London Ambulance Service NHS Trust

Cardiac Arrest Annual Report: 2008/09

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Introduction

From 1st April 2008 to 31st March 2009, the London Ambulance Service NHS Trust (LAS) attended a total of 10,051 out-of-hospital cardiac arrests.

Clinical, operational and demographic information relating to each of these patients was collected and analysed by the Clinical Audit & Research Unit. The information was obtained from Patient Report Forms (PRFs), Mobile Data Terminals (MDTs), FR2 defibrillator data files and Emergency Operations Centre (EOC) records. All patients who were taken to hospital with ongoing resuscitation efforts were traced and their outcomes collected from national databases and hospital sources.

Cause of Arrest

Of the 10,051 cardiac arrests attended by the LAS, 5,910 (58.8%) were beyond any resuscitation attempt on arrival of the ambulance personnel. LAS crews commenced resuscitation for 4,141 (41.2%) patients. Of these, 3,266 (32.5%) patients received resuscitation attempts following a cardiac arrest of a presumed cardiac cause, a further 270 (2.7%) cardiac arrests were related to trauma, and 605 (6%) were due to another non-cardiac cause (e.g. terminal illness, respiratory disease or drug overdose).

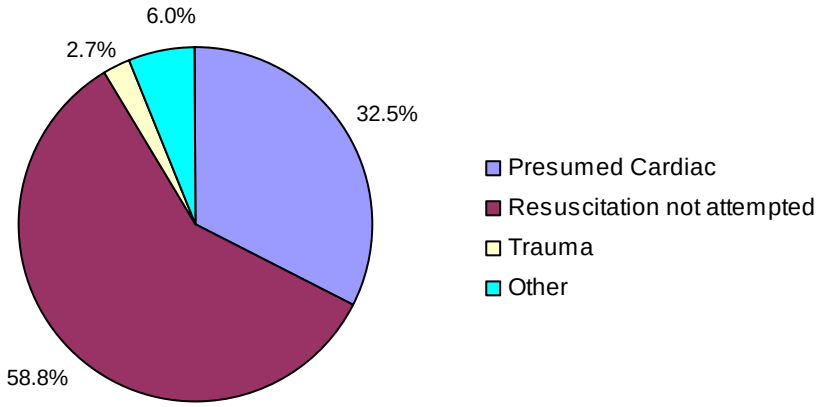


Figure 1. Cause of arrest

Please Note: the remainder of this report focuses only on patients who were received resuscitation attempts following a cardiac arrest of a presumed cardiac cause (n=3,266).

Patient Profile

The majority of patients were male (64% vs. 36% female). The average age of the cardiac arrest patient was 68 years (ranging from 0 to 104 years). Female cardiac arrest patients were older than males by an average of seven years (72 vs. 65 years respectively). Age groups are presented in Figure 2 below.

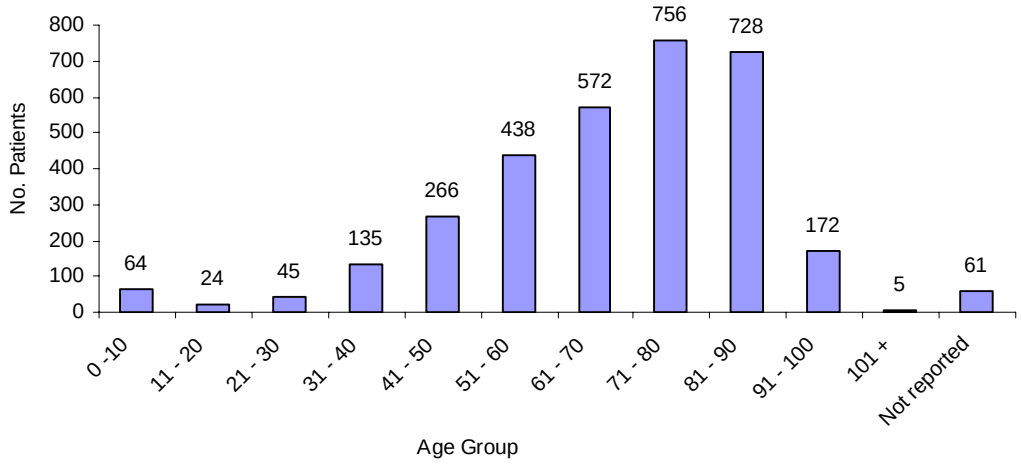


Figure 2. Age groups of patients

Day & Month of Cardiac Arrest

Figure 3 shows that although there were similar volumes of cardiac arrests each day, cardiac arrests occurred most frequently on a Monday (15%; n=487). The highest number of cardiac arrests occurred during November (9.4%; n=307) and the fewest in February (6.8%; n=223).

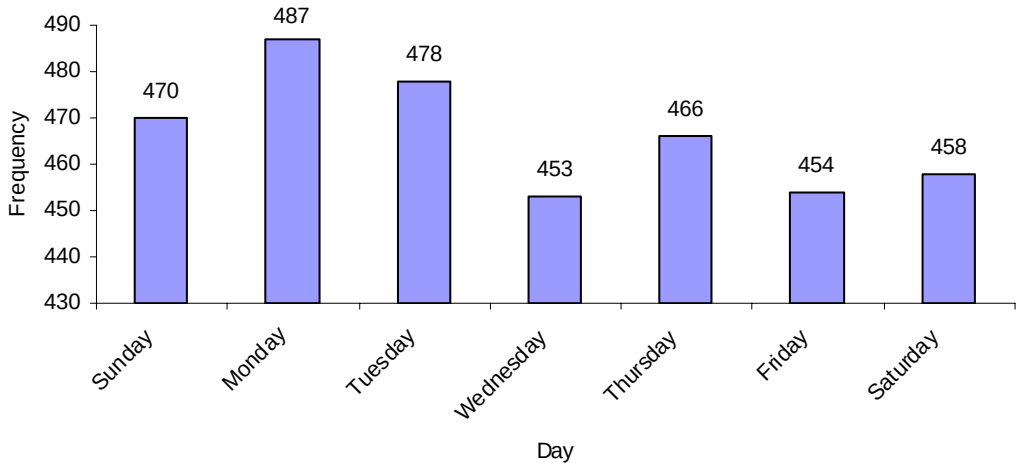


Figure 3: Frequency of cardiac arrests per day

Location of Arrest

The majority of cardiac arrests occurred in a private, residential location (78%; n=2,539); 2,186 were in the home and 353 in a care home facility. In total, 22% (n=727) of cardiac arrests occurred in a public place. The largest single location for a public cardiac arrest was the street (10%; n=328/3,266). A further breakdown of location is provided in Table 1 below.

Location	n	%
Home	2186	67
Work	63	1.9
Street	328	10
GP surgery	19	0.6
Care home	353	10.8
Other public	317	9.7

Table 1. Breakdown of location of cardiac arrest

Witnessed Arrest

The majority (44%; n=1,437) of cardiac arrests were witnessed (seen or heard) by a bystander. 17% (n=545) of patients had their cardiac arrest witnessed by LAS crews. A further 36% (n=1,197) of cardiac arrests were not witnessed, and for 3% (n=87) of cases it was not reported whether the arrest was witnessed or not.

Bystander CPR

Bystander CPR was attempted in just over a third (34%; n=1,124) of cases. It was most frequent when the cardiac arrest was bystander witnessed compared to unwitnessed (63% vs. 37%) and was more likely to occur when the arrest was in a public rather than private location (30% vs. 70%).

Initial Presenting Rhythm

Almost half of all patients (45%; n=1,481) presented to ambulance staff with an asystolic heart rhythm. Just over one quarter (26%; n=860) of patients had an initial presenting rhythm of Ventricular Fibrillation (VF) or Ventricular Tachycardia (VT).

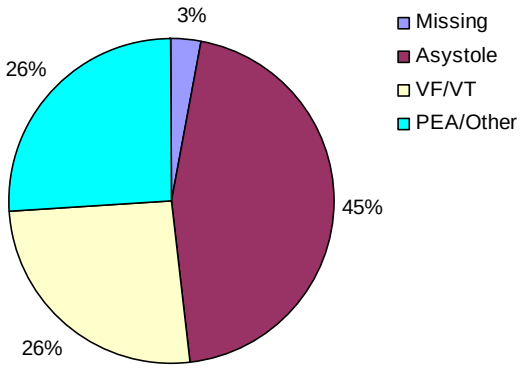


Figure 4. Initial presenting rhythm

Response Times

Ambulance response intervals are shown in Table 2 below. The average 999 call to arrival on scene interval has decreased by one minute from eight minutes in 2007/08 to seven minutes in 2008/09.

Defibrillation intervals (both call to defibrillation and arrival on scene to defibrillation) have remained consistent with last year's figures. The average 999 call to arrival at hospital times have increased slightly by one minute from the previous year. Average job cycle times, have increased considerably to 114 minutes from 108 minutes in 2007/08 and 97 minutes (including an additional two minutes to approximate the effect of Call Connect) in 2006/07.

Time Interval	Average Time (mins.)	Range (mins.)
999 (Call Connect)* - arrival on scene	7	0 - 91
999 (Call Connect)* - 1st LAS defibrillation#	10	3 – 34
Arrival at scene - 1st LAS defibrillation#	4	0 – 27
999 (Call Connect)* - arrival at hospital	48	9 – 125
Job cycle (Call Connect* - green)	114	23 – 328

* *Call Connect refers to the time that the call was connected to the ambulance service.*
\# *Includes only those patients with a non-crew witnessed cardiac arrest and an initial rhythm of VF/VT.*

Table 2. Response intervals

Return of Spontaneous Circulation

Over one quarter of patients (28%; n=925) were reported to have achieved a return of spontaneous circulation (ROSC) at some point during their treatment by the LAS. The majority of these patients collapsed in a private location (73%, n=675), had a crew or bystander witnessed arrest (74%, n=682) or presented with an initial arrest rhythm of VF/VT (44%; n=402). Of note, 6% (n=198) of all PRFs did not report whether or not the patient had achieved a ROSC.

When ROSC was achieved (n=925), this was sustained to hospital in 740 (80%) cases. Therefore, in total, 23% (n= 740/3,266) of patients had a ROSC on arrival at hospital. 7% (n=248/3,266) of PRFs did not report whether the patient had a ROSC sustained to hospital.

Survival Calculations

The LAS calculates two survival figures: an Utstein[1] survival rate and an overall survival rate.

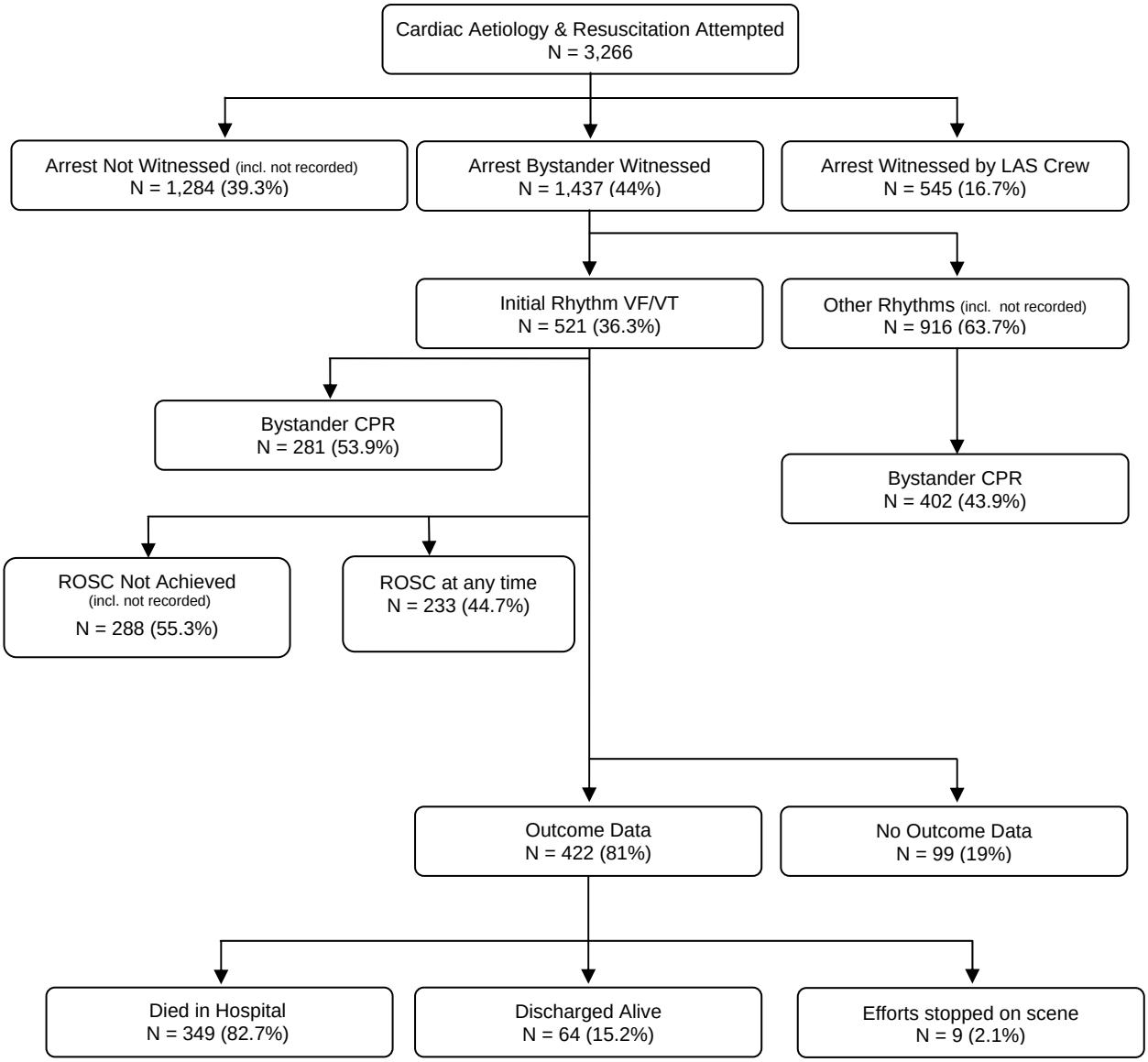
Utstein Survival Rate

The Utstein survival calculation is an internationally validated method for calculating out-of-hospital cardiac arrest survival rates that enables comparisons between services. The Utstein calculation is the number of patients discharged alive divided by the number of patients who had resuscitation attempted following a cardiac arrest of a presumed cardiac aetiology, where the arrest was bystander

[1] *Cummins RO, Chamberlain DA, Abramson NS et al. Recommended Guidelines for Uniform Reporting of Data from Out-Of-Hospital Cardiac Arrest: The Utstein Style. Annals of Emergency Medicine, 1991; 20: 861-873.*

witnessed and the initial rhythm was VF or VT. Patients for whom outcome records could not be traced (n=99) were excluded from the survival analysis. Therefore, the valid denominator for the 2008/09 Utstein survival calculation was 422.

The LAS Utstein survival rate for 2008/09 was 15.2%.

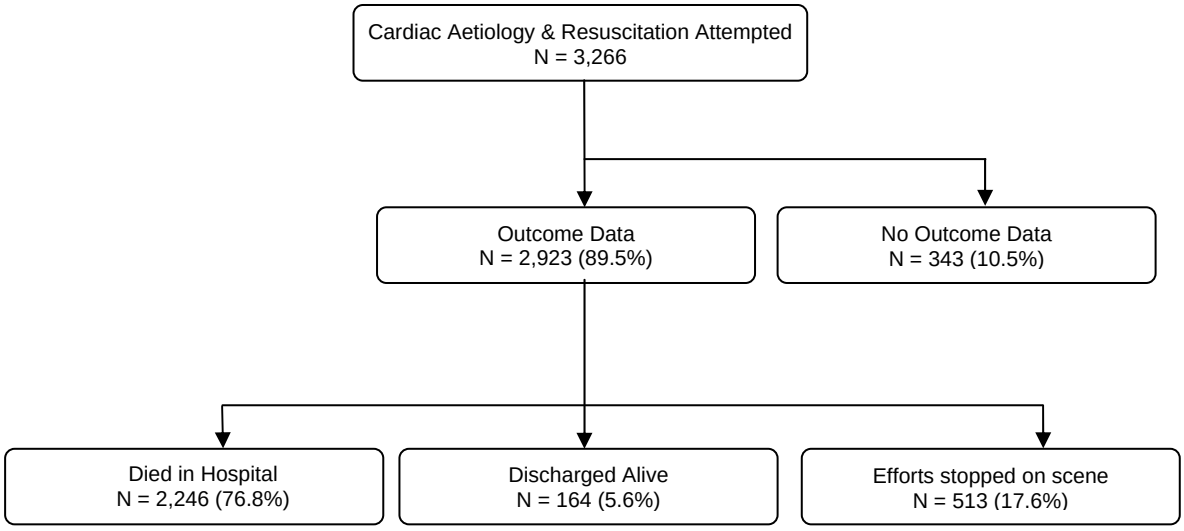


Utstein Survival Rate: (64/422) = 15.2%

Overall Survival Rate

The overall survival rate is based on all patients who had resuscitation commenced by the LAS following an out-of-hospital cardiac arrest of a presumed cardiac cause.

The overall survival rate for 2008/09 was 5.6%.



Overall Survival Rate: (164/2923) = 5.6%

Survival from Crew Witnessed Cardiac Arrests only

A total of 545 patients had their collapse witnessed by LAS crews. The outcomes for these patients are presented below. As 65 patients could not be traced to hospital, the valid denominator is 480.

Outcome	N	%
Died on scene	36	7.5
Died in hospital	383	79.8
Discharged alive	**61**	**12.7**

Table 3. Breakdown of overall survival from crew witnessed cardiac arrests

When the principles of the Utstein calculation are applied to this particular group of crew witnessed cardiac arrest patients (i.e. crew witnessed, VF/VT arrests of presumed cardiac cause where resuscitation was attempted), the survival rate increases to **34.7%** (n=41/118).

Survival from Public Access / Community Defibrillation

Public Access / Community Defibrillators were deployed 28 times during this reporting period. In 17 of these occasions the patient was in cardiac arrest. In line with Utstein reporting, this section focuses upon the 14 cases where the cardiac arrest was of a presumed cardiac aetiology only. Further information on patients where a Public Access / Community Defibrillator was used can be found in Appendix 1.

Outcomes were available in 13 cases; two patients survived to hospital discharge. Therefore, the overall survival of patients where a public access defibrillator was deployed was 15.4% (n=2/13). When applying the Utstein calculation (bystander witnessed VF arrests of presumed cardiac aetiology where resuscitation was attempted), the survival rate increases to 25% (n=2/8). However, this data should be viewed with extreme caution as the numbers are very small.

Discussion

The LAS's Utstein cardiac arrest survival rate for 2008/09 has increased by 3.2% (from 12% to 15.2%) from the previous year. This survival rate is comparable to that reported in 2006/07 (15.8%). The overall survival rate has also increased; now at 5.6% from 4.1% in 2007/08 and 5.2% in 2006/07. In instances of crew witnessed cardiac arrests, survival rates have seen substantial increases from last year (overall survival up 4.7% and Utstein survival up 6%).

The increase in survival can be attributed to a number of factors; the most pertinent of these being that staff have received further education on cardiac care including the value of effective chest compressions and the importance of stabilising the patient's condition prior to conveyance to hospital. This is evident in the rate of ROSC achieved in the field which has increased to 28% from 25% in 2007/08 and 20% in 2006/07. Furthermore, when ROSC was achieved, it was sustained to hospital in 80% of these patients. This led to an overall increase in sustained ROSC to hospital from 13.5% in 2007/08 to 23% this year. A further influential factor is that ambulance staff were arriving at scene on average one minute faster than last year and are therefore able to provide prompt care which is evidenced to benefit patient outcome. Rates of witnessed arrests, bystander CPR, VF/VT and defibrillation intervals have remained fairly consistent. Age has remained fairly consistent, although the average age has increased by 2 years (with the average female age increasing by 3 years and male by one year).

It is worth highlighting that the percentage of patients that have been transported to hospital with a ROSC has almost doubled (from 13.5% in 2007/08 to 23% this year) and it is therefore reasonable to expect that the survival from hospital discharge would potentially mirror this trend. However, this does not seem to be the case. This may be due to hospital factors, such as variations in the treatment options post resuscitation from hospital to hospital, or it may be that the survival rate is in fact much higher in reality as 10.5% of cases were missing patient outcomes therefore preventing full analysis.

The increase in survival to hospital discharge and ROSC in the field demonstrates the LAS's continued commitment to improving cardiac care for people in London. The planned rollout of pre-hospital therapeutic hypothermia is expected to aid this further. Furthermore, improvements in PRF documentation, defibrillator data downloads and collection of patient survival outcomes will allow reporting in improvements in cardiac outcomes to continue and become even more robust.

Appendix 1: Public Access / Community Defibrillation details

Patient Profile	
Number of cases	17
Average age*	68 (54-88) years
Gender	Male (82%); Female (18%)
Event Information	
Incident location	London Heathrow Airport (35%; n=6) Underground/Mainline train or coach station (53%; n=9) Exhibition/Conference centre (12%; n=2)
Bystander witnessed	76% (n=13)
Bystander CPR	65% (n=11)
Initial Rhythm (as recorded by public defibrillator)	VF/VT (71%, n=12) Non-shockable (29%, n=5)
Average number (and range) of PAD shocks**	2 (1-5) shocks
Return of Spontaneous Circulation (ROSC)***	23.5% (n=4)

** 1 case where age was not reported.*

*** 5 cases where the number of shocks given were not recorded.*

**** 2 cases missing information on ROSC.*