



ST Elevation Myocardial Infarction Annual Report 2017/18

November 2018

Produced by:

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

✉ CARU.Enquiries@lond-amb.nhs.uk

© London Ambulance Service NHS Trust 2018. Not to be reproduced in part or in whole without permission of the copyright holder.



Contents

STEMI overview 2017/18 infographic

1	Introduction	1
2	Findings	1
2.1	Patient demographics	1
2.2	Call information	2
2.3	Infarct details	3
2.4	Response information.....	3
2.5	On-scene times	6
2.6	STEMI patient care	7
2.6.1	Care bundle compliance	7
2.6.2	Aspirin and glyceryl trinitrate (GTN).....	7
2.6.3	Pain assessment and management	8
2.7	Conveyance.....	10
2.7.1	Destination of STEMI patients	10
2.7.2	Journey and call to hospital times	11
2.8	Reperfusion and patient outcomes	12
3	Quality Improvement activity	14
4	Summary	14
5	Looking forward	14
	References	15
	Glossary of abbreviations and terms	15
	Appendix 1: On-scene times and care bundle provision by Clinical Commissioning Group of incident location	17
	Appendix 2: On-scene times and care bundle provision by LAS Group Station	18



London Ambulance Service
NHS Trust

STEMI Overview | 2017-18

Patients

3,536

Total number of suspected STEMI's

74%
59 years



26%
71 years

Assessment and treatment



74%
Care
Bundle

Triage and outcomes



99.8%
Appropriately
triaged



98%
Conveyed to a specialist
heart attack centre (HAC)



89%
Confirmed STEMI and
received pPCI treatment

Timings



999 call to
arrive scene

16 mins



Overall
on-scene

41 mins



Journey to
HAC

18 mins



999 call to
pPCI

127 mins



Page intentionally blank

1 Introduction

From 1st April 2017 to 31st March 2018, the London Ambulance Service NHS Trust (LAS) attended 3,536 patients with a suspected ST-Elevation Myocardial Infarction (STEMI).

When attending a STEMI patient, LAS staff will carry out a range of assessments including a 12 lead electrocardiogram (ECG), before commencing treatment as appropriate. Suspected STEMI patients should be transported directly to a Heart Attack Centre (HAC) to enable cardiac specialists at the catheter laboratory to perform immediate angiography and reperfusion procedures as required.

This report presents information regarding the clinical care provided and the outcomes of STEMI patients. Data has been sourced from the LAS' Acute Coronary Syndrome (ACS) registry, which captures clinical information from Patient Report Forms (PRFs) and 12 lead ECG strips, and operational information from vehicle Mobile Data Terminals and emergency call logs. Outcome data is collected from hospital patient records and the Myocardial Ischaemia National Audit Project (MINAP) database.

2 Findings

2.1 Patient demographics

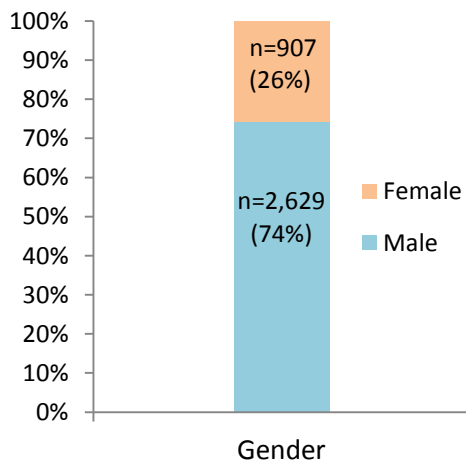


Figure 1: Gender distribution

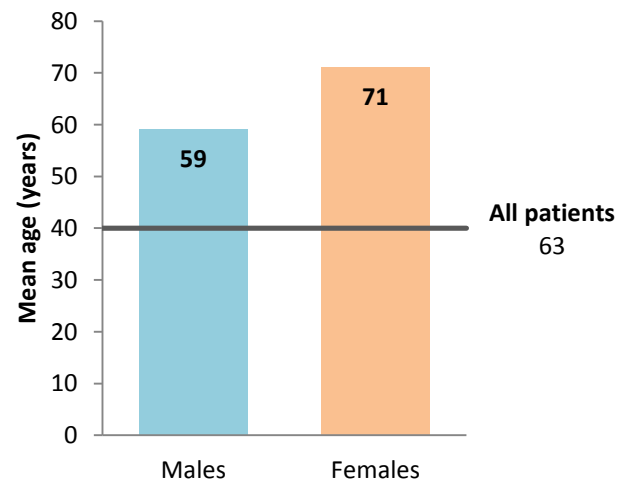


Figure 2: Age of STEMI patients by gender

- As in previous years, three-quarters of patients were male.
- The mean patient age was 63 years, with males being 12 years younger than females.

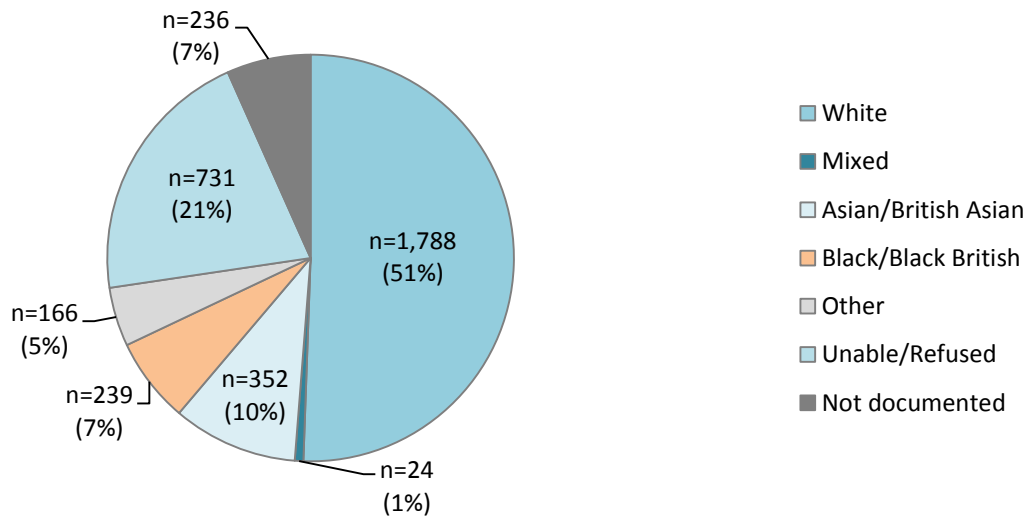


Figure 3: Breakdown of patient race

- Half of all patients were of a white race.
- A fifth of patients either refused or were unable to provide information regarding their race.

2.2 Call information

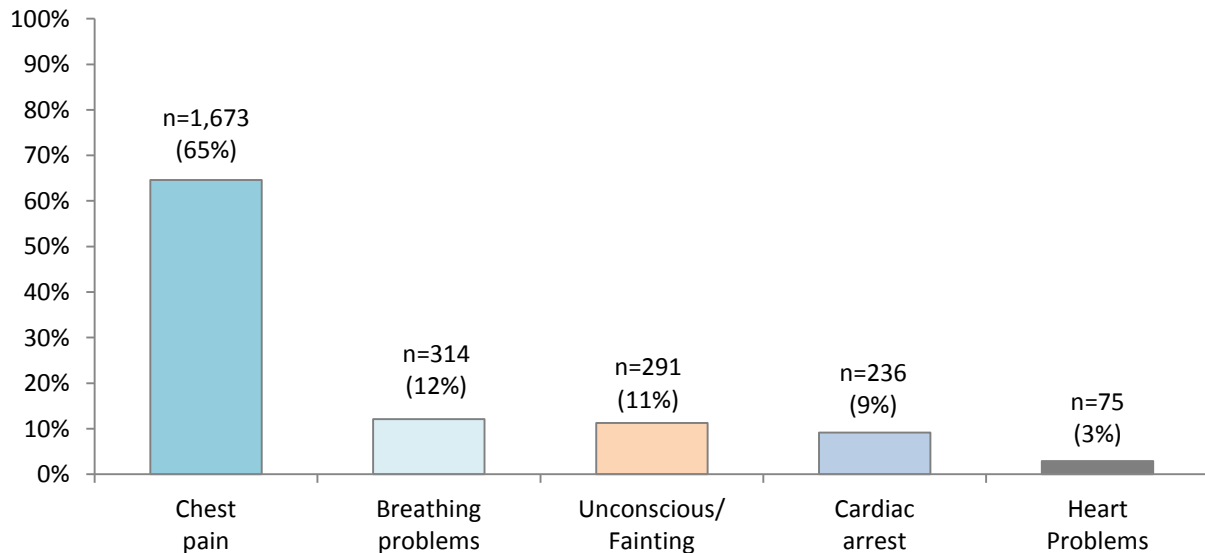


Figure 4: Top 5 chief complaints from emergency calls from members of the public

- 88% (n=3,113) of calls were from members of the public; an increase of 7% from 2016/17.
- Based on the information provided by the caller, chest pain was identified from the emergency call as the chief complaint for 54% of patients; a notable decrease of 6% from last year.
- Calls from 111 providers and Health Care Professionals (e.g. GPs) accounted for 12% (n=423) of patients attended by the LAS.

2.3 Infarct details

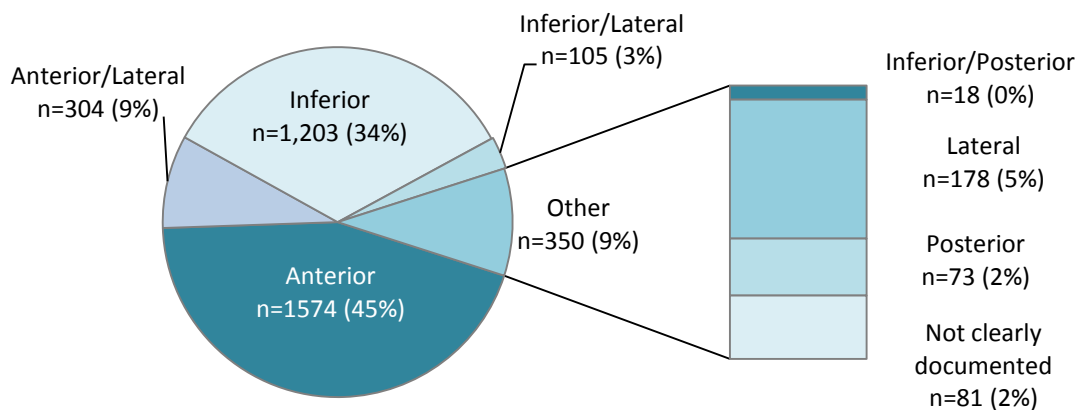


Figure 5: Location of infarct

- In line with previous years, the most prevalent location for the infarct was the anterior region of the heart (45%), followed by the inferior region (34%).
- For 2% of cases, the infarct location was not clearly documented.

2.4 Response information

On 1st November 2017, the LAS implemented the new national standard for call categorisation and associated response times as defined by NHS England's Ambulance Response Programme (ARP). As the new standards redefined response categories and the way response times are measured, this section is divided into two parts representing performance against the previous definitions (pre-ARP) and the new standards (post-ARP).

2.4.1. 1st April 2017 – 31st October 2018 (Pre-ARP)

During this period, calls were categorised as Red or Green calls. The highest priority (Red) response category was sub-divided into Red 1 and Red 2 (with Red 1 indicating those incidents which were immediately life-threatening). Red 1 responses were measured from the time the call was connected by the operator. The remaining categories allowed a period of time for information gathering by the EMD in order to assign the most appropriate response to each patient. For all categories, the clock stopped when the first resource arrived on scene. Red calls had a national target of 75% of patients receiving a response within 8 minutes.

Category	No. (%)	Response time, minutes		
		Mean	Median	90 th Centile
Red 1	168 (8%)	7	7	10
Red 2	1,674 (84%)	8	7	14
Green	160 (8%)	29	20	64
Overall[†]	2,004	10	7	16

[†]A specific category was not allocated to two incidents.

Table 1: Category by response time (Pre-ARP)

2.4.2. 1st November 2018 – 31st March 2018 (Post-ARP)

From 1st November 2017, calls were categorised into four groups from Category 1 for 'life-threatening illnesses or injuries' such as cardiac arrest through to 'less urgent conditions' in Category 4. For each category, the response time is measured using a set of rules that define the point at which the clock starts and the type of resource that is required to arrive on scene for the clock to stop (see overleaf).

Category	Response standard (minutes)		Definitions
	Mean	90 th centile	
Category 1 (Life threatening)	7	15	<u>Clock start</u> The earliest time that: <ul style="list-style-type: none"> • the call is assigned a chief complaint; or • the first resource is dispatched; or • 30 seconds from the call connecting. <u>Clock stop</u> The arrival of the first LAS resource (whether a solo responder or an ambulance).
Category 2 (Emergency)	18	40	<u>Clock start</u> The earliest time that: <ul style="list-style-type: none"> • the call is assigned a chief complaint; or • the first resource is dispatched; or • 240 seconds from call connect <u>Clock stop</u> The arrival of the first LAS vehicle able to transport the patient to hospital.
Category 3 (Urgent)	120 (maximum time)		<u>Clock stop</u> The arrival of the first LAS vehicle able to transport the patient to hospital.
Category 4 (Less urgent)	180 (maximum time)		

A set of pre-triage questions are used to help early recognition of life-threatening conditions. This enables a rapid dispatch of a resource to Category 1 calls. Emergency Medical Dispatchers (EMDs) have additional time to continue to further triage lower priority response category calls so that the most appropriate response for the patient's condition can be assigned.

Category	No. (%)	Response time, minutes		
		Mean	Median	90 th Centile
Category 1	197 (13%)	9	6	11
Category 2	1,228 (80%)	21	15	42
Category 3	87 (6%)	55	29	152
Category 4	19 (1%)	74	74	161
Overall[†]	1,531	22	14	45

[†] One incident has been excluded as, although it occurred on 1st November 2017, it was before the ARP standards were operational.

Table 2: Category by response time (Post-ARP)

- In the pre-ARP period, 84% of calls were categorised as requiring a Red 2 response.
- Under the new ARP standards, the majority of calls were allocated a Category 2 response.
- During the pre-ARP period, STEMI patients received a mean response of 10 minutes, with a median time of 7 minutes.
- The post-ARP mean response was 22 minutes from clock start to arrival of an appropriate response. The median time was 14 minutes.
- Comparing the time taken for a vehicle capable of transporting a patient to arrive on scene, the pre-ARP mean response was 20 minutes and the post-ARP mean response was 25 minutes.

2.5 On-scene times

The type of response dispatched to the scene is based on the response category allocated. The highest priority patients will often receive a solo responder (i.e. a car, motorbike, cycles) to initially assess and treat the patient, followed by an ambulance that can convey the patient to hospital. Lower priority patients may still receive a solo responder, but the aim is to dispatch an ambulance that can treat and convey the patient.

From the arrival of:	On-scene time, minutes		
	Mean	Median	90 th centile
First attending vehicle	41	38	62
First conveying ambulance	35	32	54

Table 3: On-scene times

- The mean on-scene time from the arrival of the first attending vehicle to the conveying ambulance leaving scene decreased by 2 minutes from last year to 41 minutes.
- When measuring on-scene times from the arrival of the first vehicle capable of conveying the patient to the time the transporting ambulance left scene, the mean was 35 minutes (1 minute longer than in 2016/17).

2.6 STEMI patient care

2.6.1 Care bundle compliance

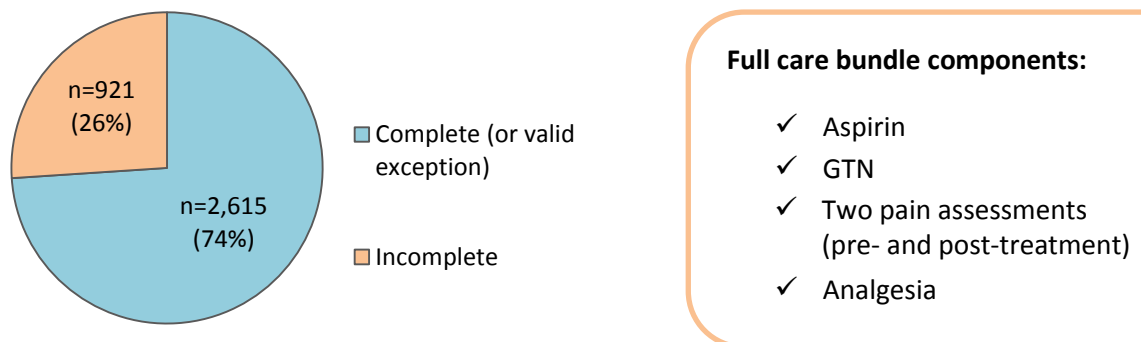


Figure 6: Full care bundle administration

- 74% of patients received a complete care bundle or had a valid exception; a 1% increase from last year
- Further details regarding the performance against the specific components of the care bundle are provided in section 2.6.2 and 2.6.3.

2.6.2 Aspirin and glyceryl trinitrate (GTN)

Patients presenting with a STEMI should be administered aspirin and GTN as soon as possible to increase the blood flow to the heart.

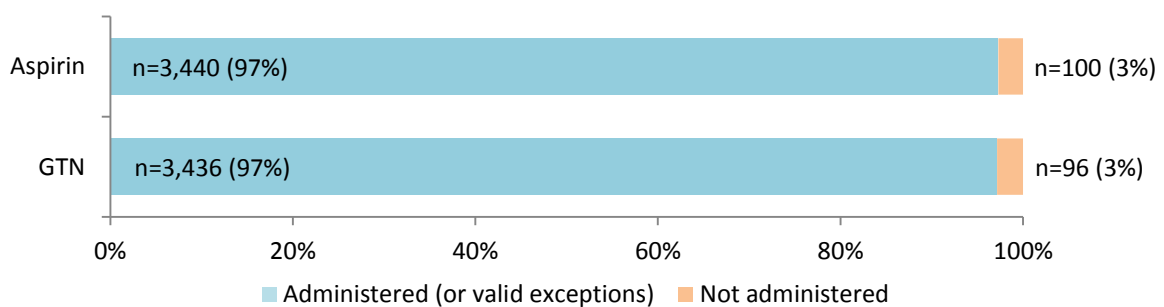


Figure 7: Aspirin and GTN administration

- Administration of both aspirin and GTN remained at a high level, with 97% of patients receiving each drug.

2.6.3 Pain assessment and management

Patients should have their level of pain assessed to ensure that the appropriate treatment is provided. Ideally, the pain will be quantified using a numerical rating scale (scored from 0 to 10), or where this is not possible, a qualitative assessment describing the pain experienced.

Where a patient is pain-free (either as a result of an atypical presentation or as a result of the administration of aspirin and GTN), analgesia is exempted. Where pain has been described as mild (a score of 1 to 3), Entonox is the indicated drug. For higher levels of pain, patients should be provided with morphine. Entonox is also an option for patients with moderate to severe pain where it is not possible to administer morphine (e.g. where intravenous access is unsuccessful or where there is no paramedic available), or as a precursor to morphine administration.

Pain should be reassessed in order to determine the effectiveness of the treatment and whether the patient has any further analgesic needs.

2.6.3.1 Pain assessment

- Overall, 96% of patients (n= 3,404) received a pre- and post-treatment pain assessment (or had a valid exception).
- 4% of patients (n=132) did not receive two pain assessments and there were no valid reasons documented for this.

2.6.3.2 Analgesic drugs administered

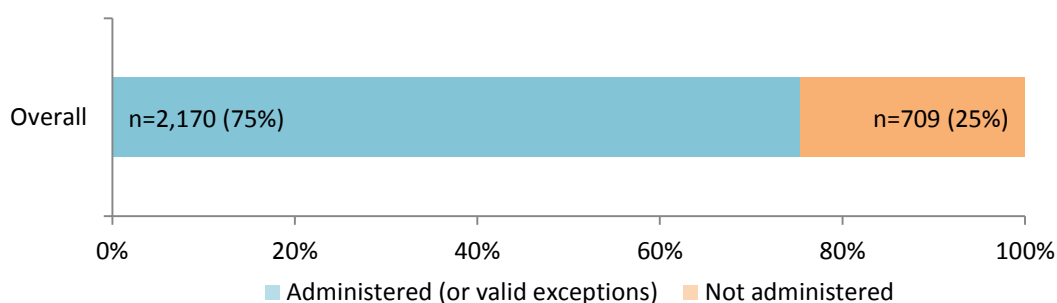


Figure 8: Administration of analgesia

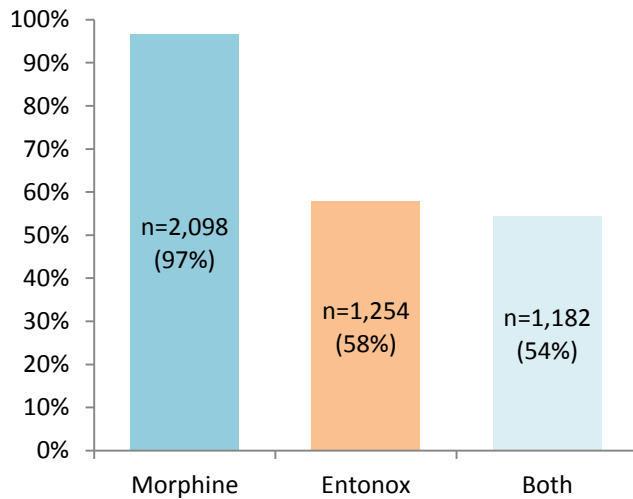


Figure 9: Type of analgesia administered

- 81% of patients (n=2,879) reported they were in pain, and three-quarters received at least one form of analgesia (or had valid exceptions to both). This is a decrease of 6% from last year.
- When analgesia was administered, morphine was the most prevalent drug used.
- Further details regarding the pain level reported by the 709 patients who did not receive analgesia can be found in 2.6.3.3.

2.6.3.3 Pain level of patients not receiving analgesia

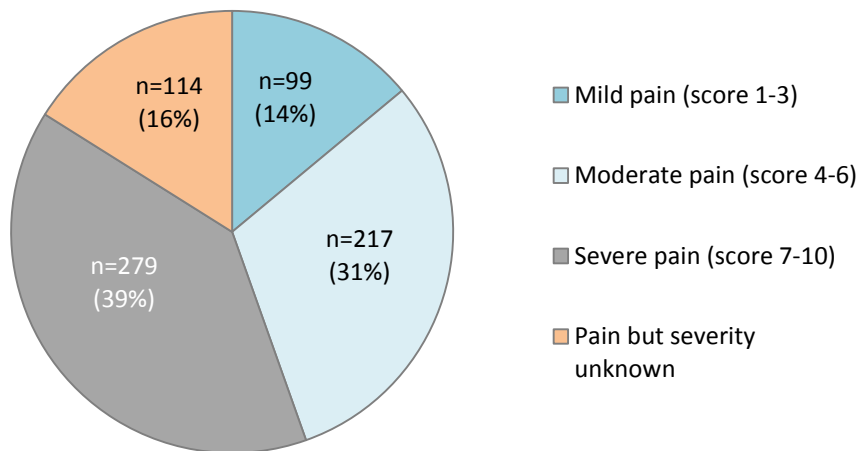


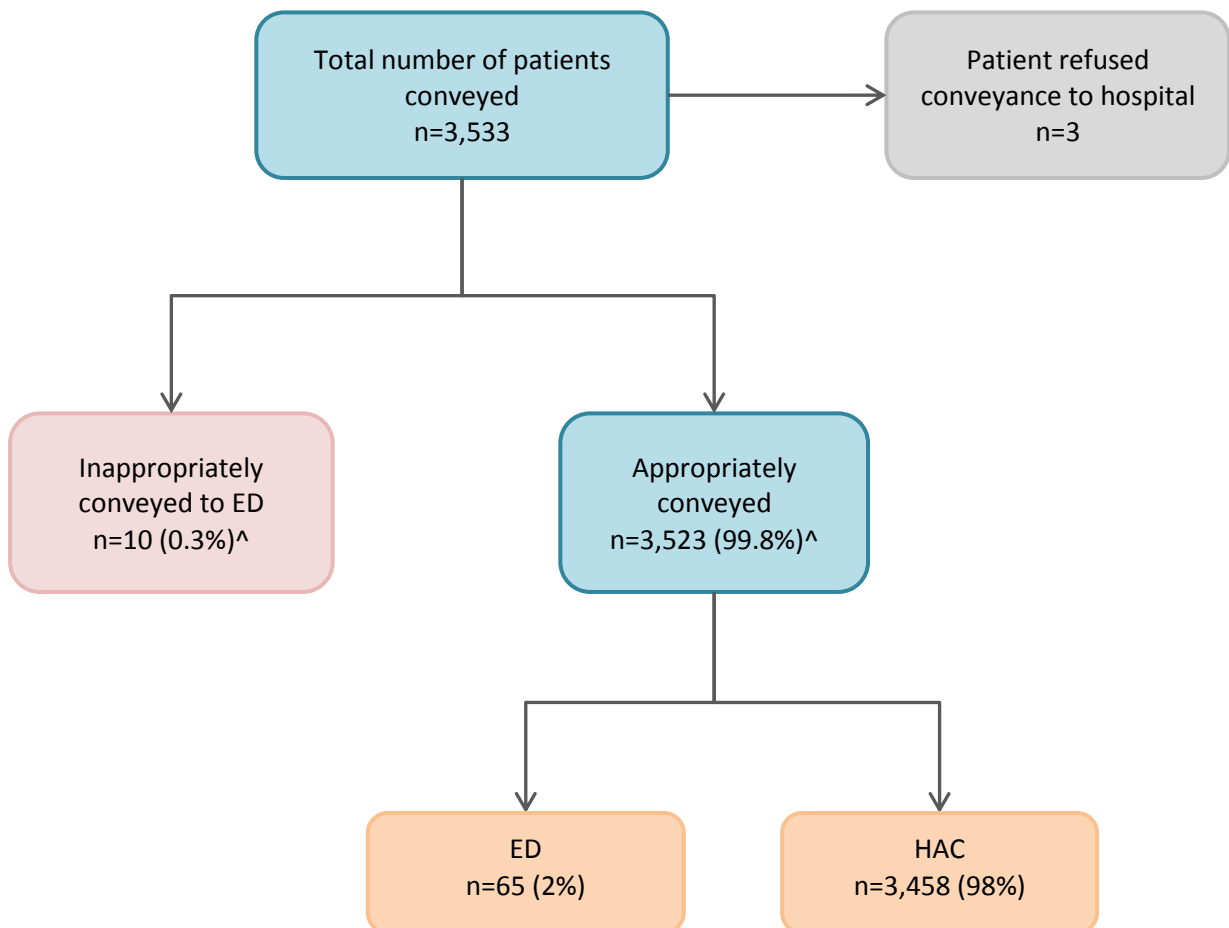
Figure 10: Pain level of patients not receiving analgesia

- 709 patients did not receive any analgesia despite being in pain (following aspirin and GTN administration), and over a third (39%, n=279) were in severe pain.

2.7 Conveyance

There are nine specialist Heart Attack Centres (HACs) to which the LAS can directly convey STEMI patients 24 hours a day, 7 days a week. On occasion, there may be circumstances where it is more appropriate for the patient to be conveyed to an Emergency Department (ED), including where the airway is unmanageable, the patient has uncontrolled seizures, where a patient may refuse conveyance to a HAC, or where there are operational infrastructure issues within the HAC itself.

2.7.1 Destination of STEMI patients



[^] Percentages do not equal 100% due to rounding.

Figure 11: Patient destination

- Nearly 100% of patients were conveyed to an appropriate destination, which is consistent with 2016/17.
- 98% of patients were transported to a HAC, which is also the same as last year.

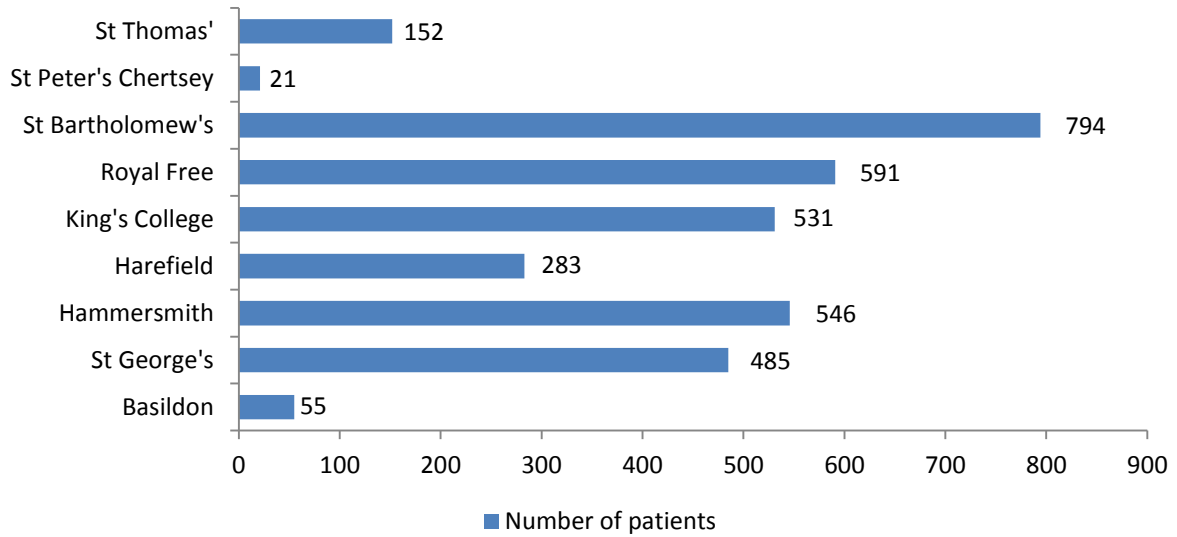


Figure 12: Number of patients conveyed to each HAC

- The majority of patients were conveyed to Barts Health.
- Small numbers of patients are conveyed to St Peter's and Basildon Hospitals due to their limited catchment areas.

2.7.2 Journey and call to hospital times

Destination	Leave scene – arrive hospital, minutes			999 call – arrive hospital [†] , minutes		
	Mean	Median	90 th centile	Mean	Median	90 th centile
HAC	18	17	29	75	70	105
ED	12	10	23	80	72	133

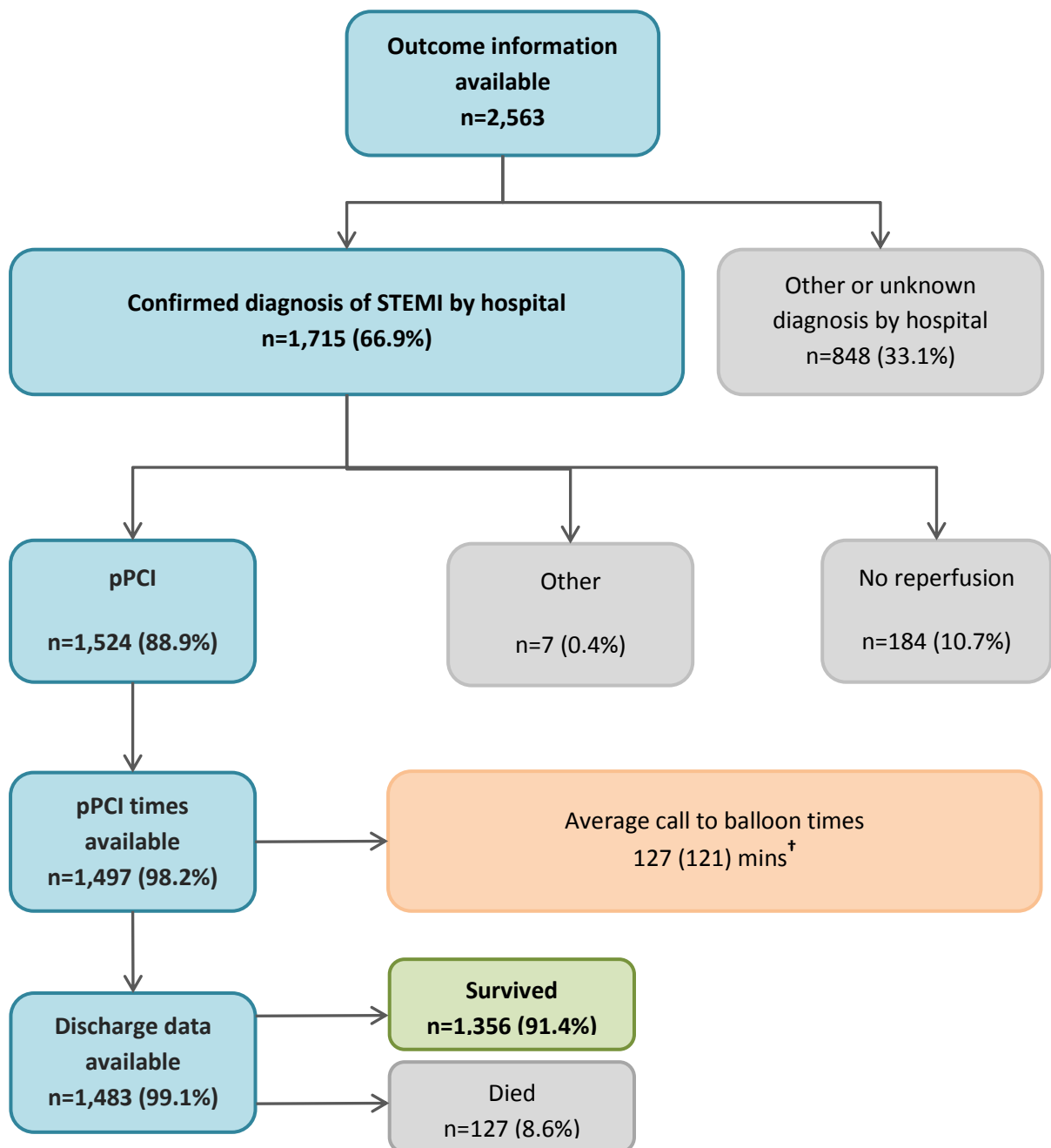
[†] 999 call to hospital times shown have been calculated from call connect time.

Table 5: Journey and call to hospital times

- Patients conveyed directly to a HAC had a mean journey time (leave scene to arrival at hospital) of 18 minutes.
- The mean call to hospital arrival time to a HAC was 75 minutes.

2.8 Reperfusion and patient outcomes

The majority of patients who receive reperfusion treatment undergo Primary Percutaneous Coronary Intervention (pPCI) whereby the artery is unblocked via the insertion of a catheter, inflation of a small balloon and placing of a stent to ensure the artery remains open. However, in a small number of cases, patients may receive thrombolytic drug treatment to dissolve the blockage.



† Mean (median) based on 999 call connect time.

Figure 13: Outcomes for patients who received reperfusion at a HAC

- A diagnosis of STEMI was confirmed at hospital for 67% of patients conveyed to a HAC.
- 89% of those with a confirmed STEMI received pPCI treatment.
- The mean time from the 999 call to balloon insertion time was 127 minutes, well within the target of 150 minutes^[1].
- 91% of patients were discharged from hospital alive, a 2% decrease from last year.

3 Quality Improvement activity

During 2017/18, the LAS continued to implement measures aimed at improving the care received by STEMI patients, including:

- Providing ongoing training in the interpretation of ECGs to assist crews in the recognition of a STEMI and subsequent decision making.
- Where patients were identified as having been conveyed to an inappropriate destination, details were forwarded to local management to enable feedback to be provided to the crews involved.
- Local quality improvement measures were also undertaken to improve the delivery of analgesia.

4 Summary

The LAS continues to maintain a high standard of care, with a good level of pain assessment and treatment using aspirin and GTN. The LAS recognises that, for the care bundle provision to improve, a greater focus on delivering appropriate analgesia to patients is needed. We have continued to demonstrate excellent compliance with specialist conveyance pathways. Our patient outcomes show that patients continue to receive pPCI treatment well within the national time targets.

5 Looking forward

In the coming year, the LAS will focus on a number of initiatives to improve patient care:

- An infographic poster outlining to clinicians the four elements of the care bundle, including which circumstances constitute an exception will be produced and made available to all staff.
- Details of all incidents where a full care bundle was not provided will be shared with local management teams for investigation and individual feedback.
- Collaborating with NHS England in the development of the Ambulance Quality Indicators to include working with MINAP to support data linkage within the pre-hospital and hospital system to enhance the quality of the patient outcome data we can source.

References

1. Treatment of Heart Attack National Guidance – Final Report of the National Infarct Angioplasty Project (NIAP), Crown, 2008.

Acknowledgements

CARU wishes to thank colleagues in the Medical Directorate for their ongoing support, particularly Mark Whitbread and Jo Nevett.

Glossary of abbreviations and terms

Aspirin – Aspirin thins the blood and improves its flow through the arteries.

Call Connect – The time the 999 call is connected to the ambulance service.

Call to Balloon Time – The overall time taken from the initial 999 emergency call to the point of balloon inflation in a primary Percutaneous Coronary Intervention (pPCI) procedure performed at hospital.

Cardiac Catheter Laboratory (Cath Lab) – The area within a specialist Heart Attack Centre where patients receiving reperfusion will be treated.

Care Bundle – The optimum combination of observations and treatments that ambulance crews should perform so that the patient receives the best possible care.

Clinical Commissioning Group – NHS organisations that govern the delivery of services within areas of England.

Entonox – A mix of 50% nitrous oxide and 50% oxygen (also known as “gas and air”).

First arriving vehicle – A resource dispatched to immediately life-threatening calls which can include a solo responder (such as a car, motorcycle, bicycle response) or an ambulance.

Glyceryl Tri-Nitrate (GTN) – A drug which allows blood vessels to relax and widen, thus allowing improved blood flow and reducing the workload of the heart.

Heart Attack Centre (HAC) – Specialist centres in London hospitals to which patients suffering a STEMI are taken directly for primary Percutaneous Coronary Intervention (pPCI).

Medical Priority Dispatch System (MPDS) – A medically approved system used by call handlers to triage patients based on their responses to pre-determined questions.

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

Morphine – An analgesic which can be administered (usually intravenously) by a paramedic.

Myocardial Infarction (MI) – Commonly known as a ‘heart attack’. A myocardial infarction refers to a blockage of the coronary artery that limits blood flow to an area of the heart.

Myocardial Ischaemia National Audit Project (MINAP) – A national registry maintained by hospitals containing details of patients who were taken to Heart Attack Centres, reperfusion treatment performed and patient outcomes.

Numerical rating scale – A method of rating a patient’s pain based on a score from zero (no pain) to 10 (the worst pain imaginable).

Pain assessment – An observation which should be taken both pre- and post-treatment to assess the patient’s level of pain.

Paramedic – A type of clinical staff that are able to perform advanced skills such as cannulation to allow for the delivery of drugs intravenously.

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

Primary Percutaneous Coronary Intervention (pPCI) – A surgical procedure performed at a Heart Attack Centre which seeks to unblock arteries by means of insertion of a catheter into the affected artery and inflating a small balloon to re-open it. The opened artery is then held in place with a small stent.

ST-Elevation Myocardial Infarction (STEMI) – A type of myocardial infarction. ST-Elevation refers to a particular pattern seen on a 12-Lead ECG which indicates a complete blockage in a coronary artery.

Thrombolysis – A form of reperfusion which breaks down blood clots by pharmacological means (also known as “clot busting”). It is now generally only used in a small number of patients who are not suitable for primary Percutaneous Coronary Intervention treatment and is undertaken at hospital.

Appendix 1: On-scene times and care bundle provision by Clinical Commissioning Group of incident location

Incident CCG	Mean (median) on-scene times, minutes		Care Bundle			
	Arrival of first vehicle	Arrival of first conveying vehicle	Yes/ Exception		No	
			n	%	n	%
Barking & Dagenham	40 (37)	33 (30)	70	77%	21	23%
Barnet	41 (37)	36 (32)	111	73%	42	27%
Bexley	42 (42)	37 (35)	81	81%	19	19%
Brent	40 (34)	35 (31)	129	72%	50	28%
Bromley	45 (44)	40 (37)	76	72%	30	28%
Camden	40 (37)	36 (32)	58	62%	35	38%
Central London	38 (34)	35 (30)	72	67%	35	33%
City & Hackney	42 (37)	37 (34)	69	70%	29	30%
Croydon	42 (38)	35 (30)	115	74%	40	26%
Ealing	40 (36)	34 (31)	124	79%	33	21%
Enfield	41 (38)	34 (31)	113	75%	38	25%
Greenwich	40 (37)	36 (34)	68	79%	18	21%
Hammersmith & Fulham	41 (40)	36 (34)	45	66%	23	34%
Haringey	42 (38)	35 (29)	67	67%	33	33%
Harrow	39 (36)	34 (31)	101	78%	29	22%
Havering	41 (38)	35 (31)	96	87%	15	13%
Hillingdon	44 (40)	33 (30)	134	75%	45	25%
Hounslow	42 (40)	32 (32)	86	75%	28	25%
Islington	42 (40)	37 (34)	52	64%	29	36%
Kingston	39 (38)	32 (31)	48	69%	22	31%
Lambeth	38 (36)	34 (33)	78	77%	24	23%
Lewisham	44 (41)	41 (40)	88	79%	23	21%
Merton	39 (33)	34 (29)	49	74%	17	26%
Newham	41 (38)	34 (31)	78	67%	39	33%
North West Surrey	26	26	1	100%	0	0%
Redbridge	41 (39)	35 (31)	109	77%	33	23%
Richmond	38 (35)	33 (31)	59	78%	17	22%
Southwark	43 (40)	41 (38)	74	74%	26	26%
Surrey Downs	26	26	1	100%	0	0%
Sutton	37 (34)	32 (28)	67	76%	21	24%
Tower Hamlets	45 (43)	38 (35)	85	74%	30	26%
Waltham Forest	43 (40)	35 (29)	75	72%	29	28%
Wandsworth	35 (33)	31 (31)	72	72%	28	28%
West London	38 (36)	33 (32)	64	76%	20	24%

Appendix 2: On-scene times and care bundle provision by LAS Group Station

LAS Group Station	Mean (median) on-scene times, minutes		Care Bundle			
	Arrival of first vehicle	Arrival of first conveying vehicle	Yes/ Exception		No	
			n	%	n	%
Homerton	42 (39)	36 (33)	118	67%	58	33%
Newham	41 (39)	34 (31)	191	76%	62	24%
Romford	41 (38)	35 (31)	198	78%	56	22%
North East	41(39)	35 (31)	507	74%	176	26%
Camden	40 (37)	35 (31)	125	69%	56	31%
Edmonton	40 (38)	34 (30)	161	72%	64	39%
Friern Barnet	41 (36)	36 (32)	92	70%	40	30%
North Central	40 (37)	35 (31)	378	70%	160	30%
Brent	40 (36)	35 (32)	244	75%	80	25%
Fulham	39 (35)	33 (31)	133	72%	52	28%
Hanwell	41 (38)	33 (31)	172	76%	55	24%
Hillingdon	41 (40)	31 (30)	98	75%	32	25%
Westminster	39 (38)	34 (32)	61	70%	26	30%
North West	40 (37)	34 (31)	708	74%	245	26%
Bromley	43 (40)	37 (33)	124	73%	47	27
Deptford	41 (38)	38 (35)	213	74%	74	26%
Greenwich	43 (41)	38 (36)	143	82%	31	18%
South East	42 (39)	38 (35)	480	76%	152	24%
Croydon	43 (40)	37 (35)	89	76%	28	24%
New Malden	40 (36)	33 (32)	81	77%	24	23%
St Helier	37 (34)	32 (29)	87	70%	38	30%
Wimbledon	37 (34)	31 (28)	109	73%	40	27%
South West	39 (36)	33 (30)	366	74%	130	26%
PAS & VAS	50 (45)	43 (36)	78	72%	30	28%
Other LAS [†]	41 (39)	36 (32)	98	78%	28	22%

[†] Includes Hazardous Area Response, Special Events, Tactical Response Units and Training.