Cardiac Arrest Annual Report

April 2022 – March 2023

November 2023

Produced by:

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Table of Contents

Data within this report are correct as of the time of publication

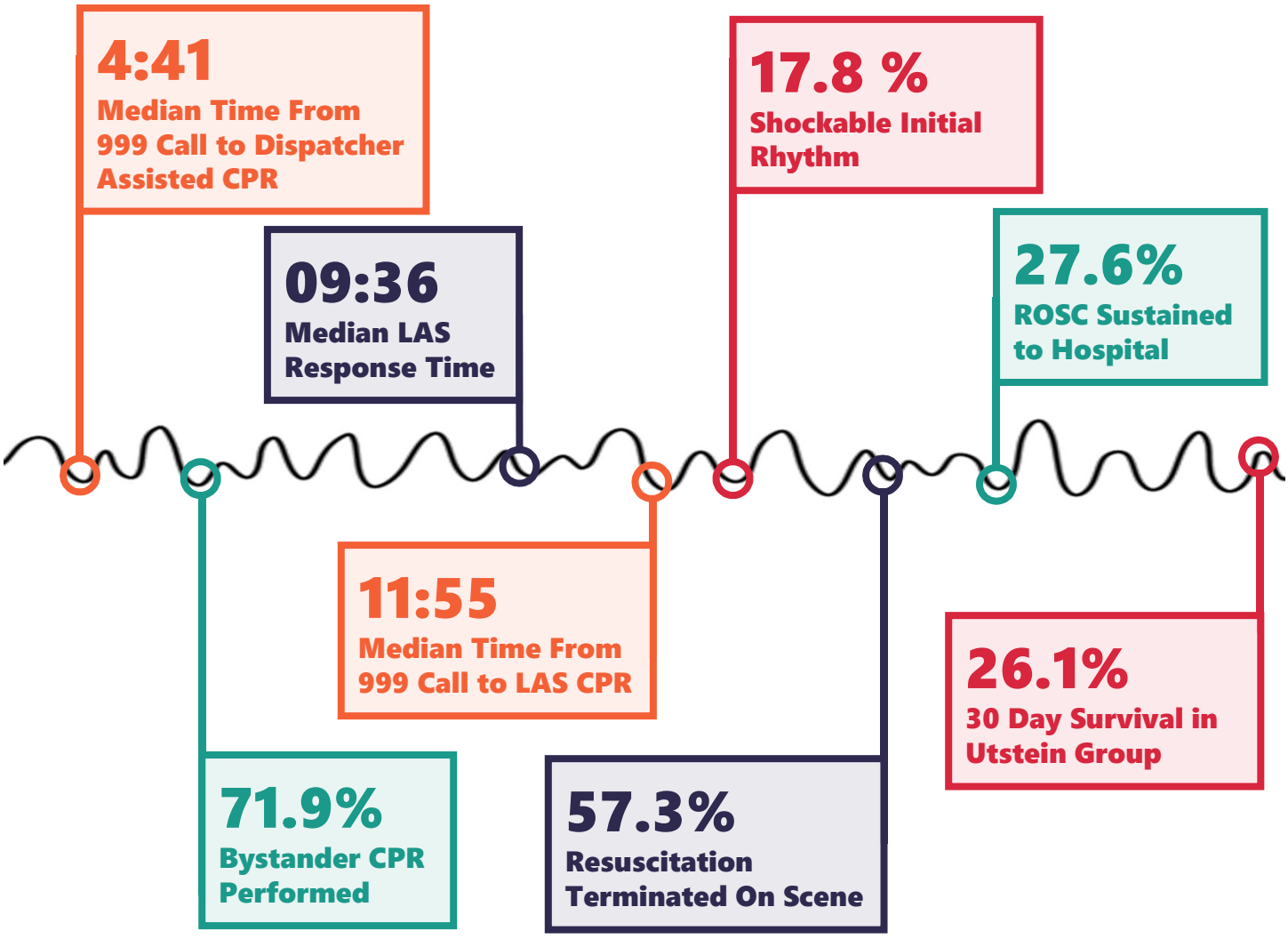
London Ambulance Service
NHS Trust

Cardiac Arrest Summary 2022-2023

12,948
Patients Attended

4,613
Resuscitation Attempted

7.8%
Survived For 30 Days



1. Introduction

Between 1st April 2022 and 31st March 2023, the London Ambulance Service NHS Trust (LAS) responded to 12,948 patients in Greater London who had a cardiac arrest. 44 of these patients (0.3%) had been successfully resuscitated by a member of the public following a public access defibrillator shock and did not require further cardiopulmonary resuscitation (CPR) from the LAS.

Our clinicians attempted resuscitation for 4,613 patients (35.6%). The remaining 8,291 patients (64.0%) had either already died before we arrived (n=4,957), had a valid Do Not Attempt Cardio-Pulmonary Resuscitation Order (DNAR) or equivalent in place (n=2,904), or there were other signs that resuscitation attempts would be futile (n=430).

Eighteen patients were attended by LAS clinicians outside of London in order to provide assistance to the local ambulance service. These patients are not included in this report.

2. Pre-Arrival Interventions

This section focusses on the bystander interventions that were delivered **before LAS arrived on scene** to all 12,948 patients that we attended in London this year.

2.1. Dispatcher-Assisted CPR

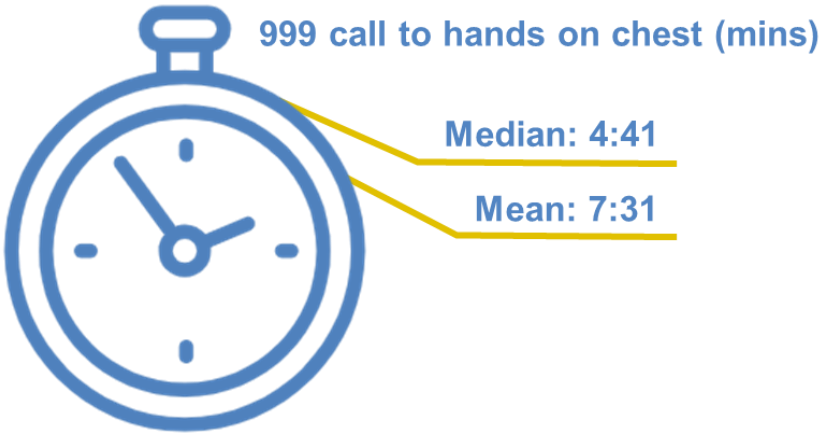


Figure 1: Average time to hands on chest for all patients who received dispatcher-assisted CPR (n=4,439)

- Dispatcher-Assisted CPR instructions were provided to **34.3%** of all patients (n=4,439), a reduction of 1.5% compared to 2021/22. Of note, some callers may refuse CPR instructions and, in some instances, CPR instructions may not be appropriate (e.g. when the call relates to an obvious or expected death).

- The mean time from the 999 call being connected to the ambulance service and dispatcher CPR instructions being given was **2 minutes and 48 seconds longer** this year than last year. This is consistent with the increased call answering times seen this year.

2.2. GoodSam[1] Responders

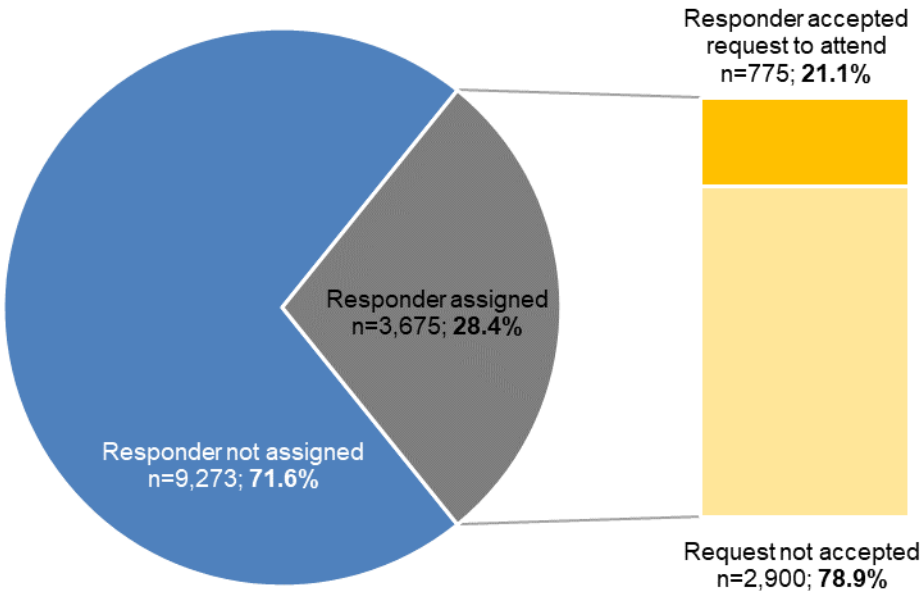


Figure 2: GoodSam responder assignments and acceptance

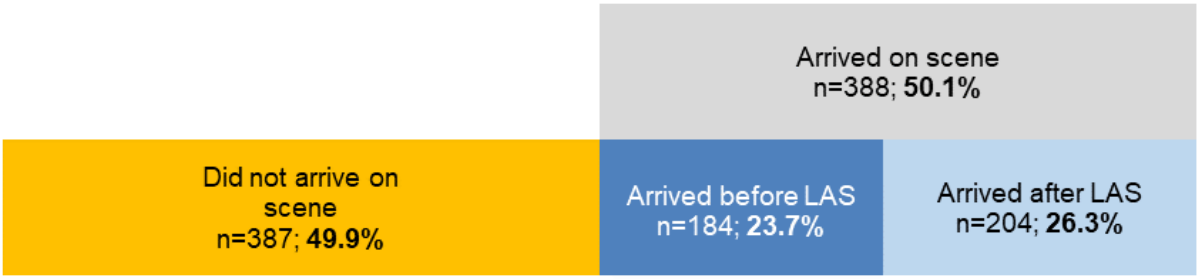


Figure 3: Outcome of GoodSam alerts accepted by a responder*

**Based on the responder 'arrival at scene time' recorded on the GoodSam app*

[1] GoodSam (https://www.goodsamapp.org/) is a mobile phone application that automatically alerts trained volunteer responders of cardiac arrest incidents in their area

- GoodSam volunteer responders were alerted to 28.4% of cardiac arrest incidents in London this year, an increase of 4.7% compared to 2021/22. **21.1%** (n=775/3675) of alerts were accepted by a volunteer, up 4.4%.

- Half (**50.1%**) of all responders who accepted an alert arrived on scene (up from 41.8% last year), with 23.7% arriving before the first LAS resource (compared with 13.5% in 2021/22).

- 75 patients who had a GoodSam responder arrive before LAS had resuscitation continued by our clinicians (40.8%). Of these, **24.0%** (n=18) achieved ROSC which was sustained until hospital arrival and **9.5%** (n=7/74) were alive at 30 days.

2.3. Public Access Defibrillation[2] (PAD)

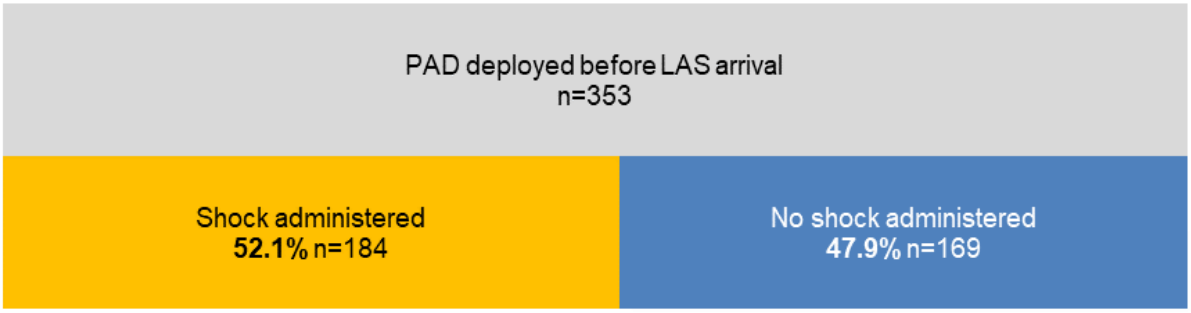


Figure 4: PAD deployments and shocks delivered before LAS arrival

[2] This analysis excludes patients who had been successfully resuscitated before arrival of LAS and for whom resuscitation was not attempted or continued by our clinicians.

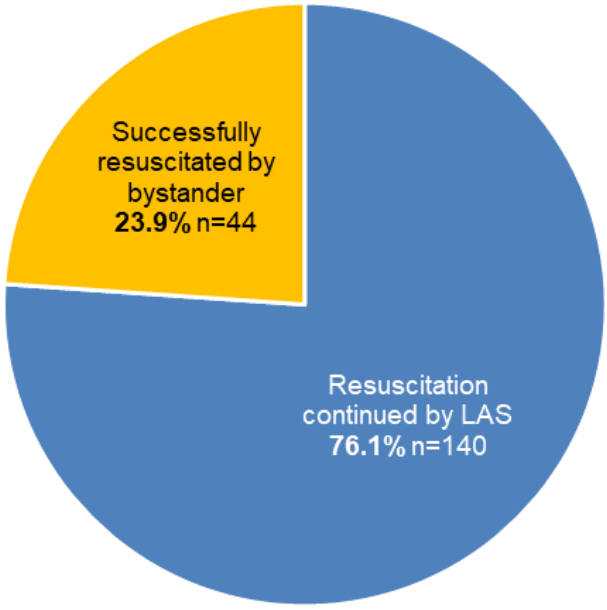


Figure 5: Patients who received a PAD shock and were successfully resuscitated before LAS arrival

- The number of patients who had a defibrillator applied prior to the arrival of LAS increased from 326 in 2021/22 to **353** this year.
- More than half of these patients (**52.1%,** n=184) received at least one defibrillator shock before LAS arrived.
- Of the patients who received a PAD shock, **44** were successfully resuscitated prior to the arrival of LAS clinicians and did not require further cardiopulmonary resuscitation by LAS.

3. LAS Resuscitation

In this section, we describe the demographics and care provided to the **4,613** patients in London for whom LAS clinicians attempted resuscitation.

3.1 Profile of arrests

Gender, n (%)	
Male	2,960 (64.2)
Female	1,626 (35.2)
Unknown	27 (0.6)

Age, mean (median) in years †	
Overall	65 (68)
Male	63 (66)
Female	67 (72)

Location, n (%)	
Private location	3,531 (76.5)
Private address	*3,362 (95.2)*
Care home	*169 (4.8)*
Public Location	1,082 (23.5)

Race, n (%)	
White	1,969 (42.7)
Black	277 (6.0)
Asian	293 (6.4)
Mixed	28 (0.6)
Other	95 (2.1)
Unknown	1,951 (42.3)

Chief complaints at the 999 call, n (%)	
Cardiac arrest	2,488 (53.9)
Unconscious/fainting	497 (10.8)
Breathing problems	290 (6.3)
NHS 111 Transfer	237 (5.1)
Falls	190 (4.1)
Other ‡	911 (19.7)

Table 1: Profile of cardiac arrests where resuscitation was attempted

† excludes cases with unknown age (n=24), ‡includes HCP admissions (n=14)

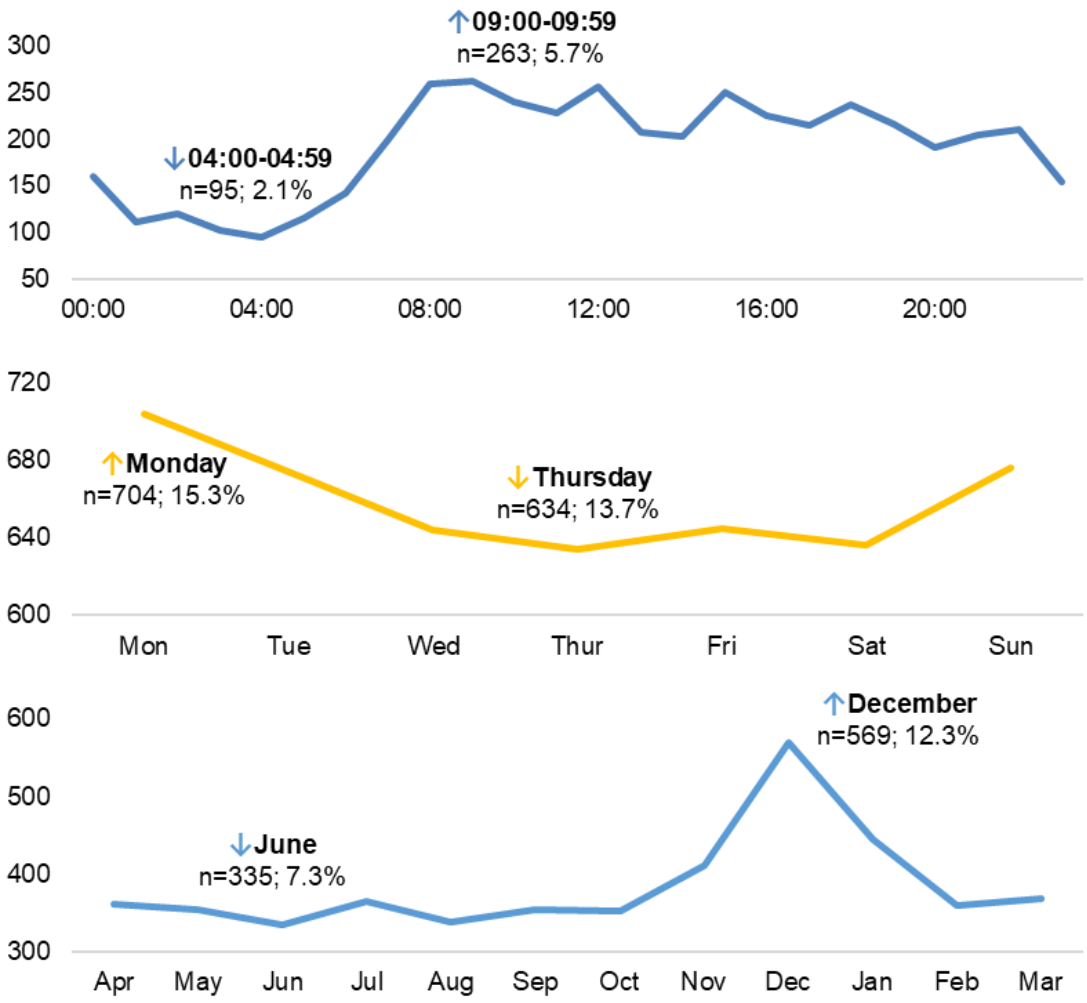


Figure 6: Peak occurrence of cardiac arrests where resuscitation was attempted

Arrows indicate the highest and lower number of incidents in each series

- Patients treated for cardiac arrest in London this year had similar demographics to those in 2021/22, although the average age of patients was slightly older this year (**65** vs 63 years).
- The number of cardiac arrests peaked between **09:00-09:59** and remained high during the daytime, with fewer cardiac arrests occurring overnight.
- **Thursday** was the day of the week with the fewest cardiac arrests (n=634).
- **December** had considerably more cardiac arrests than other months (n=569; 12.3%).

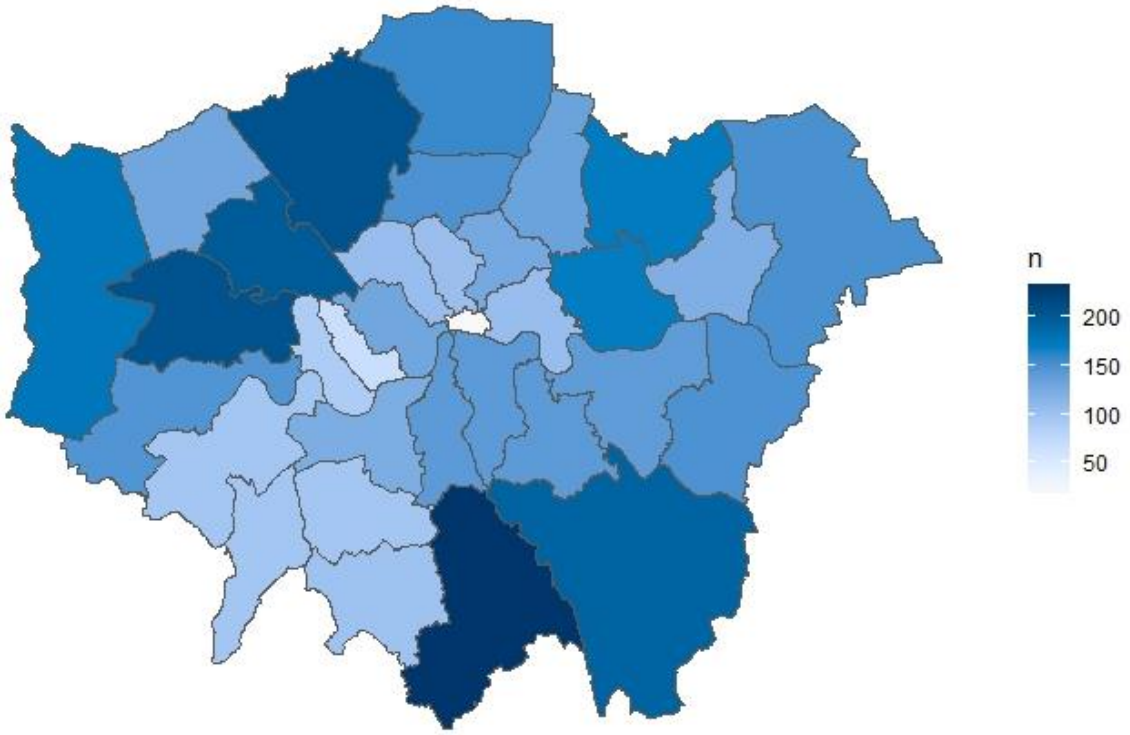


Figure 7: Count of cardiac arrest incidents by Local Authority District

- Consistent with previous years, there was considerable geographical differences in the number of cardiac arrests occurring across London, which may be due to differing sizes and demographics of the populations in each borough. The London Borough of Croydon had the highest number of cardiac arrest incidents (n=234).

3.2 Call answering times

Figure 8 shows the call answering times relating to patients who were subsequently confirmed as being in cardiac arrest by attending clinicians and had a resuscitation attempt made. The total number of emergency calls connected to our 999 contact centres is shown for context.

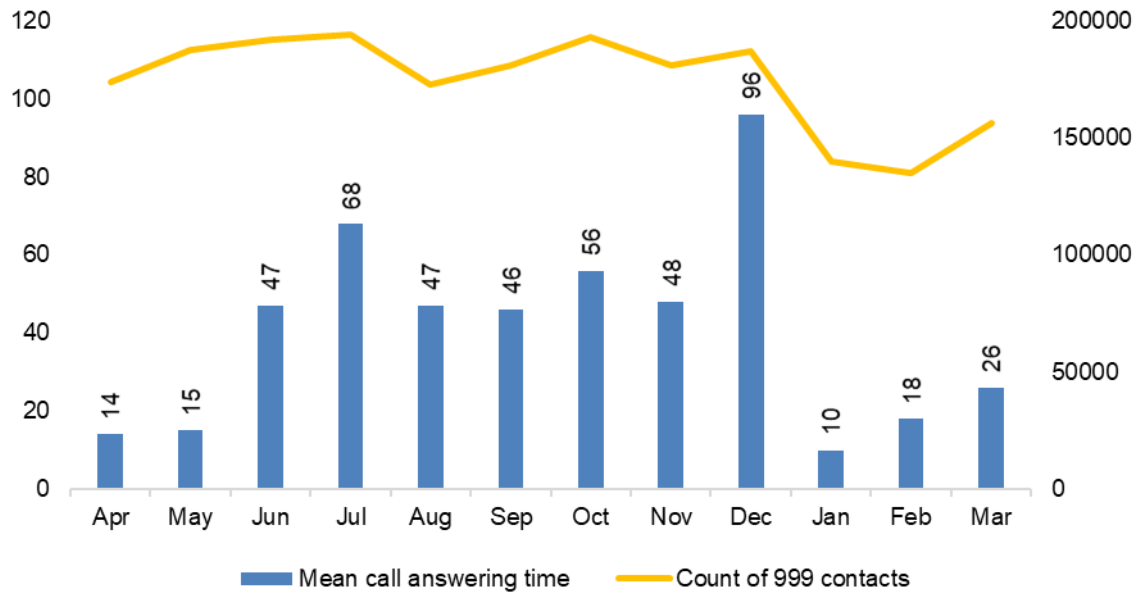


Figure 8: Mean call answering times (seconds) per month for cardiac arrest patients.

n=4,147; excluding calls transferred directly from another service and those with missing times.

- The mean 999 call answering time, once the call was connected to one of our emergency contact centres, was **42 seconds**.
- Call answering times were longest in **December** (96 seconds), falling sharply in January (10 seconds), corresponding with a drop in overall demand for our services.

3.3 Response times

This report provides the **clinical response interval** ('999 call' to 'arrival at scene'; Table 2). This is an international definition for reporting the response interval of clinical significance and starts at the time the 999 call is connected to the ambulance service, ending when the first vehicle's wheels stop turning upon arrival at scene (https://www.ahajournals.org/doi/pdf/10.1161/01.CIR.84.2.960). These times will be longer than times reported by the NHS England Ambulance Quality Indicators (AQIs) because they report a different interval. [3]

Clinical response intervals for this reporting period are provided in Table 2, along with corresponding information from the previous two years for comparison purposes.

Year	n	Mean	Median
2020-21	4,904	11:53	07:59
2021-22	4,366	14:22	09:00
2022-23	**4,610**	**16:06**	**09:36**

Table 2: '999 call to arrival at scene' clinical response intervals (mm:ss).

[3] NHS England AQI response intervals are measured using Clock Start to Clock Stop as per the national AmbSYS specification which can be found at: https://www.england.nhs.uk/statistics/statistical-work-areas/ambulance-quality-indicators/.

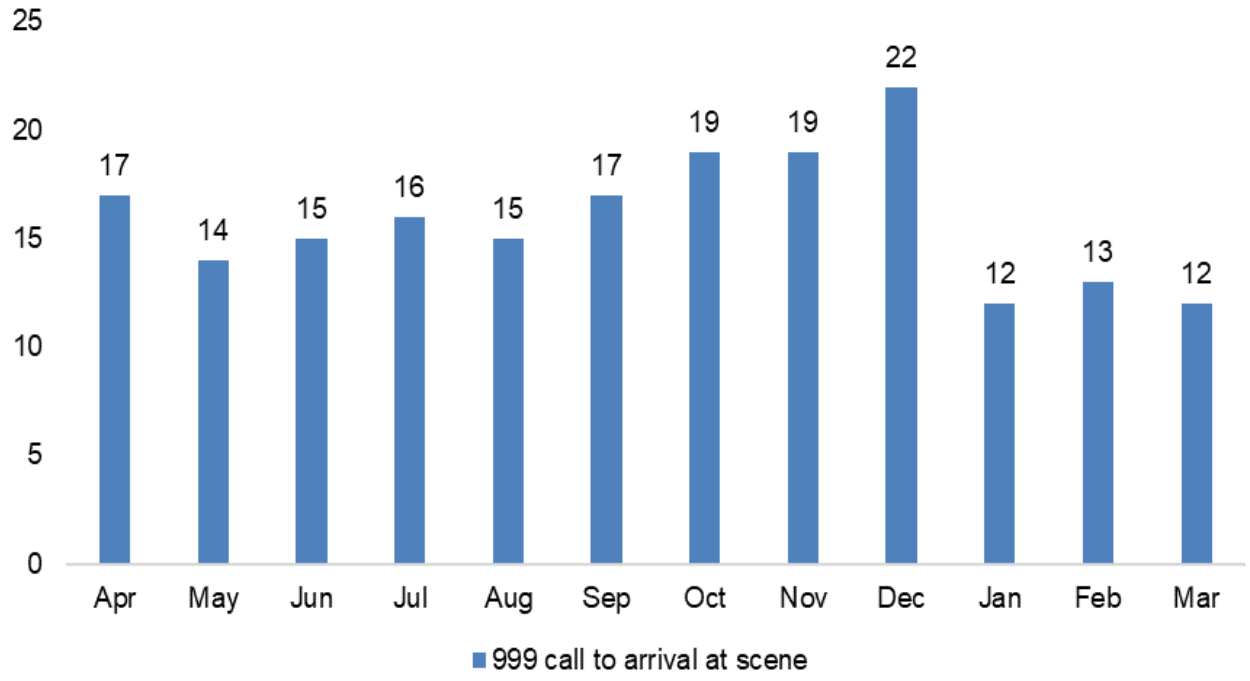


Figure 9: Mean response intervals per month (mins)

- The mean call to scene has **increased** from 14:22 in 2021/22 to **16:06** this year.
- Average response times varied month to month, with the longest average time seen in December 2021 (mean 22 minutes).

3.4 Key clinical intervention intervals

Interval	n	Mean	Median
999 call^ – LAS CPR*	2,615	17:13	11:55
999 call^ – LAS defibrillation*~	596	15:34	12:04

*^ Time the 999 call was connected to the ambulance service; * Excludes LAS witnessed arrests and incidents where times were not documented; ~ Based on an initial rhythm of VF/VT*

Table 3: Key time intervals from 999 call (mm:ss)

- We also observed **increases** in the mean time from 999 call to LAS CPR (up from 15:59 in 2021/22 to **17:13** this year) and the mean time from 999 call to LAS defibrillation (up from 14:11 in 2021/22 to **15:34** this year).

3.5 Bystander interventions

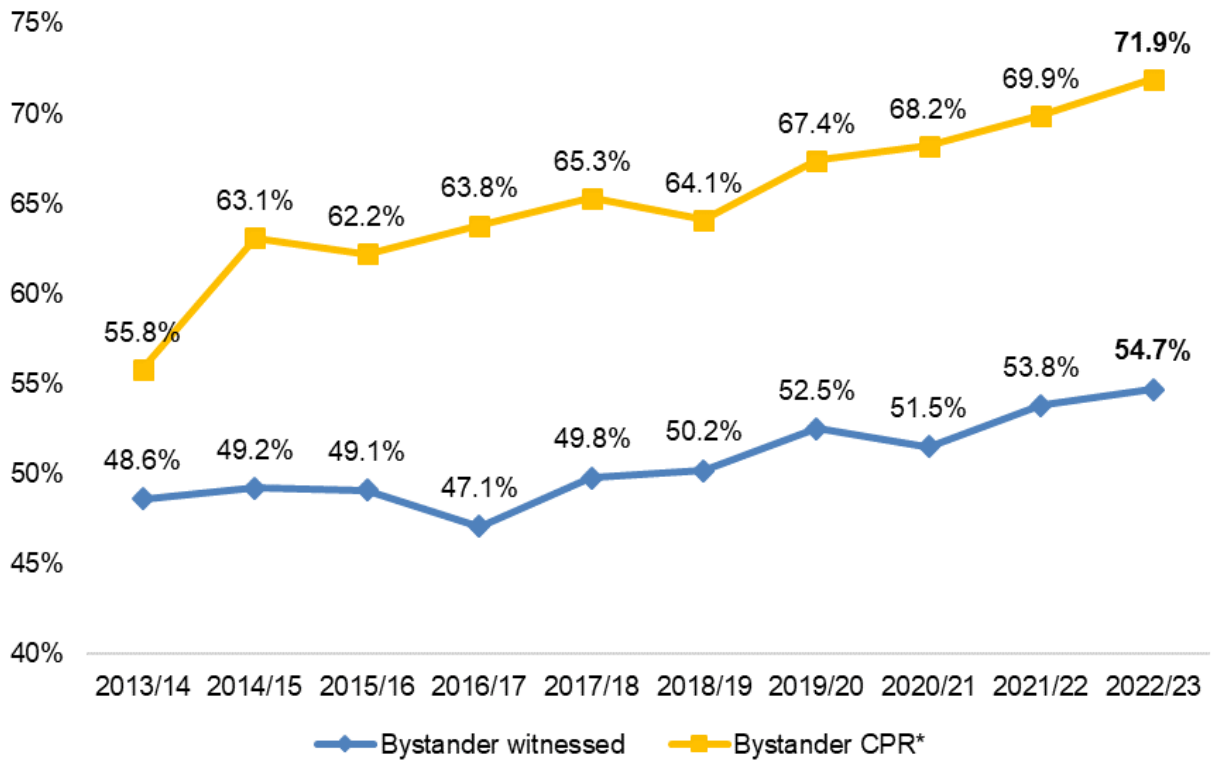


Figure 10: Bystander witnessed arrests and bystander CPR by year

**Excludes LAS witnessed arrests*

- There was a **slight increase** this year in the number of patients whose cardiac arrest was witnessed by a bystander (**54.7%** compared with 53.8% in 2021/22).
- The number of patients for whom a bystander started CPR before LAS arrival **increased by 2%** this year. At **71.9%,** this is the highest rate of bystander CPR we have ever reported.

3.6 Clinical Presentation

3.6.1 Aetiology

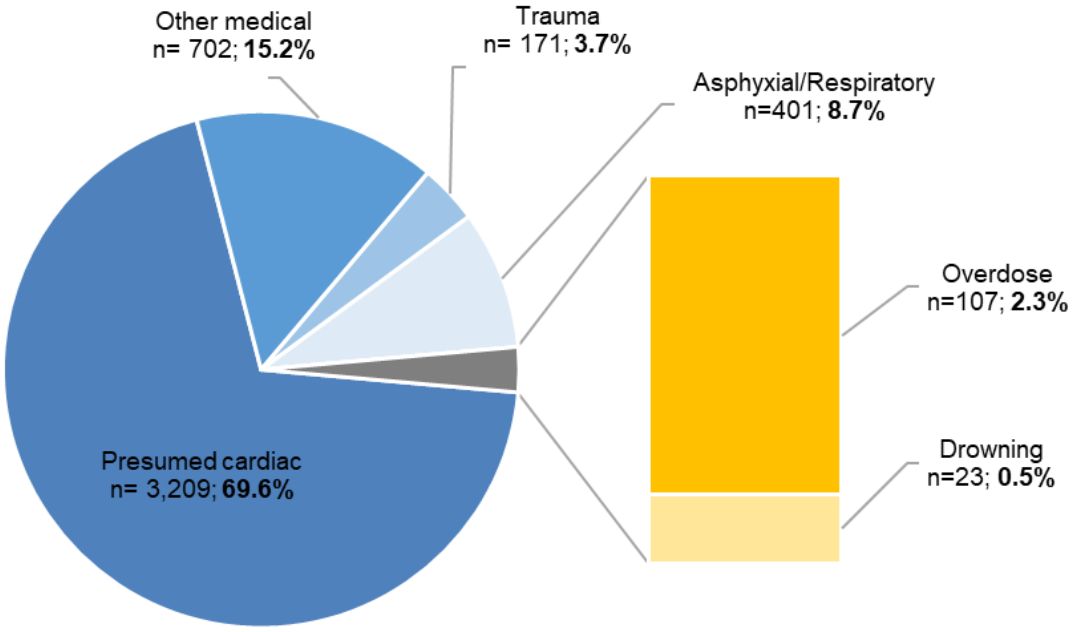


Figure 11: Breakdown of aetiology of cardiac arrests

- As in previous years, most cardiac arrests (**69.6%**) were attributed to a presumed cardiac cause, which includes cases with no other obvious cause.
- There was a slight reduction in the proportion of patients who experienced a cardiac arrest as a result of trauma this year (3.7% vs 4.1%).

3.6.2 Initial arrest rhythm

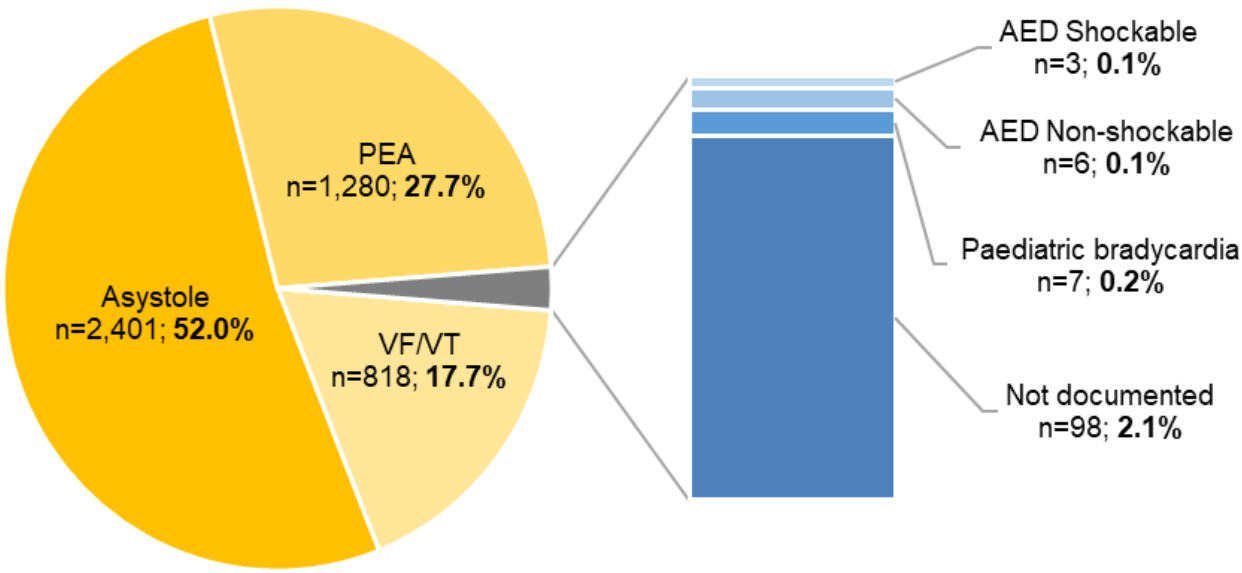


Figure 12: Breakdown of initial recorded cardiac rhythm

- Whilst the proportion of patients presenting in PEA decreased slightly this year (27.7% vs 29.0%), the proportion of patients presenting in **asystole increased**, accounting for more than half of all patients (**52.0%** vs 48.2%).
- There was a **1.7% decrease** in the proportion of patients presenting in **VF/VT** this year (**17.7%** vs 19.4%).

3.7 Conveyance

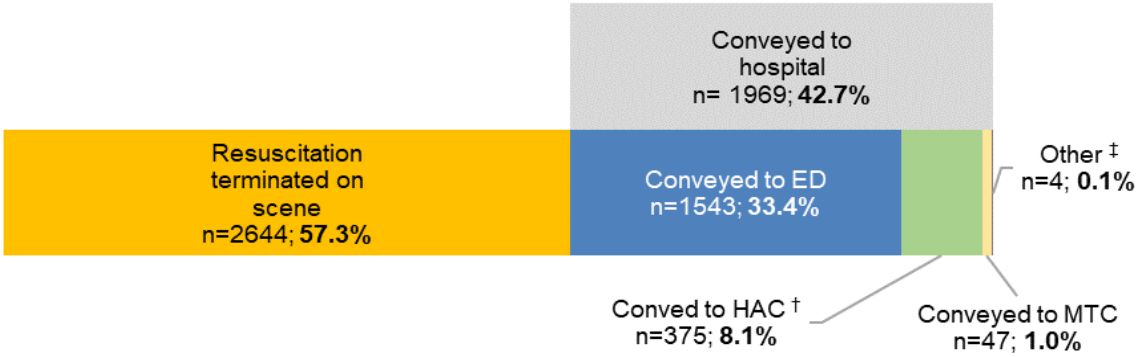


Figure 13: Breakdown of conveyance by destination

† Includes two patients conveyed to an Emergency Arrhythmia Centre. ‡ Two new-born patients conveyed directly to a maternity unit; two patients whose destination could not be determined

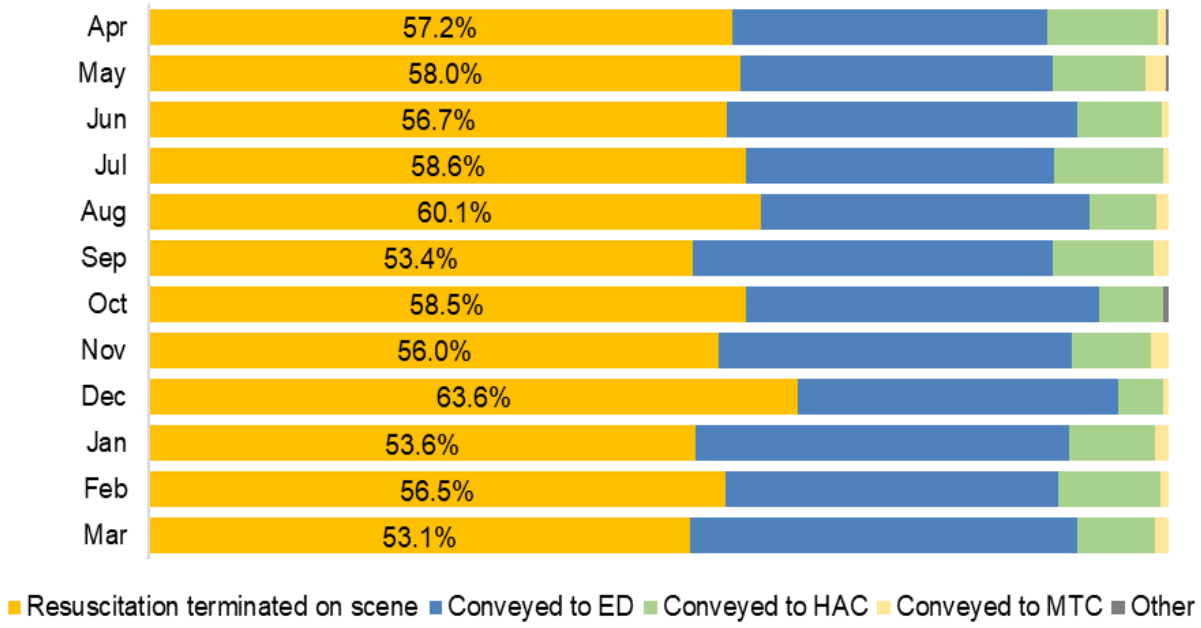


Figure 14: Breakdown of conveyance destination by month

- Fewer patients had resuscitation terminated on scene compared with 2021/22 (57.3% vs 59.0%).
- Similar numbers of patients were conveyed to specialist facilities this year: 8.1% to a Heart Attack Centre (8.2% in 2021/22) and 1.0% to a Major Trauma Centre (1.0% in 2021/22).
- There was monthly variation in the number of patients who had a resuscitation attempt terminated on scene, ranging from 53.1% in March 2022 to 63.6% in December 2021.

4. Patient outcomes

In this section, we provide the outcomes for two groups of patients according to international reporting guidelines:

1. **Overall group**: all patients for whom resuscitation was attempted by LAS.

2. **Utstein comparator group**: a sub-group of patients for whom resuscitation was attempted following a cardiac arrest of a presumed cardiac cause, which was bystander witnessed, and presented in a shockable rhythm.

4.1 Return of spontaneous circulation (ROSC)

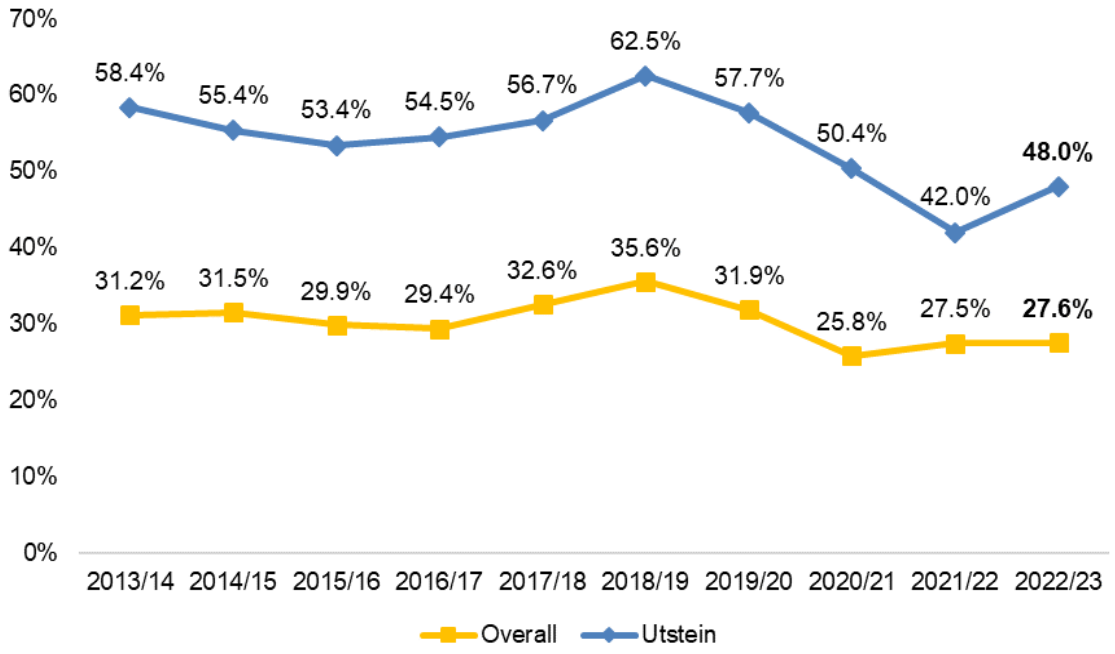


Figure 15: ROSC sustained to hospital per year

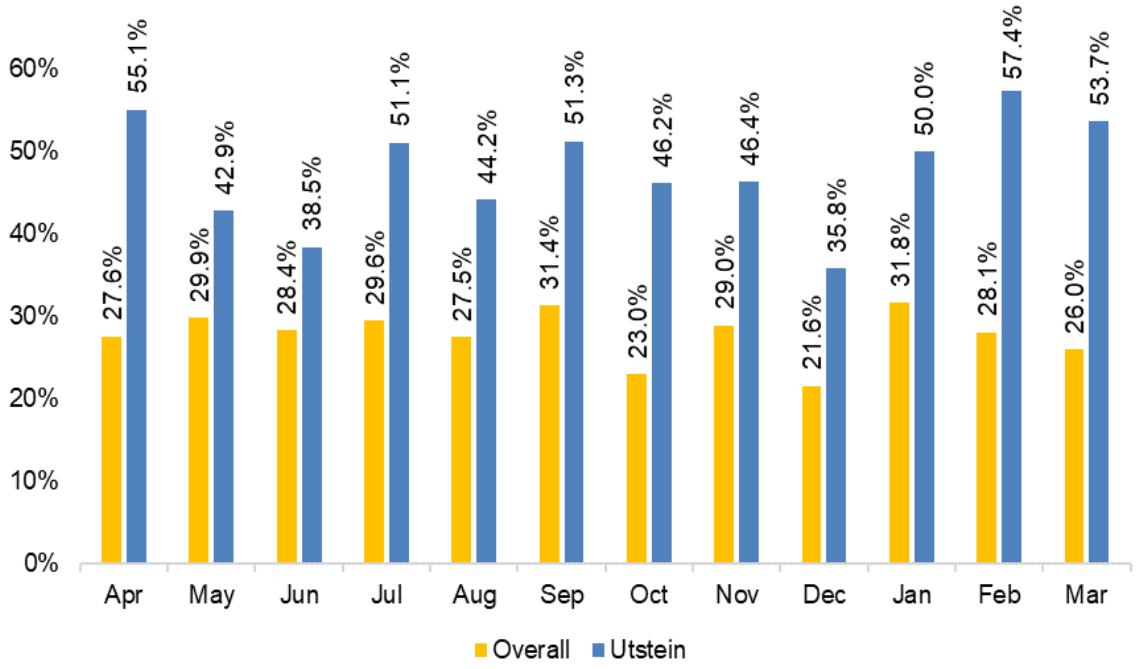


Figure 16: Monthly ROSC sustained to hospital

- The proportion of patients who achieved a ROSC which was sustained until arrival at hospital was **similar to last year** (**27.6%** vs 27.5%)
- In the Utstein comparator group, the rate of ROSC sustained to hospital arrival **increased by 6.0%** compared with 2021/22. However, whilst heading in an upwards direction, this figure of **48.0%** remains below the rates observed over the previous 10 years.
- The proportion of patients achieving ROSC sustained to hospital arrival varied throughout the year, with the lowest rates for both the overall and Utstein comparator groups observed in December 2021.

4.2 Survival

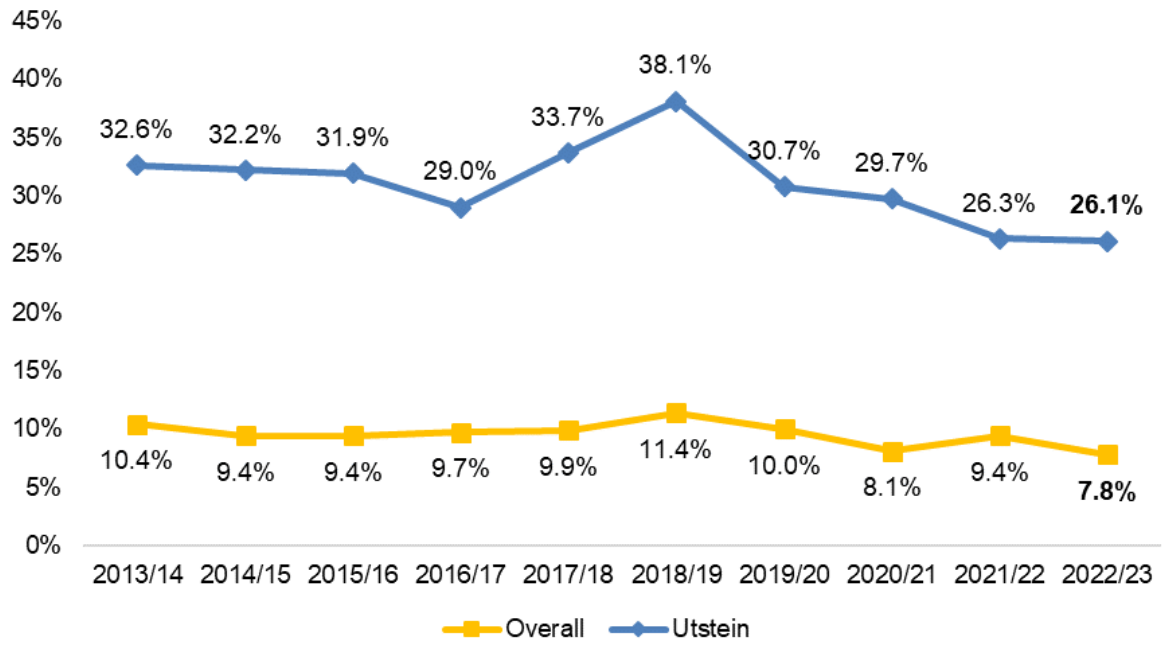


Figure 17: 30 day survival per year

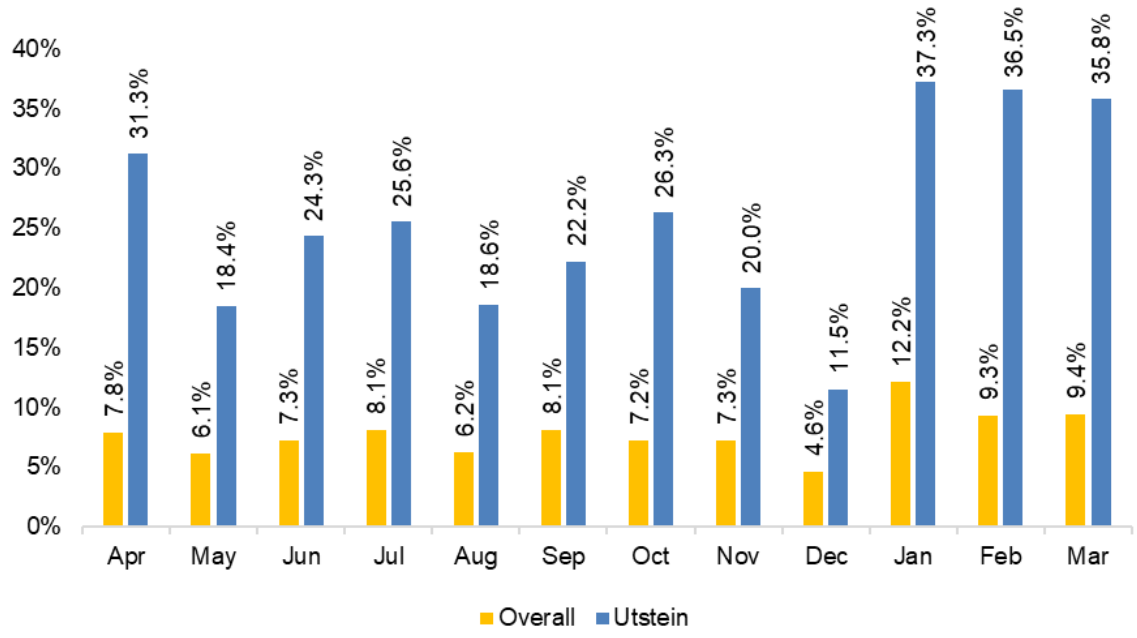


Figure 18: Monthly 30-day survival

- **7.8%** of all patients were still **alive 30 days** after their cardiac arrest. This is a **reduction of 1.6%** compared with 2021/22 and is the **lowest figure** observed in the last 10 years.
- Survival also reduced slightly in the Utstein comparator group, falling from 26.3% in 2021/22 to **26.1%** this year.
- The rate of survival varied throughout the year. The lowest rates were observed in **December 2021** with the highest rates seen in **January 2022.**

Group	30 Day Survival	
	LAS	National Average
Overall group	7.8%	7.8%
Utstein comparator group	26.1%	25.1%

Table 4: LAS survival compared with the national average for England.

- The survival rate in the overall group was **the same as the national average** this year (7.8%) whilst in the Utstein comparator group, it was **1% higher** (26.1% vs 25.1%).

5. Conclusions

This was another challenging year for the LAS with overall response times increasing by almost two minutes and the average time from the 999 call to dispatcher assisted CPR instructions being initiated increasing by almost three minutes. This can be partly explained by the extended call answering times we experienced throughout the year due to sustained levels of high demand. Late 2022 was particularly challenging, with performance improving in January when we saw a significant reduction in overall demand for our services and improved rates of staff sickness, which corresponded with improved call answering times, faster overall response times and improved outcomes for our patients.

Despite the challenges, we have seen encouraging improvements in the community response to cardiac arrest this year. For the first time ever, more than 70% of cardiac arrest patients in London had CPR attempted by a bystander before our arrival, and we also saw encouraging increases in the number of patients who had a public access defibrillator applied. The use of GoodSam (to alert volunteer responders to a cardiac arrest) is improving, with more than a quarter of cardiac arrest incidents generating an alert in the system, and more responders accepting alerts and arriving on scene before our clinicians.

Compared with last year, we saw fewer patients presenting in a shockable rhythm, with more patients presenting in asystole, which is something that may be partly explained by the increased response times. However, once resuscitation was started, fewer patients had their resuscitation attempt terminated on scene by our clinicians, with more patients being conveyed to hospital.

The proportion of all patients who achieved a ROSC that was sustained until hospital arrival did not significantly change this year (increasing by just 0.1%), but we did observe an increase of 6% in the Utstein comparator group. It is important to note however, that these figures remain below the rates we observed prior to the COVID-19 pandemic.

Overall survival was lower this year than in previous years at 7.8%, having reduced by 1.6% compared with 2021/22, and is the lowest figure we have reported over the last 10 years. Survival was more stable in the Utstein comparator group, reducing by just 0.2%. However, at 26.1%, this survival rate is also the lowest figure we have reported in more than 10 years. Importantly, when compared to the rest of England, our overall survival rate matches the national average, and survival in the Utstein comparator group is 1% above average.

This year we have continued our efforts to improve the response to patients in out of hospital cardiac arrest in London. We continue to advocate and support the delivery of community

first aid training, the use of the GoodSam volunteer responder app, and the roll-out of public access defibrillators. In September 2022, we introduced a new Computer Aided Dispatch (CAD) system and, as part of this process, we joined The Circuit national defibrillator network[4] giving our 999 call handlers access to up-to-date information about defibrillator availability.

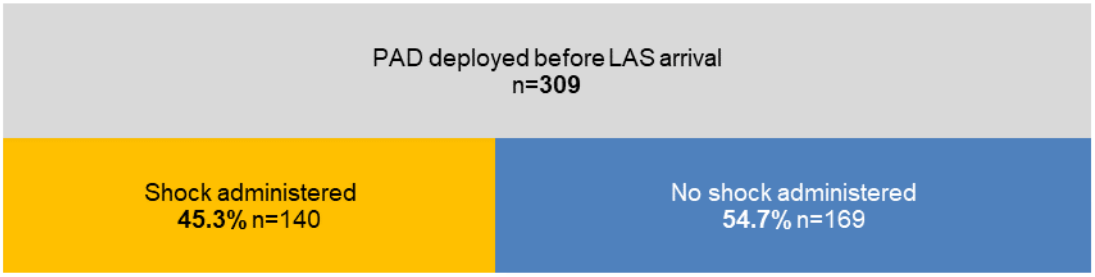
We have continued to participate in a range of research studies aiming to improve our cardiac care, enrolling a total of 1,036 of our cardiac arrest patients into trials this year. In December 2022, we completed the ARREST trial which aimed to determine the best post-resuscitation care pathway for cardiac arrest patients without ST-segment elevation, the results of which were published in The Lancet in August 2023[5].

We provided refresher training in adult, paediatric and neonatal life support to all our clinicians this year and, in recognition of their contribution to patient survival, we sent thank you letters to 1,697 clinicians, call handlers and dispatchers who were involved in successful resuscitation attempts in 2022/23.

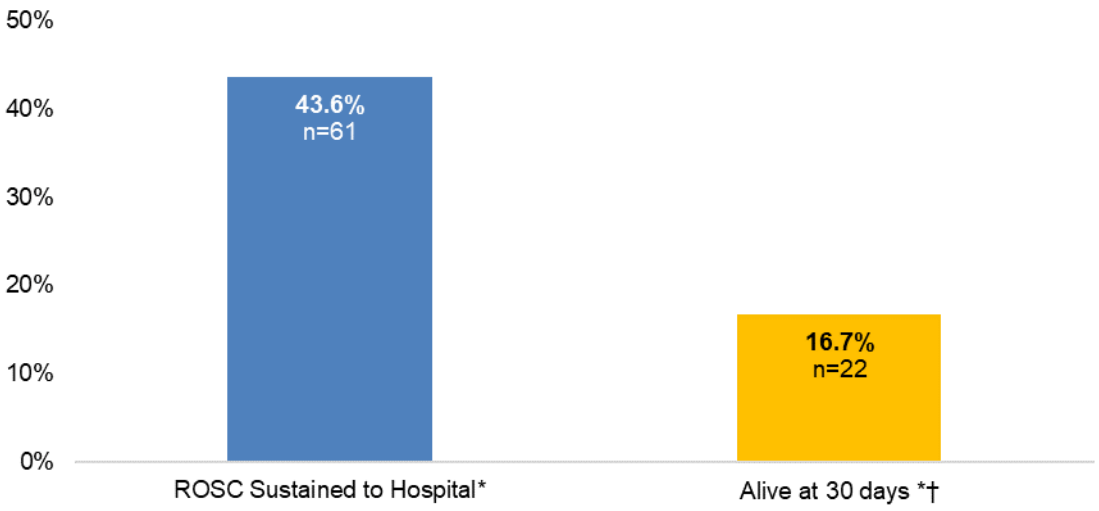
[4] https://www.thecircuit.uk/
[5] https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(23)01351-X/fulltext

Appendix 1 – Outcomes of Public Access Defibrillator (PAD) Use

A PAD was deployed to 353 patients before arrival of the LAS (section 2.3). 309 (87.5%) had resuscitation continued by LAS clinicians and their outcomes are reported here.



Public access defibrillator where resuscitation was attempted by LAS



Outcomes for patients who received a PAD shock and had resuscitation continued by LAS
**includes only cases where a PAD shock was delivered; † excludes incidents where outcome is unknown (n=8)*

- The number of patients who had a PAD deployed and went on to have resuscitation attempted by our clinicians increased from 286 in 2021/22 to 309 this year.
- A shock was delivered before LAS arrival for 45.3% of these patients, a reduction of 2.6% compared with last year.
- The proportion of patients who survived their cardiac arrest following a PAD shock reduced from 25.2% in 2021/22 to 16.7% this year.

Appendix 2 – Utstein survival template