2%)
Diabetic problems	80 (0.7%)
Other	583 (4.8%)

[1] Due to the condition of stroke patients, definite race information is not always possible to obtain and therefore this data should be regarded with some caution.
[2] The stroke network in London is designed for patients 16 years and over.

Response Category[3]	n (%)
R1	110 (1.0%)
R2	8,238 (74.4%)
C1	1,383 (12.5%)
C2	929 (8.4%)
C3	281 (2.5%)
C4	127 (1.1%)

999 Call to scene	median (range[4]) in mins
Call connect	10 (0-446)
ORCON	8 (0-443)

- Stroke was recognised as the chief complaint at the 999 call for just under half of patients.
- Patients who were allocated to the stroke chief complaint received a response time of 9 minutes. The response time was 2 minutes longer at 11 minutes for patients who were not identified as experiencing a stroke based on the information provided at the 999 call.
- Three-quarters of calls were categorised as a Red response, with the majority allocated a Red 2 category.
- The overall response time was 10 minutes for all patients when measured from the point at which the 999 call was connected, and 8 minutes when using ORCON definitions (which allows an initial period of time prior to the clock starting in an attempt to establish the chief complaint).

2.3. Patient Assessment

Care Bundle		n (%)
FAST	Assessed or a valid exception	11,974 (97.7%)
	Not assessed	277 (2.3%)
Blood Glucose	Assessed or a valid exception	12,195 (99.5%)
	Not assessed	56 (0.5%)
Blood Pressure	Assessed or a valid exception	12,224 (99.8%)
	Not assessed	27 (0.2%)
Overall	Complete or a valid exception	11,903 (97.2%)
	Not complete	348 (2.8%)

[3]Health Care Professional admissions are excluded from these figures because response timeframes for these patients are determined by the referring clinician.
[4] Zero minute times in the range are due to running calls where a patient/passerby has flagged an ambulance.

Onset of symptoms	n (%)
Symptom onset within 4.5 hours	7,534 (61.5%)
Symptom onset older than 4.5 hours	2,015 (16.4%)
Unknown	2,583 (21.1%)
Not documented	119 (1.0%)

- The majority of patients (97%) received a complete pre-hospital stroke care bundle consisting of FAST, blood glucose measurement and blood pressure assessment.
- The provision of blood glucose assessment, which historically has been the most challenging element of the stroke care bundle, has continued to improve from 96.7% (in 2012-13) to 99.5 % (see Appendix 1).
- The majority of stroke patients (99%) had the onset of symptoms time recorded or it was documented that the onset time could not be determined.

2.4. On-scene times

On scene time[5]	median (range) in mins
From arrival of first attending vehicle to leaving scene	32 (4-255)
From arrival of first ambulance to leaving scene	25 (4-255)

- The overall on-scene time from the arrival of the first vehicle to leaving scene was 32 minutes. However, when measured from arrival of the first ambulance vehicle the on-scene time was 25 minutes. The 7 minute difference can largely be attributed to the time when a first responder was on scene awaiting an ambulance capable of conveying a patient to hospital.

2.5. Conveyance assessment

Destination[6],[7]	n (%)
HASU	12,067 (98.9%)
ED appropriate	74 (0.6%)
ED inappropriate	63 (0.5%)

[5] Non-conveyed patients are excluded from on scene time figures.
[6] This table excludes 43 patients who refused to travel to hospital against the advice of staff.
[7] Four patients were conveyed to a HASU outside the defined stroke network in London and are therefore excluded from the table.

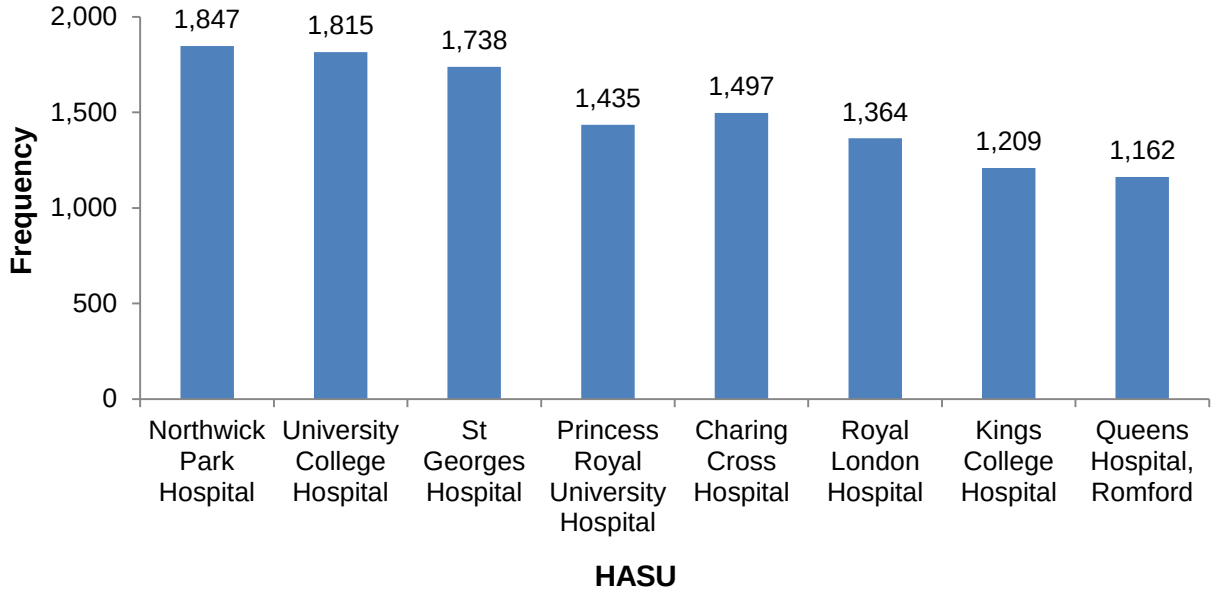

Figure 1: HASU Utilisation

- Almost all stroke patients (99.1%, n=12,141) were conveyed to the most appropriate destination for their condition, in compliance with the London stroke pathway.
- The majority of stroke patients conveyed to a HASU were transported to Northwick Park hospital, closely followed by University College London hospital.
- Of the patients conveyed appropriately to ED (n=74), 43 were clinically unstable or required assessment and intervention for other medical conditions/injuries. A further 8 were determined as suitable for ED conveyance by the Clinical Hub. The remaining 23 patients were conveyed to ED following instructions of a Health Care Professional, who arranged LAS attendance.
- 63 (0.5%) patients were conveyed to an ED when they should have been transported to a HASU as they were FAST positive and feedback was provided to staff regarding their decision.

2.6. Journey times

Journey times	Median (range) in mins
All stroke patients	15 (1-123)
All patients conveyed to HASU	15 (1-123)
Patients with onset of symptoms <4.5 hours conveyed to a HASU	13 (1-111)
All patients conveyed to ED	13 (2-48)

- Overall, the average journey to hospital time for both patients conveyed to a HASU or an ED was 15 minutes.
- Stroke patients, who were potentially eligible for thrombolysis (i.e. the symptoms were less than 4.5 hours old) arrived at a HASU 13 minutes after leaving the scene. This was well within the 30 minute target set by the stroke network in London.

3. Discussion

This report demonstrates that the LAS has continued to provide high quality care to stroke patients, as evidenced by a timely response, comprehensive assessment and excellent compliance with the specialist HASU pathway in London.

This has been achieved against a background of an increase in the number of patients with a suspected stroke; growing by 25% over four years (see Appendix 1). Furthermore, the proportion of stroke patients allocated a Red response has increased from 63% in 2012/13 to 75% in 2015/16. These increases reflect the overall rise in demand for ambulance services. Although it is difficult to establish the reasons behind the increases in the numbers of stroke patients attended by the LAS each year, it is expected that this will be for a multitude of reasons and will in part include: larger volumes of calls to the LAS from 111 providers and referrals from Health Care Professionals (increasing by 8% from 2012/13 - see Appendix 1) as well as greater public awareness of stroke symptoms following Public Health England's 'Act-FAST' media campaign. The increase in Red response calls are also likely to be a result of changes in the categorisation of stroke calls whereby Emergency Medical Dispatchers establish the time of onset as part of the over the phone FAST assessment to ensure patients within the 3.5 hours of symptom onset receive a high priority response.

The percentage of stroke patients, who received a complete pre-hospital care bundle is at a record high of 97%, which reflects the success of initiatives aimed at improving the care bundle provision. In particular, all staff have been provided with personal-issue blood glucose monitoring kits, thus significantly reducing the instances where patients' were not tested due to the equipment not being available to less than 0.5%. As part of the continued education, staff were invited to attend a one- day stroke education event run by the LAS in conjunction with the stroke networks. The event provided a forum to discuss current and future stroke care in London with experts. The significance of the stroke care bundle and the importance of assessing and documenting all elements of the FAST were discussed, alongside a teaching session covering the wider mini-neurological assessment. Furthermore, a multimedia training tool has been made available to staff and educational material promoted, highlighting the need to appropriately assess speech deficits such as aphasia, which can often be overlooked.

Compliance with the stroke pathway by LAS staff is excellent: 99.1% of stroke patients were conveyed to the most appropriate destination for their condition, with the vast majority (98.5%, n=12,067) conveyed directly to a HASU. For patients conveyed to a HASU average journey times were well within the 30 minutes target set by the stroke network in London, with stroke patients reaching a HASU within 15 minutes on average from leaving the scene.

It is recognised that the data collected within the LAS stroke registry is dependent on clinicians identifying the patient as stroke and/or conveying the patient to a HASU and therefore it is not always possible to identify cases that were missed. However, a small proportion of stroke patients (0.5%) were transported to ED when they should have been conveyed to a HASU. The Clinical Audit and Research Unit flag these cases for review by the local Quality, Governance and Assurance Manager. This allows the clinicians involved to discuss the basis of their decision and, where indicated, receive feedback to inform future use of the stroke pathway. Feedback is also shared with voluntary and

private ambulance services contracted to assist the LAS. It is hoped that in the future outcome information from hospitals will better inform the development and use of the pathway, and enable further staff education.

Stroke patients often present with reduced mobility and an element of communication difficulty, which may complicate and prolong assessment and extraction from the scene to the ambulance. The data shows that when the on-scene time is measured from the arrival of the first vehicle (and therefore not including first responders awaiting a conveying vehicle), the median time spent on scene is 25 minutes. The proportion of time that can be attributed to first responders awaiting ambulances capable of conveying the patient to hospital is on average just 7 minutes. The LAS will continue its efforts to encourage staff to try and spend as little time as possible on-scene to enable stroke patients to reach definitive treatment and minimise neurological damage. A one minute video has been developed to reinforce the message that 'Time is Brain' and this will be released to staff via the LAS intranet and staff Facebook page.

The LAS remains committed to developing and improving stroke services in London. We are currently represented on Intercollegiate Guideline Development Groups for stroke in adults (Royal College of Physicians) and children (Royal College of Paediatrics and Child Health). In line with the evolving evidence on the role of interventional neuroradiology for thrombectomy (clot extraction), the LAS is in discussions with the London HASUs around how we will support network arrangements and potentially identify suitable patients early on.

In conclusion, this report demonstrates that the stroke pathway in London has been consolidated into clinical practice and that LAS staff should feel proud of the high quality care that they have continued to provide for stroke patients.

References

1. Hacke W, Kaste M, Bluhmki E, Brozman M, Dávalos A, Guidetti D, et al. Thrombolysis with alteplase 3 to 4.5 hours after acute ischemic stroke. *N Engl J Med*. 2008 Sep 25. 359(13):1317-29.

2. Hunter R, Davie C, Rudd A, Thompson A, Walker H, Thomson N, et al. Impact on Clinical and Cost Outcomes of a Centralized Approach to Acute Stroke Care in London: A Comparative Effectiveness Before and After Model. *PLoS ONE.* 2013 Aug 1. 8(8):e70420. doi: 10.1371.

Glossary for abbreviations and terms

Blood glucose (BM) – Blood glucose molarity is a measure of a patients' blood glucose level.

Blood pressure (BP) – Blood pressure measured in systolic and diastolic units.

Call to Hospital Time – The overall time taken from the initial 999 emergency call to the arrival of the patient at hospital.

Call to Scene Time – The overall time taken from the initial 999 emergency call to the arrival of a response to the patient.

Category C – Calls which are not deemed immediately life-threatening (based on the information given by the caller regarding the patient's condition) are classed as Category C. Some patients subsequently diagnosed with a stroke receive this response, primarily where the patient has not reported any FAST symptoms or where other medical conditions were reported instead (e.g. collapse/ not alert).

Computerised Tomography (CT) – A cross-sectional, three-dimensional picture of internal organs made by combining multiple x-ray images. HASUs to identify where in the brain the suspected stroke is occurring, how old it is, and how best it should be treated.

Emergency Operations Centre (EOC) – the co-ordinating centre where incoming 999 calls are taken, triaged and subsequent responses dispatched from.

Face, Arm and Speech Test (FAST) – A diagnostic test developed in the UK in 1998 used by ambulance clinicians to help assess and detect the symptoms of a stroke. The FAST assesses for Facial drooping, Arm weakness and Speech difficulties as signs of a stroke. The 'T' can also refer to Time to emphasise the importance of rapid assessment and treatment. If a patient presents with one or more of these features they are known as FAST positive (in this report these patients are referred to as stroke patients).

First responder – A solo resource dispatched to immediately life-threatening calls to ensure that the patient begins to receive care as quickly as possible prior to the arrival of an ambulance.

Hyper Acute Stroke Unit (HASU) – Specialist centres which patients suffering a stroke are taken directly to for rapid assessment and treatment.

Mobile Data Terminal (MDT) – The device used by clinical staff to receive incoming call information and navigate to the location.

ORCON – a definition used to determine the clock start time. The ORCON start time allows for an initial period prior to the clock starting in an attempt to establish the chief complaint.

Patient Report Form (PRF) – The document used by the LAS to record all aspects of patient care and treatment.

Red category – Red calls (or category A) are those classed as immediately life-threatening, and should receive a response within 8 minutes of the initial 999 emergency call. The vast majority of patients diagnosed with a stroke receive a Red response.

Stroke network – the clinical network responsible for overseeing the stroke services delivered to patients.

Time of Onset – The potential time that the stroke occurred based on information available from patients and others. Where a time cannot be established the last time the patient was seen is used as an alternative to help assist ambulance staff with decisions regarding rapid conveyance to HASU.

Thrombolysis – A form of treatment in which a drug that breaks down blood clots is used in an attempt to un-block the artery leading to the area of brain affected by the stroke. Also known as “clot busting” it carries a number of risks and is only used in a small number of patients where the benefit outweighs the risk.

Thrombectomy – Also known as mechanical thrombectomy or interventional neuroradiology. This is a procedure in which the clot causing the stroke is removed directly using a device inserted into the artery under x-ray guidance

Appendix 1: Comparisons to previous years (2012-2015)

Demographics		2012-13	2013-14	2014-15	2015-16
Number of patients		9,814	10,474	11,183	12,251
Gender* n (%)	Male	4,640 (47.3%)	5,132 (49.0%)	5,277 (47.2%)	5,878 (48.0%)
	Female	5,174 (52.7%)	5,340 (51.0%)	5,906 (52.8%)	6,373 (52.0%)
Mean Age (range)**	All patients	72 (18-107)	71 (18-105)	71 (16-104)	71 (16-110)
	Male	70 (18-103)	69 (18-103)	70 (16-104)	69 (16-106)
	Female	74 (18-107)	73 (18-105)	73 (16-103)	73 (16-110)

* Data excludes 2 cases from 2013-14 where gender was not documented.

** The HASU pathway in London for FAST positive patients was available for over 18's only until 2014-15 when the pathway became available for patients over 16 years of age.

Chief complaint	2012-13	2013-14˜	2014-15	2015-16
Stroke	5,451 (55.5%)	5,355 (51.1%)	5,665 (50.7%)	5,874 (47.9%)
Unconscious/fainting	805 (8.2%)	874 (8.3%)	1,010 (9.0%)	1,261 (10.3%)
Chest pain	210 (2.1%)	218 (2.1%)	234 (2.1%)	272 (2.2%)
Breathing problems	217 (2.2%)	266 (2.5%)	332 (3.0%)	339 (2.8%)
Convulsions/fitting	273 (2.8%)	323 (3.1%)	373 (3.3%)	385 (3.1%)
Sick person (specific diagnosis)	591 (6.0%)	473 (4.5%)	378 (3.4%)	356 (2.9%)
Falls	654 (6.7%)	715 (6.8%)	728 (6.5%)	824 (6.7%)
Diabetic problems	83 (0.8%)	103 (1.0%)	87 (0.8%)	80 (0.7%)
111 transfer	153 (1.6%)	770 (7.4%)	878 (7.8%)	1,094 (8.9%)
Health Care Professional admission	899 (9.2%)	883 (8.4%)	981 (8.8%)	1,183 (9.7%)
Other	478 (4.9%)	494 (4.7%)	517 (4.6%)	583 (4.8%)

˜ Percentages do not equal 100% due to rounding.

Response information		2012-13	2013-14	2014-15	2015-16
Category■# n (%)	Red calls	5,635 (63.2%)	6,479 (67.6%)	7,479 (73.3%)	8,348 (75.4%)
	Category C calls	3,279 (36.8%)	3,111 (32.4%)	2,723 (26.7%)	2,720 (24.6%)
Median 999 Call to scene^■ (range)	Overall	8 (0-246)	8 (0-282)	10 (0-570)	10 (0-446)
Median On- Scene£ (range)	From arrival of first attending vehicle	31 (4-139)	31 (7-175)	32 (3-261)	32 (4-255)
	From arrival of first ambulance	26 (0-139)	25 (2-175)	25 (2-261)	25 (4-255)

■ Health Care Professional Admissions are excluded from category and response time figures because the timeframe is specified by the clinician making the referral.

Data excludes cases where the category given to the call was unavailable (1 case in 2012-13 and 1 case in 2013-14).

^ Zero minute times in the range are due to running calls where a patient/passerby has flagged an ambulance.

£ Non-conveyed patients are excluded from on scene time figures.

Assessment		2012-13	2013-14	2014-15	2015-16
Complete FAST	Assessed or a valid exception documented	9,529 (97.1%)	10,211 (97.5%)	10,905 (97.5%)	11,974 (97.7%)
	Not assessed	285 (2.9%)	263 (2.5%)	278 (2.5%)	277 (2.3%)
Blood Glucose	Assessed or a valid exception documented	9,495 (96.7%)	10,217 (97.5%)	11,111 (99.4%)	12,195 (99.5%)
	Not assessed	319 (3.3%)	257 (2.5%)	72 (0.6%)	56 (0.5%)
Blood Pressure	Assessed or a valid exception documented	9,800 (99.9%)	10,460 (99.9)	11,163 (99.8%)	12,224 (99.8%)
	Not assessed	14 (0.1%)	14 (0.1%)	20 (0.2%)	27 (0.2%)
Care Bundle	Complete or a valid exception documented	9,211 (93.9%)	9,950 (95.0%)	10,816 (96.7%)	11,903 (97.2%)
	Not complete	603 (6.1%)	524 (5.0%)	367 (3.3%)	348 (2.8%)

Conveyance		2012-13□	2013-14	2014-15~	2015-16
Patients conveyed to hospital$◊		9,765	10,427	11,149	12,204
HASU	Appropriate destination	9,442 (96.7%)	10,273 (98.5%)	10,991 (98.6%)	12,067 (98.5%)
ED	Appropriate destination	184 (1.9%)	106 (1.0%)	63 (0.6%)	74 (0.6%)
	Inappropriate destination	139 (1.4%)	48 (0.5%)	95 (0.9%)	63 (0.5%)

$ 120 cases patients refused transport to hospital (41 from 2012-13, 46 from 2013-14 and 33 from 2014-15) and are excluded from the table.

◊ 7 patients conveyed to a non-London site with HASU/ ASU facilities are excluded from the table (5 in 2012-13, 1 from 2013-14 and 1 in 2014-15)

□ In 2012-13, 3 cases were excluded from the table as it was unclear as to whether the patient was conveyed to a HASU or ED.

~ Percentages do not equal 100% due to rounding.

HASU utilisation	2012-13	2013-14	2014-15	2015-16
Northwick Park Hospital	1,516 (16.1%)	1,518 (14.8%)	1,720 (15.7%)	1,847 (15.3%)
University College Hospital	1,502 (15.9%)	1,633 (15.9%)	1,677 (15.3%)	1,815 (15.0%)
St Georges Hospital	1,258 (13.3%)	1,412 (13.7%)	1,613 (14.7%)	1,738 (14.4%)
Princess Royal University Hospital	1,165 (12.3%)	1,280 (12.5%)	1,358 (12.4%)	1,435 (11.9%)
Charing Cross Hospital	1,114 (11.8%)	1,262 (12.3%)	1,270 (11.6%)	1,497 (12.4%)
Kings College Hospital	1,049 (11.1%)	1,101 (10.7%)	1,104 (10.0%)	1.364 (11.3%)
Royal London Hospital	974 (10.3%)	1,135 (11.0%)	1,188 (10.8%)	1,209 (10.0%)
Queens Hospital, Romford	864 (9.2%)	932 (9.1%)	1,060 (9.6%)	1,162 (9.6%)

Median journey times (range)		2012-13	2013-14	2014-15○	2015-16
All stroke patients		14 (1-100)	15 (1-98)	15 (0-134)	15 (1-123)
HASU	All patients conveyed to HASU	15 (1-100)	15 (1-98)	15 (0-134)	15 (1-123)
	Patients with onset of symptoms <4.5 hours	13 (11-78)	14 (1-80)	14 (1-134)	13 (1-111)
ED	All patients conveyed to ED	14 (1-61)	13 (2-45	14 (2-47)	13 (2-48)

○ Zero minute journey time as location of the incident was outside of the hospital.