



Cardiac Arrest Annual Report: 2011/12

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Foreword

“The London Ambulance Service NHS Trust (LAS) has led pre hospital cardiac care developments in the UK for over a decade and during that time we have seen significant developments both in and out-of-hospital. From improvements in training, equipment and treatment, to defibrillators in public places and a new network of Heart Attack Centres across London. All have contributed to improved care and outcomes for patients in cardiac arrest. This cardiac arrest annual report shows what impact our staff, with the support of a range of partners and members of the public, can have in saving lives. Cardiac arrest survival to discharge has long been the gold standard by which ambulance services across the world strive to measure and improve and the introduction of the new national clinical quality indicators over this last year across England will provide a crucial benchmark for our service in this most important area. My thanks to all LAS staff who have contributed to making this remarkable improvement in outcomes for our patients and to the Clinical Audit and Research Unit for a first class report.”

Peter Bradley CBE
CEO LAS/DH National Ambulance Director

“It is with enormous pride that the London Ambulance Service publishes its annual report detailing the survival of patients who have suffered an out-of-hospital cardiac arrest. Since we started collecting data in 1998, we have seen a steady improvement in survival to hospital discharge, with a very marked increase in both our internationally comparable Utstein survival figure, and an increase in overall survival in the year 2011/ 2012.

The reasons for this improvement are multi-factorial. Our Control Room staff identify possible cardiac arrest patients quickly, and crucially initiate dispatch life support, where the caller is unfamiliar with chest compressions. Our front line resources arrive at the patient's side with minimal delay and initiate advanced life support. We have maintained our targets in these areas for many years now. So why the continued rise in survival, particularly in those patients whose arrest is witnessed and who's heart is amenable to an electric shock?

We are doing the basics better; maintaining high quality chest compressions and early defibrillation. We minimise time taken on less evidence based interventions. We stabilise patients before moving them in the early minutes after the heart starts beating again. We are increasingly transferring suitable patients directly to a Heart Attack Centre, and have seen a sustained increase in survival within this subgroup.

We have had great cooperation from those sites with defibrillators, and have continued to work closely with them to support the training of their staff. We have also had amazing support from the Emergency Departments who receive our patients; without their input our efforts would be in vain. They have also worked very hard to feed back data on our patients so we can identify where patients have survived to leave hospital.

All in all this report demonstrates a marked increase in the number of patients who have left hospital after an event which previously was regarded as fatal. This is an achievement of which all our staff, and those who work with us can be very proud.”

Fionna Moore *BSc, FRCS, FRCS(Ed), FCEM, FIMC RCSEd.*
Medical Director LAS

Key findings

- The Utstein survival rate has increased considerably to 31.7% (previously at 22.8% in 2010/11) and the overall survival rate has also increased to 10.9% (up from 8%). These figures are the highest achieved by the LAS to date.
- The survival from crew witnessed arrests has also increased substantially to 58% (Utstein) and 20.8% (Overall).
- There was a large increase in the number of patients conveyed directly to a Heart Attack Centre and the overall survival rate for these patients is 63.3%.
- 80.3% of arrests were believed to be due to a cardiac cause, 5.7% were the result of a trauma, and 14% of patients suffered an arrest that was classified as 'other' non-cardiac cause.
- 47% of all arrests were witnessed (either seen or heard) by a bystander prior to LAS arrival and a further 19% were witnessed by an LAS crew.
- Bystander CPR rates have also improved this year to 41% (from 36.7% in 2010/11).
- Shockable rhythms accounted for approximately a quarter of initial arrest rhythms.
- Rates of asystole, VF/pulseless VT and PEA have remained consistent over the last three years.
- A return of spontaneous circulation (ROSC) was sustained to hospital in nearly a third of patients, an increase of nearly 5% on 2010/11.

1. Introduction

From 1st April 2011 to 31st March 2012, the London Ambulance Service NHS Trust (LAS) responded to a total of 9,657 patients who suffered an out-of-hospital cardiac arrest. This report details the profile of these patients, our response times, the interventions we delivered, and the survival outcomes for those patients who were conveyed to hospital.

During 2011/12, the LAS undertook a number of measures with the aim of improving the outcomes for patients who suffer a cardiac arrest: we ensured that our clinical practice reflects the latest European Resuscitation Council guidelines, we have provided consistency in messages to our staff regarding the management of cardiac arrest patients through cardiac information bulletins and training sessions, and a new pathway has been fully implemented allowing patients who have had a cardiac arrest to be taken to a Heart Attack Centre (HAC) if there is evidence of ST-elevation on a 12 lead ECG indicating potential blockage(s) within the coronary arteries.

The LAS has boosted its programme of public education in basic life saving skills, with the support of the British Heart Foundation (BHF) who have funded additional Resuscitation Training Officers to support our staff. This year, we trained 14,378 members of the public in resuscitation methods as part of the BHF Heartstart campaign and recruited 67 volunteers to deliver training within their community. We continued to support the Saving Londoners Lives campaign which taught life saving techniques to approximately 8,000 school children and teachers during 2011. Additionally, training in cardiopulmonary resuscitation (CPR) and the use of defibrillators has been provided to 8,058 personnel who work at 755 public locations in London. In 2011/12, there were 31 instances where a public access defibrillator was deployed in a public place by trained personnel. Further details regarding these patients and the overall survival rate can be found in Appendix 4.

Since 1998, the LAS has captured clinical, operational and survival information relating to our cardiac arrest patients to enable the monitoring of clinical quality and facilitate improvements and developments in cardiac care across London. In April 2011, the Department of Health (DH) began to monitor the outcome of cardiac arrest patients through the introduction of national Ambulance Clinical Quality Indicators¹. Therefore, we are now able to monitor and improve cardiac care at both a local and national level.

The Clinical Audit and Research Unit obtain and analyse data from Patient Report Forms (PRFs), Emergency Operations Centre records, Mobile Data Terminals, defibrillator data files and third party paperwork where possible. In addition, all cardiac arrest patients who are transported to hospital are identified and their survival status sourced from national databases and receiving hospitals. Two types of survival figure are calculated, the overall survival rate and the Utstein^{2,3} survival

rate. Additional information regarding rates of Return of Spontaneous Circulation (ROSC) sustained to hospital and overall survival to discharge is provided by Complex, receiving hospital and Primary Care Trust in Appendices 1, 2 and 3 respectively. Appendices 4, 5 and 6 provide information for: defibrillators in public places, cardiac arrests as a result of trauma and patients under 18 years of age.

2. Profile of Cardiac Arrests

2.1. Resuscitation Not Attempted

Of the 9,657 cardiac arrest patients that the LAS attended during 2011/12, a full cycle of resuscitation was not completed for 56.4% (n=5,449) of cases. Within this group, 98.3% (n=5,355) of patients were declared dead upon the arrival of the LAS and a further 94 had a valid Do Not Attempt Resuscitation (DNAR) order in place.

2.2. Resuscitation Attempted

Resuscitation was initiated for a total of 4,208 (43.6%) patients. Of these: 80.3% (n=3,377) of arrests were believed to be due to a cardiac cause, 5.7% (n=240) of arrests were the result of a trauma, and 14% (n=591) of patients suffered an arrest that was classified as 'other' (i.e. respiratory disease, overdose, terminal illness etc).

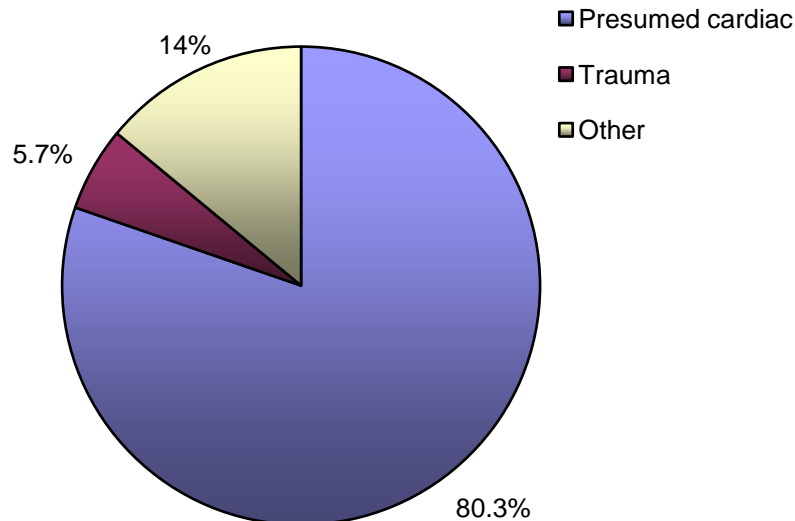


Figure 1 – Cause of arrest

2.3. Profile of Cases where Resuscitation was Attempted

Table 1 below displays the profile of all cardiac arrest patients where resuscitation was attempted regardless of cause. Further details are presented for patients whose cardiac arrest was thought to be due to a cardiac cause, trauma or other in Table 2.

Resuscitation Attempted	
Number of cases:	4,208
Patient Demographics	
Average age:	66 (0 -108) years
Gender:	Male (64%; n=2,692); Female (36%; n=1,514); Not documented (0%; n=2)
Average age by gender:	Male (64 years); Female (71 years)
Ethnicity ^{^†} :	White (63.9%); Mixed (0.4%); Asian/ British Asian (7.8%); Black/Black British (6.5%); Other Ethnic Group (3.4%); Unable to Obtain (15.8%); Not documented (2.3%)
Event Information	
Most common time of day:	08.00-11.59 (22.6%; n=949)
Most common day:	Monday (15.2%; n=639)
Most common month:	December (9.9%; n=416)
Response times (median):	999 call - arrival on scene = 6 minutes On-scene time = 46 minutes 999 call - arrival at hospital = 64 minutes Job cycle [∞] = 129 minutes
Response categories ^{^*} :	Red 1 (59.2%; n=2,490); Red 2 (33.3%; n=1,400); Green (7.6%; n=318)
Location:	Private (77.3%; n=3,253); Public (22.6%; n=952); Not documented (0.1%; n=3)
Witnessed:	Bystander (45.9%; n=1,932); Not Witnessed (34%; n=1,431); Crew Witnessed (19.9%; n=836); Not documented (0.2%; n=9)
Bystander CPR:	40.5% (n=1,704)
Initial rhythm:	Asystole (49.1%; n=2,067); Ventricular Fibrillation/pulseless Ventricular Tachycardia (22.2%; n=934); PEA (27.1%; n=1,141); Not documented (1.6%; n=66)
ROSC sustained to hospital:	29.4% (n=1,237)

[^] Due to rounding, percentages will not equal 100%.

[†] Due to the nature and condition of cardiac arrests, patients are often unable to provide ethnicity information. Crews therefore document on the PRF that they are unable to obtain this information.

[∞] Job cycle is the time taken from 999 call to the point at which the crew are available for the next patient.

^{*} The highest response category (Red) is allocated to 999 calls that are immediately life threatening: Red 1 to patients who are not breathing, Red 2 to those that are breathing but not conscious or where these factors are unknown, or chest pain is stated. All other calls are given a Green category.

Table 1 – Profile of cardiac arrests in London for all patients where resuscitation was attempted

	Presumed cardiac [^]	Trauma [*]	Other non-cardiac
Cardiac arrests: <i>n</i>	3,377	240	591
Gender: <i>n</i> (%)			
Male	2,160 (64)	193 (80.4)	339 (57.4)
Female	1,216 (36)	46 (19.2)	252 (42.6)
Not documented	1 (0)	1 (0.4)	-
Age:			
Average age	68	43	63
Most common time: (%)			
Time	08.00 – 11.59 (23.8)	16.00 – 19.59 (21.3)	12.00 – 15.59 (19.6)
Arrest location: <i>n</i> (%)			
Public	741 (21.9)	153 (63.8)	58 (9.8)
Private	2,634 (78)	87 (36.3)	532 (90)
Not documented	2 (0.1)	-	1 (0.2)
Shockable rhythm: <i>n</i> (%)			
VF/Pulseless VT	894 (26.5)	11 (4.6)	29 (4.9)
ROSC sustained to hospital: <i>n</i> (%)			
Yes	1,017 (30.1)	48 (20)	172 (29.1)
No	2,343 (69.4)	190 (79.2)	417 (70.6)
Not documented	17 (0.5)	2 (0.8)	2 (0.3)

[^] Detailed information for presumed cardiac patients can be found in section 3.

^{*} Further details and survival rates for trauma patients can be found in Appendix 5.

Table 2 – Comparison of causes of arrest where resuscitation was attempted

3. Patients Resuscitated with an Arrest of Presumed Cardiac Cause

This section of the report focuses **only** on those patients whose cardiac arrest was presumed to be cardiac in origin and for whom resuscitation was undertaken (n=3,377).

3.1. Patient Demographics

As reported in previous years, approximately two-thirds of patients were male (64% vs. 36%) and were younger than female patients by an average of 7 years (65 vs. 72). The age of patients ranged from 0–108 years and the mean average age was 68 years. Age group distribution is displayed in Figure 2 below.

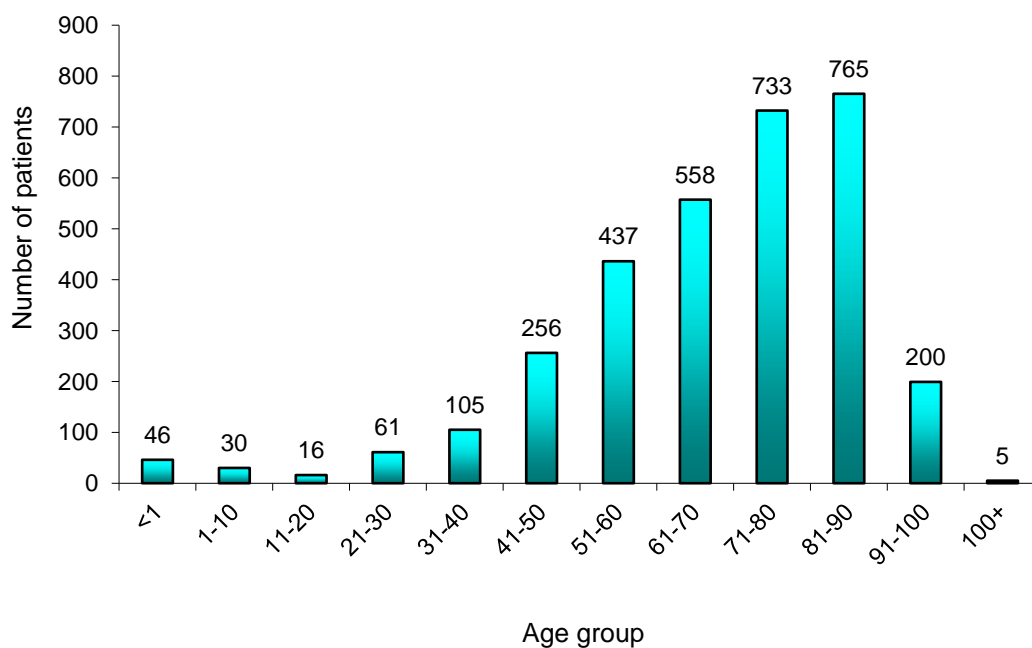


Figure 2 – Age groups of patients

3.2. Location

Over three-quarters (78%; n=2,634) of all cardiac arrests of a presumed cardiac cause occurred in a private, residential location. Of these, 2,267 were in the home and 367 in a care home facility. 21.9% (n=741) of cardiac arrests occurred in a public place. It was not possible to determine the category of the location for two patients (0.1%) due to lack of information on the PRF.

Location	n	%
Private		
Home	2,267	67.1%
Care Home	367	10.9%
Public		
Work	82	2.4%
Street	342	10.1%
GP Surgery	16	0.5%
Other Public	301	8.9%

Table 3 – Location of cardiac arrests

As shown above, 301 arrests occurred within the 'other public' location category. Of these, the ten most common locations are outlined in the following table.

Top 10 Other Public		
Location	n	%
Public Transport	51	16.9%
Leisure centre/ Sports facility	48	15.9%
Hospital/ Walk in centre	43	14.3%
Shop	42	14%
Airport	20	6.6%
Hotel/ Hostel	18	6%
Public House/ Club	14	4.7%
Parkland/ Woodland	12	4.0%
Place of worship	10	3.3%
School/ College	7	2.3%

Table 4 – Breakdown of top ten other public locations

3.3. Witnessed Arrest

Almost half of all cardiac arrests (47.3%; n=1,597) were witnessed (either seen or heard) by a bystander; a trend which continues from previous years. A further 19.3% (n=653) of patients had their arrest witnessed by an LAS crew. In 33.2% (n=1,120) of cases the arrest was not witnessed by either a bystander or the LAS, and in just 0.2% (n=7) there was insufficient documentation to indicate whether or not the arrest was witnessed.

3.4. Bystander CPR

Rates of bystander CPR prior to LAS arrival have increased this year to 40.5% (n=1,369) from 36.7% in 2010/11, which is the highest figure achieved to date. As would be expected, bystander CPR was commenced more frequently when the arrest was witnessed rather than un-witnessed (65% vs. 35%).

3.5. Initial Presenting Rhythm

Over a quarter (26.5%; n=894) of patients had a shockable initial rhythm of Ventricular Fibrillation (VF) or pulseless Ventricular Tachycardia (VT). The majority of patients (72.3%; n=2443) had non-shockable rhythms, with nearly half of all cardiac arrest patients presenting to LAS crews in an Asystolic initial rhythm (46.4%; n=1,567) and 25.9% (n=876) of patients in Pulseless Electrical Activity (PEA). In just 1.2% (n=40) of cases the patients initial presenting rhythm was not reported on the PRF.

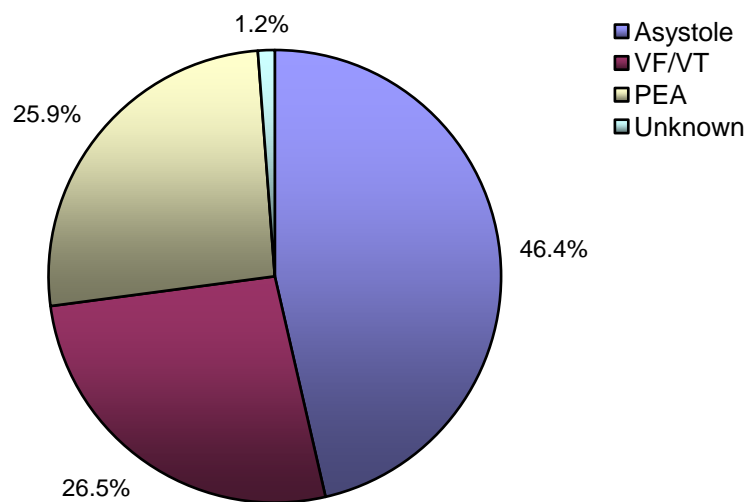


Figure 3 – Initial presenting rhythm

It is interesting to note that over the past three years, rates of Asystole, VF/pulseless VT and PEA have remained relatively stable.

3.6. Defibrillation Times

Table 5 below displays both the median and mean average response times for those patients whose arrest was due to a presumed cardiac cause, where the arrest was bystander witnessed and where the initial presenting rhythm was shockable (VF/pulseless VT). Mean and median average response times for both 2011/12 and 2010/11 have also been included to allow comparisons between response intervals. However, as response times are skewed by extended time ranges, the median response time provides a more accurate representation of the average and should therefore be used.

Time Interval	2011/12		2010/11	
	Median Average Time (mins.)	Mean Average Time (mins.)	Median Average Time (mins.)	Mean Average Time (mins.)
999 (Call Connect)* - 1 st LAS defibrillation	10	11	10	11
Arrival at scene - 1 st LAS defibrillation	4	4	4	4

* Call Connect refers to the time that the call was connected to the ambulance service.

Table 5 – Response times to 1st LAS defibrillation

3.7. Airway Management

During 2011/12, there were 1,439 successful endotracheal tube intubations performed and supraglottic airway devices (SGA) were placed in 1,570 instances. In 83.7% of cardiac arrests at least one successful airway management intervention was performed.

Airway Management	
Number of successful intubations*	1,439
Number of SGA's placed*	1,570
Percentage of patients who were successfully intubated, had an SGA placed, or both	83.7%

* In some cases a patient may have been intubated and had an SGA placed prior or subsequent to intubation; these cases have been included and reported in both intubation and SGA data.

Table 6 – Airway management

3.8. Return of Spontaneous Circulation (ROSC) Sustained to Hospital

ROSC was sustained to hospital in 30.1% (n=1,017) of cases. Figure 4 displays the increases achieved in sustaining ROSC to hospital from 2007/08 onwards, demonstrating the positive outcome of resuscitation efforts by LAS staff.

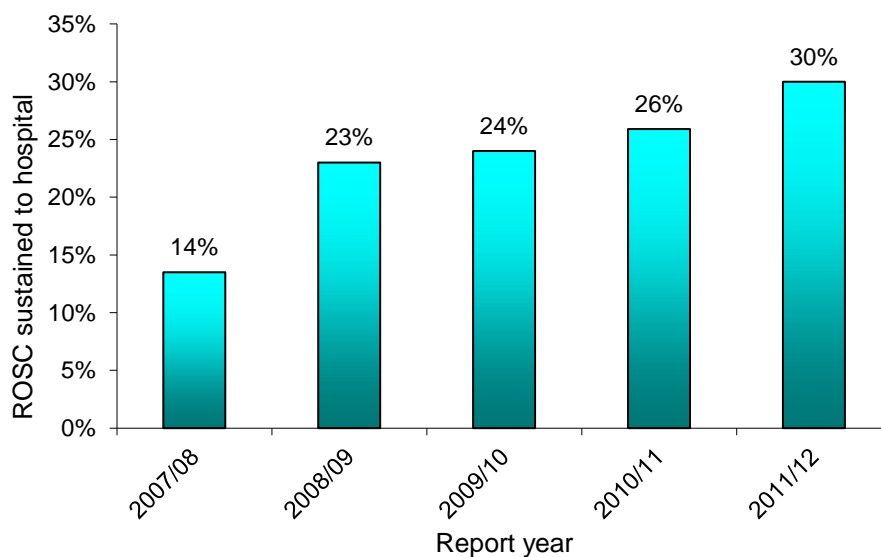
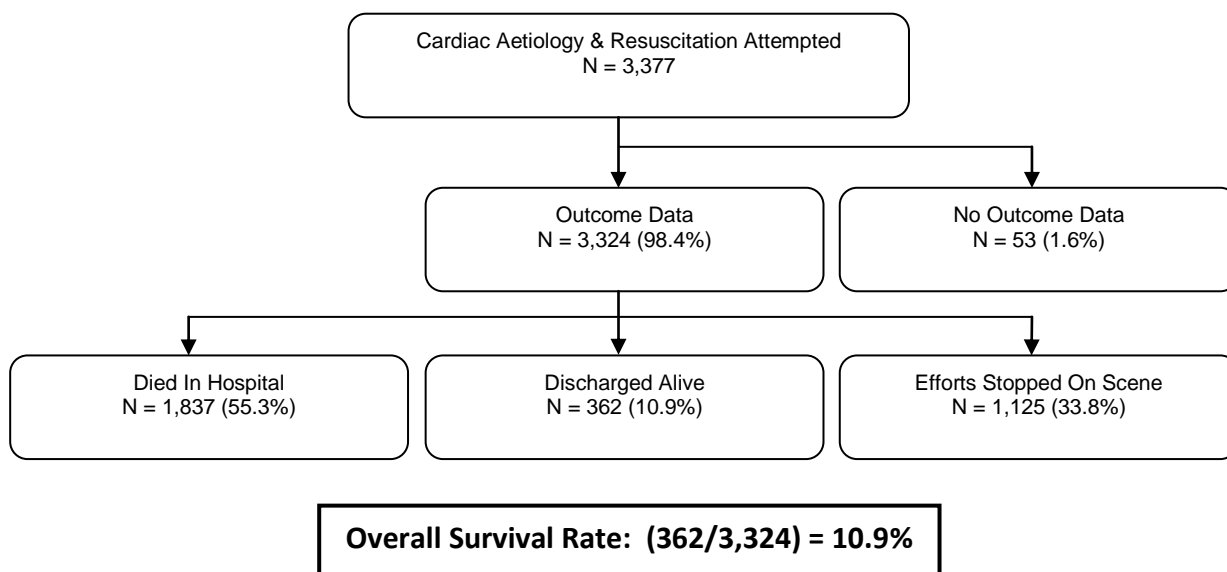


Figure 4 – Percentage of patients with ROSC sustained to hospital by year

4. Survival Calculations

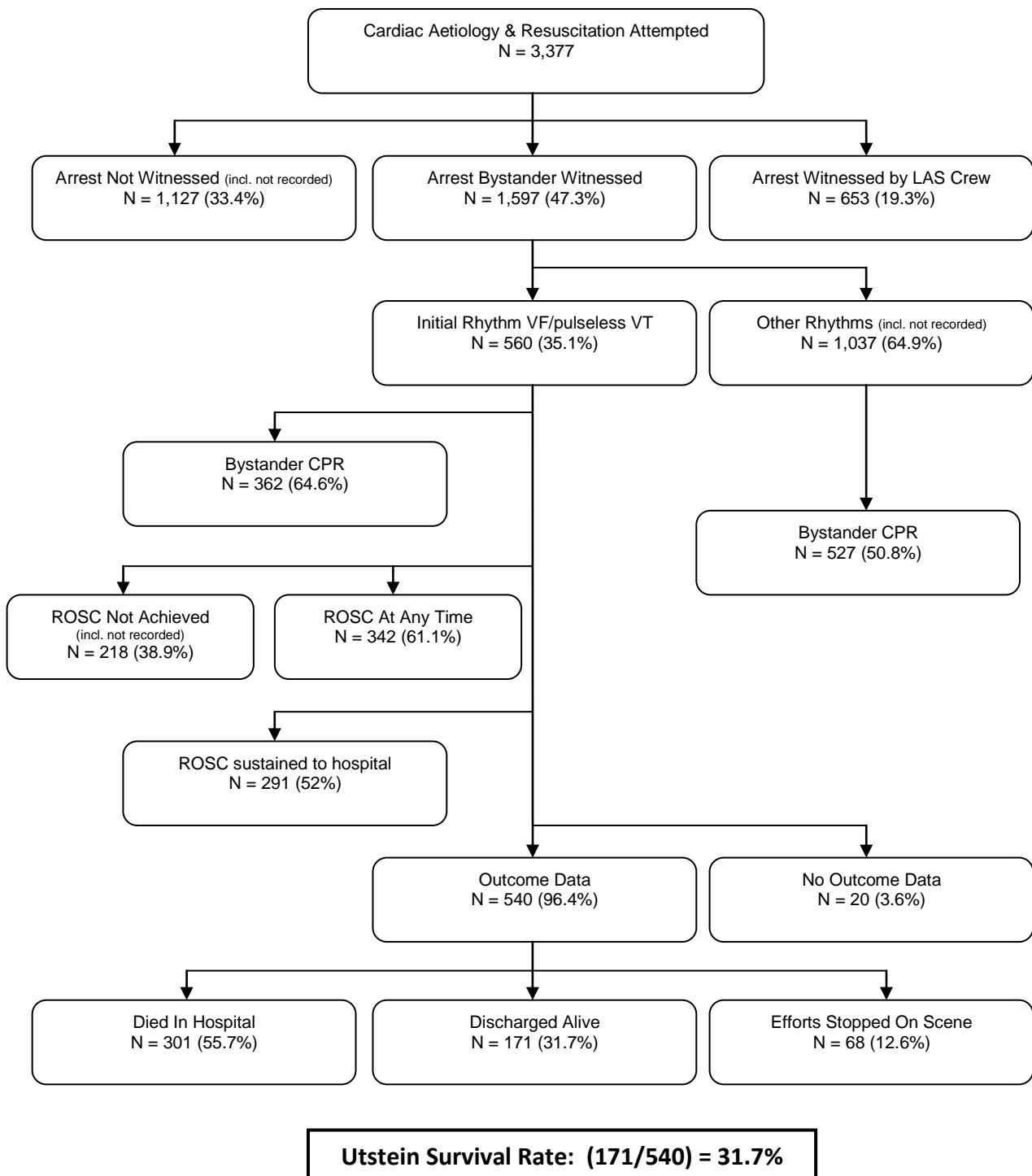
4.1. Presumed Cardiac Cause Overall Survival Rate

The overall survival rate calculation is based on those patients who had resuscitation attempted following an out-of-hospital cardiac arrest of a presumed cardiac cause, irrespective of all other factors. The overall survival rate from a cardiac arrest of presumed cardiac cause is 10.9% (n= 362/3,324).



4.2. Utstein Survival Rate

The Utstein survival rate focuses on a specific sub-set of patients: those who had resuscitation commenced following a cardiac arrest of a presumed cardiac cause, where the arrest was bystander witnessed and the initial presenting arrest rhythm was VF/pulseless VT. This method is internationally validated and allows accurate comparisons to be made between Emergency Medical Services. Outcomes could not be obtained for 20 patients and these cases have been excluded from the denominator for the calculation of the Utstein survival figure. The LAS Utstein survival rate for 2011/12 is 31.7% (n=171/540).



The overall and Utstein survival rates are the highest ever achieved by the LAS. The overall survival rate has increased by 2.9% to 10.9% (from 8% in 2010/11), which is the largest increase observed to date. The Utstein survival rate has had a substantial increase of 8.9% from 22.8% in 2010/11 to 31.7% this year. As seen in the graph below, with the exception of 2007/08, the Utstein survival rate has continued to increase each year since 1998 demonstrating the Service's commitment to improving survival outcomes.

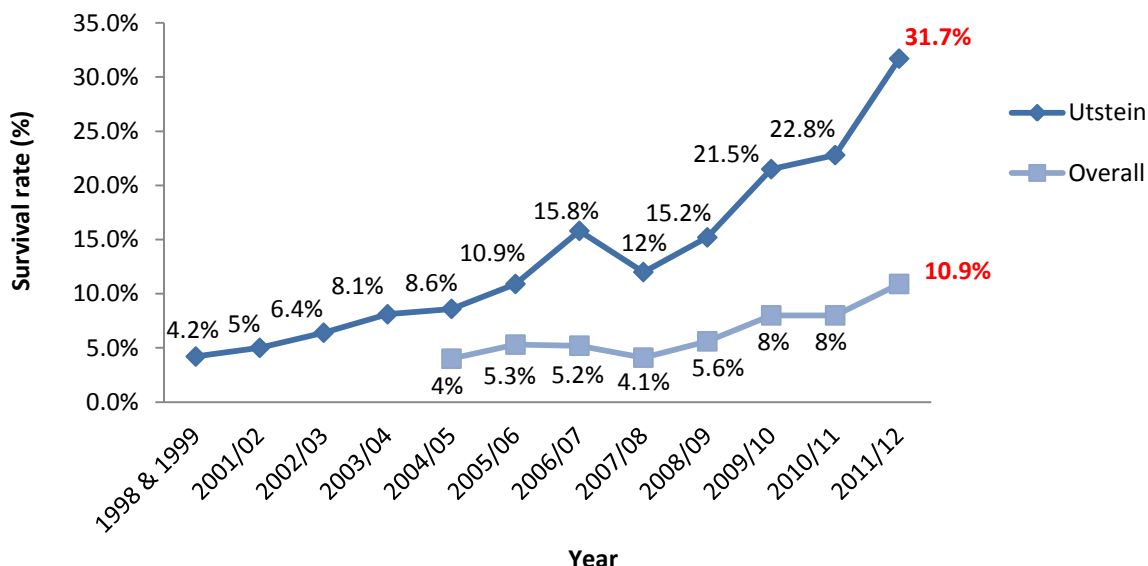


Figure 5 – Overall and Utstein survival rates by year

4.3. Survival from LAS Crew Witnessed Cardiac Arrests Only

As expected, survival rates are higher for those patients whose cardiac arrest is witnessed by an ambulance crew due to the fact that they receive immediate life saving interventions. In 2011/12 LAS crew witnessed arrests accounted for 19.3% (n=653) of all out-of-hospital cardiac arrests of a presumed cardiac cause. Five patient survival outcomes could not be obtained, as such the valid denominator for overall survival is 648 and for the Utstein group 181.

Outcome	n	%
Died on scene	88	13.6
Died in hospital	425	65.6
Overall survival rate	135/648	20.8
Utstein survival rate	105/181	58

Table 7 – Overall and Utstein survival for crew witnessed arrests

4.4. Survival for Patients Directly Conveyed to Heart Attack Centres (HAC)

In September 2010, the LAS introduced a new pathway whereby cardiac arrest patients are directly conveyed to one of eight HACs within London if they meet the eligibility criteria: aged 18 years or older; ROSC achieved after an initial arrest rhythm of VF/pulseless VT; evidence of ST-elevation on a 12 lead ECG, and the cause of arrest is believed to be cardiac in origin. In May 2011, the criteria was modified to include patients who present with any initial arrest rhythm. As a result, there was an increase in the number of patients conveyed directly to a HAC, from 100 in 2010/11 to 255 in 2011/12. ROSC on arrival at hospital for this group of patients is 92.9% (n=237) and the overall rate of survival is 63.3% (n=155).

Figure 6 below shows the overall survival rate by month for those patients conveyed directly to a HAC, which shows that although survival rates fluctuate each month they consistently exceed 45%. A survival breakdown by each HAC is presented in Appendix 2.

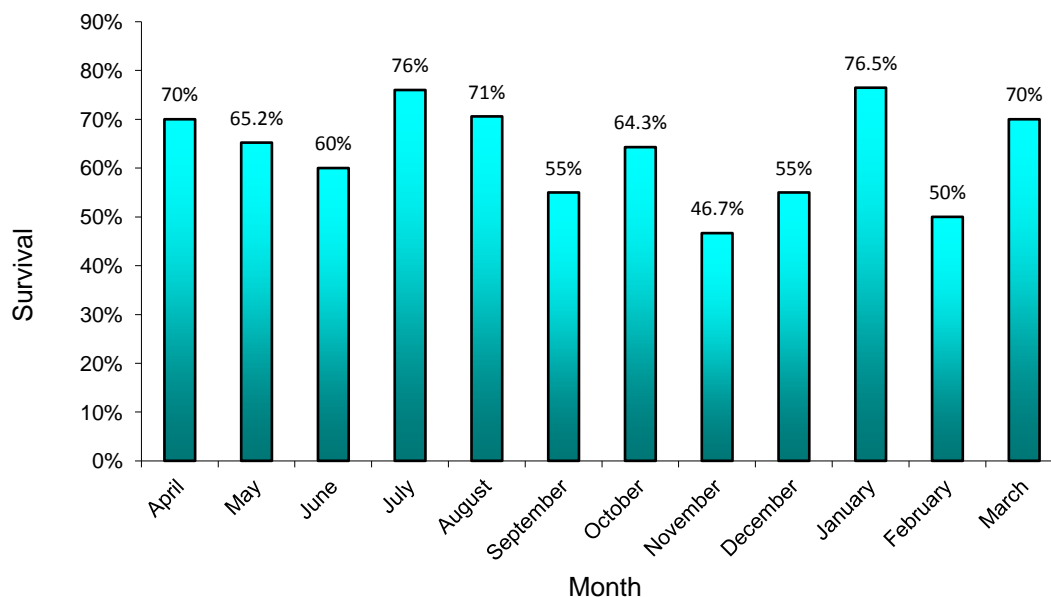


Figure 6 – Survival to discharge for patients conveyed directly to Heart Attack Centres

4.5. Survival Rate Summary

A summary of survival rates is displayed in Table 8 below.

Survival Rate	
All Resuscitation Attempted	9.7% (400/4,140)
Presumed Cardiac	
Presumed Cardiac (Overall)	10.9% (362/3,324)
Utstein	31.7% (171/540)
All Crew Witnessed	20.8% (135/648)
Crew Witnessed - Utstein	58% (105/181)
Direct to HAC	63.3% (155/245)

Table 8 – Survival rates by patient group

Appendix 7 provides a breakdown of the survival rates by each contributing factor (e.g. cause, initial rhythm, witnessed).

5. Discussion

This report presents the highest survival rates ever achieved by the London Ambulance Service NHS Trust and demonstrates the efforts made in improving the management of cardiac arrest patients. This year, the Utstein survival rate has seen the largest increase of 8.9% (from 22.8 to 31.7%), which is a remarkable achievement. The overall survival rate from a cardiac arrest of presumed cardiac cause has also followed a positive trend increasing by 2.9% (from 8% in 2010/11 to 10.9%). Furthermore, through monitoring the data for the DH Ambulance Clinical Quality Indicators we are able to demonstrate that we currently have the highest survival rates amongst the 12 English Ambulance Services⁵.

The increase in survival rates this year has been influenced by a number of improvements in the management of cardiac arrest patients. The changes made following the release of the European Resuscitation Council guidelines have been embedded into clinical practice and reinforced through clinical bulletins and training packages. Staff have been made aware of the value of effective chest compressions, the use of defibrillators in manual mode to enable shocks to be delivered without delay, and the importance of using escalating energy when delivering shocks to patients who have recurring episodes of VF. Furthermore, our crews have been encouraged to remain on scene until ROSC is achieved and the patient's condition is stable prior to conveyance to hospital.

Another important contributing factor to the increases seen in both overall and Utstein survival is enabling cardiac arrest patients to gain immediate access to primary angioplasty by direct conveyance to a HAC. The change in eligibility criteria in May 2011 to include all initial arrest rhythms has allowed a greater number of patients to be taken directly to a HAC, leading to an impressive overall survival figure of 63.3% for this group.

A notable increase has been seen in the rate of CPR undertaken by bystanders and this could be a result of: a greater number of witnessed cardiac arrests, Emergency Medical Dispatchers continuing to advise 999 callers to provide CPR to patients in cardiac arrest, and the training provided by the LAS this year alone to over 30,000 members of the public in resuscitation methods. Furthermore, to increase rates of bystander CPR, there has been a move towards chest compression only techniques in public education, such as that illustrated in the BHF's 'Hands-only CPR' campaign. The LAS supports this method of basic life support by members of the public and has previously undertaken a research project in collaboration with the Emergency Medical Service in Seattle whereby our dispatchers provided compression-only instructions to 999 callers. The findings of this research are published in a high profile medical journal and contribute to the evidence base internationally for compression-only CPR.

The quality of PRF documentation has remained high, allowing the compilation of a robust dataset. In addition, the continued support from hospitals has allowed us to obtain the highest volume of outcomes to date with only 1.6% of all patient outcomes missing. This year the process for collecting survival outcomes was amended to enable data to be captured and submitted by the LAS to the DH Ambulance Clinical Quality Indicators on a monthly basis. The efforts made by hospitals to comply with this process has meant that we have been able to continually monitor outcomes for our patients, which has been used to communicate to staff through bulletins and presentations at meetings the positive impact of our current clinical practice.

To continue improving cardiac care and ensure that cardiac arrest patients receive optimal treatment, there are a number of initiatives that we plan to implement during 2012/13 including: a cardiac arrest checklist to ensure consistency in clinical practice, a feasibility trial of pre-hospital therapeutic hypothermia using intra-nasal cooling, and the initial identification of hospitals that are able to provide immediate access to angiography and Computerised Tomography (CT) scan facilities as a future service development.

Alongside these initiatives, improvements in current practice will need to be considered, the most pertinent of which is to address the number of defibrillator data files that are routinely downloaded. The download percentage for those files that could be matched to a cardiac arrest incident during this reporting period fell to an all time low of just 5%. Data downloads are used to provide evidence that clinical

guidelines are being followed and that we are providing effective resuscitation, it is therefore imperative that we have access to this information. In addition, if a greater number of downloads were available, it would be possible to feed back to staff on the quality of resuscitation attempts to further enhance patient care.

The findings of this report are extremely encouraging and demonstrate that the LAS provides world class care to patients who suffer an out-of-hospital cardiac arrest. The increase in survival rates show that our staff play a vital role in ensuring that more and more patients survive a cardiac arrest.

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Appendix 1: ROSC Sustained to Hospital and Survival per Complex 2011/12

Complex	Number of Patients	ROSC Sustained to Hospital		Overall Survival %
		N	%	
West				
Brent	180	57	32	15.7 (28/178)
Camden	77	21	27	10.5 (8/76)
Friern Barnet	143	41	29	10.6 (15/142)
Fulham	102	35	34	17.3 (17/98)
Hanwell	154	53	34	12.4 (19/153)
Hillingdon	145	52	36	9.7 (14/145)
Isleworth	146	39	27	12.6 (18/143)
Islington	67	18	27	9.1 (6/66)
Kenton, Pinner & Wembley	163	45	28	10.4 (17/163)
East				
Chase Farm	71	17	24	7.1 (5/70)
City and Hackney	126	39	31	12 (15/125)
Edmonton	143	41	29	10.6 (15/141)
Newham	113	28	25	7.3 (8/110)
Romford	150	40	27	8.2 (12/147)
Tower Hamlets	95	28	30	13.6 (12/88)
Whipps Cross	219	61	28	7 (15/213)
South				
Barnehurst	155	50	32	9.9 (15/151)
Bromley	148	49	33	8.2 (12/147)
Croydon	189	54	29	11.8 (22/187)
Deptford	89	24	27	13.6 (12/88)
Greenwich	156	34	22	9 (14/156)
New Malden	107	41	38	9.7 (10/103)
Oval	91	25	28	11 (10/91)
St.Helier	121	45	37	11.7 (14/120)
Waterloo	98	37	38	15.5 (15/97)
Wimbledon	93	35	38	12.2 (11/90)
No Complex				
No Complex	36	8	22	8.3 (3/36)
Summary				
West	1177	361	31	12.2 (142/1164)
East	917	254	28	9.2 (82/894)
South	1247	394	32	11 (135/1230)
LAS-Wide	3377	1017	30	10.9 (362/3324)

Appendix 2: ROSC Sustained to Hospital and Survival per Hospital 2011/12

Hospital	Number of Patients	Missing Patient Outcomes %	ROSC Sustained to Hospital		Overall Survival with ROSC Sustained to Hospital %	Overall Survival %
			N	%		
Barnet General	62	2	22	36	9.5 (2/21)	4.9 (3/61)
Central Middlesex	30	0	7	23	14.3 (1/7)	3.3 (1/30)
Charing Cross	28	4	7	25	33.3 (2/6)	7.4 (2/27)
Chase Farm	38	3	11	29	20 (2/10)	5.4 (2/37)
Chelsea & Westminster	36	3	14	39	30.8 (4/13)	14.3 (5/35)
Croydon University Hospital	113	1	40	35	27.5 (11/40)	10.7 (12/112)
Darent Valley	15	0	6	40	16.7 (1/6)	6.7 (1/15)
Ealing	46	2	24	52	30.4 (7/23)	15.6 (7/45)
Hammersmith	65	0	38	59	44.7 (17/38)	26.2 (17/65)
Hillingdon	79	0	36	46	22.2 (8/36)	10.1 (8/79)
Homerton	40	0	17	43	11.8 (2/17)	5 (2/40)
Kings College	100	1	46	46	40 (18/45)	19.2 (19/99)
King Georges Ilford	58	2	16	28	6.7 (1/15)	1.8 (1/57)
Kingston	55	5	25	46	26.1 (6/23)	11.5 (6/52)
Lewisham	90	0	32	36	31.3 (10/32)	11.1 (10/90)
Newham General	85	2	24	28	17.4 (4/23)	4.8 (4/83)
North Middlesex	70	4	30	43	40 (12/30)	17.9 (12/67)
Northwick Park	94	1	34	36	15.2 (5/33)	5.4 (5/93)
Princess Royal Farnborough	65	3	25	39	17.4 (4/23)	6.3 (4/63)
Queen Elizabeth	108	1	39	36	28.2 (11/39)	11.2 (12/107)
Queens Romford	98	5	30	31	7.4 (2/27)	2.2 (2/93)
Royal Free	56	2	32	57	38.7 (12/31)	21.8 (12/55)
Royal London	63	10	29	46	46.2 (12/26)	21.1 (12/57)
St Georges Tooting	97	4	54	56	20.8 (11/53)	12.9 (12/93)
St. Helier	53	2	24	45	8.3 (2/24)	3.8 (2/52)
St Mary's Paddington	34	0	7	21	0 (0/7)	5.9 (2/34)
St Thomas's	77	1	30	39	41.4 (12/29)	17.1 (13/76)
University College London	29	0	14	48	28.6 (4/14)	13.8 (4/29)
West Middlesex	85	4	28	33	25.9 (7/27)	11 (9/82)
Whipps Cross	97	2	30	31	20.7 (6/29)	6.3 (6/95)
Whittington	24	0	5	21	0 (0/5)	0 (0/24)
Other Hospitals	7	0	4	57	0 (0/4)	0 (0/7)

Appendix 2: ROSC Sustained to Hospital and Survival per Hospital continued...

Catheter Lab	Number of Patients	Missing Patient Outcomes %	ROSC Sustained to Hospital		Overall Survival with ROSC Sustained to Hospital %	Overall Survival %
			N	%		
Hammersmith Catheter Lab	43	5	42	98	72.5 (29/40)	70.7 (29/41)
Harefield Catheter Lab	36	3	31	86	56.7 (17/30)	51.4 (18/35)
Kings College Catheter Lab	30	3	29	97	64.3 (18/28)	62.1 (18/29)
London Chest Catheter Lab	68	6	61	90	65.5 (38/58)	62.5 (40/64)
Royal Free Catheter Lab	25	0	24	96	58.3 (14/24)	56 (14/25)
St Georges Catheter Lab	30	3	29	97	75 (21/28)	72.4 (21/29)
St Thomas's Catheter Lab	5	20	5	100	75 (3/4)	75 (3/4)
The Heart Catheter Lab	18	0	16	89	75 (12/16)	66.7 (12/18)

Appendix 3: ROSC Sustained to Hospital and Survival per Hospital Primary Care Trust 2011/12

Hospital PCT	Number of Patients	Missing Patient Outcomes %	ROSC Sustained to Hospital		Overall Survival with ROSC Sustained to Hospital %	Overall Survival %
			N	%		
Barnet	62	2	22	36	9.5 (2/21)	4.9 (3/61)
Brent	124	1	41	33	15 (6/40)	4.9 (6/123)
Bromley	65	3	25	39	17.4 (4/23)	6.3 (4/63)
Camden	110	1	70	64	43.5 (30/69)	27.5 (30/109)
City & Hackney	41	0	18	44	11.1 (2/18)	4.9 (2/41)
Croydon	113	1	40	35	27.5 (11/40)	10.7 (12/112)
Ealing	46	2	24	52	30.4 (7/23)	15.6 (7/45)
Enfield	108	4	41	38	35 (14/40)	13.5 (14/104)
Greenwich	108	1	39	36	28.2 (11/39)	11.2 (12/107)
Hammersmith & Fulham	136	2	87	64	57.1 (48/84)	36.1 (48/133)
Havering	98	5	30	31	7.4 (2/27)	2.2 (2/93)
Hillingdon	115	1	67	58	37.9 (25/66)	22.8 (26/114)
Hounslow	85	4	28	33	25.9 (7/27)	11 (9/82)
Islington	24	0	5	21	0 (0/5)	0 (0/24)
Kensington & Chelsea	36	3	14	39	30.8 (4/13)	14.3 (5/35)
Kingston	55	5	25	46	26.1 (6/23)	11.5 (6/52)
Lambeth	212	2	110	52	48.1 (51/106)	25.5 (53/208)
Lewisham	90	0	32	36	31.3 (10/32)	11.1 (10/90)
Merton & Sutton	53	2	24	45	8.3 (2/24)	3.8 (2/52)
Newham	85	2	24	28	17.4 (4/23)	4.8 (4/83)
Redbridge	58	2	16	28	6.7 (1/15)	1.8 (1/57)
Tower Hamlets	130	8	89	69	60.2 (50/83)	43.3 (52/120)
Waltham Forest	97	2	30	31	20.7 (6/29)	6.3 (6/95)
Wandsworth	127	4	83	66	39.5 (32/81)	27 (33/122)
Westminster	52	0	23	44	52.2 (12/23)	26.9 (14/52)
Out of London	22	0	10	46	10 (1/10)	4.5 (1/22)

Appendix 4: Defibrillators in public places

The table below provides details on all 31 cases in which a Public Access Defibrillator was deployed.

Public Access / Community Defibrillation	
Patient Demographics	
Number of cases:	31
Average age:	67 (33 - 96 years)
Gender:	Male (87%); Female (13%)
Event Information	
Incident location:	Airport 39% (n=12) Public Transport 39% (n=12) Leisure centre 3% (n=1) Street 13% (n=4) Other location 6% (n=2)
Bystander witnessed:	Bystander (94%; n=29)
Bystander CPR:	87% (n=27)
Initial rhythm (as recorded by public defibrillator):	VF/VT (74%; n=23) Non-shockable (23%; n=7) Not documented (3%; n=1)
Average number (and range) of PAD shocks*:	2 (1-5) shocks
ROSC sustained to hospital:	58% (n=18)
Overall Survival	35.5% (n=11/31)

* Where initial rhythm was VF/pulseless VT

Appendix 5: Trauma patients

Throughout the period of 2011/12, 240 patients experienced a cardiac arrest that was due to a traumatic event. London's Air Ambulance (HEMS) were present on scene in 60.8% (n=146) of cases. The most frequent cause of arrest within this category was Road Traffic Accident (RTA) which remains consistent with previous years. The table below provides a breakdown of cause of arrest.

Trauma		
Cause	n	%*
RTA	55	22.9%
Hanging	53	22.1%
Fall (from height)	38	15.8%
Stabbing	27	11.3%
Drowning/ Submersion	23	9.6%
Assault	9	3.8%
Shooting	9	3.8%
Person under train/tube	8	3.3%
Fall (from standing)	7	2.9%
Electrocution	1	0.4%
Other	10	4.2%

* Due to rounding percentages will not equal 100%.

The overall survival rate for patients who had a cardiac arrest as a result of trauma is 3.4% (n=8/233). Please note, outcomes could not be obtained for 7 patients; therefore, these cases have been excluded from the calculation of the survival figure.

Appendix 6: Key findings for patients under 18 years

The table below shows a breakdown of cardiac arrests within the under 18's age group. Resuscitation was attempted for 136 (85.5%) patients, of which 87 (64%) were presumed to be due to a cardiac cause, 17 (12.5%) were thought to be due to trauma and 32 (23.5%) were due to another non-cardiac cause.

	Presumed Cardiac*	Trauma*	Other Non-Cardiac*
Cardiac Arrests: <i>n</i>	87	17	32
Gender: <i>n</i> (%)			
Male	54 (62.1)	12 (70.6)	18 (56.3)
Female	33 (37.9)	5 (29.4)	14 (43.8)
Ethnicity: <i>n</i> (%)			
White	33 (37.9)	8 (47.1)	7 (21.9)
Mixed	2 (2.3)	-	1 (3.1)
Asian/ British Asian	6 (6.9)	2 (11.8)	2 (6.3)
Black/ Black British	9 (10.3)	5 (29.4)	7 (21.9)
Other Ethnic Group	8 (9.2)	-	3 (9.4)
Unable to obtain	23 (26.4)	2 (11.8)	10 (31.3)
Not documented	6 (6.9)	-	2 (6.3)
Presenting cardiac rhythm: <i>n</i> (%)			
VF/VT	4 (4.6)	-	2 (6.3)
PEA	11 (12.6)	5 (29.4)	4 (12.5)
Asystole	66 (75.9)	12 (70.6)	16 (50.0)
Not known	6 (6.9)	-	10 (31.3)
Arrest witnessed: <i>n</i> (%)			
Bystander	28 (32.2)	2 (11.8)	11 (34.4)
EMS personnel	2 (2.3)	3 (17.6)	4 (12.5)
Not witnessed	56 (64.4)	12 (70.6)	17 (53.1)
Not known	1 (1.1)	-	-
Bystander CPR: <i>n</i> (%)			
Yes	44 (50.6)	9 (52.9)	16 (50.0)
No	43 (49.4)	8 (47.1)	16 (50.0)
Arrest location: <i>n</i> (%)			
Public	13 (14.9)	5 (29.4)	2 (6.3)
Private	74 (85.1)	12 (70.6)	30 (93.8)
Other public location: <i>n</i> (%)			
Leisure centre	1 (1.1)	-	-
Parkland/ Woodland	-	1 (5.9)	-
Public Transport	1 (1.1)	-	-
Restaurant/ Café	1 (1.1)	-	1 (3.1)
School	5 (5.7)	-	-
ROSC sustained to hospital: <i>n</i> (%)			
Yes	12 (13.8)	4 (23.5)	5 (15.6)
No	75 (86.2)	13 (76.5)	27 (84.4)
Overall Survival: % (<i>n</i>)	2.5 (2/80)	6.3 (1/16)	13.3 (4/30)

* Due to rounding percentages will not equal 100%.

Appendix 7: Breakdown of types of survival rates

Survival Rates						
Types of Survival Rates	Reported To	Resuscitation Attempted	Cause	Initial Rhythm	Witnessed	Survival (%)
Resuscitation attempted	DH	Yes	All causes	All rhythms	Irrespective of witnessed or not	9.7
Utstein	DH & LAS	Yes	Presumed cardiac	VF/pulseless VT	Bystander witnessed	31.7
Presumed cardiac (overall)	LAS	Yes	Presumed cardiac	All rhythms	Irrespective of witnessed or not	10.9
Crew witnessed - overall	LAS	Yes	Presumed cardiac	All rhythms	Crew witnessed	20.8
Crew witnessed - Utstein	LAS	Yes	Presumed cardiac	VF/pulseless VT	Crew witnessed	58