



London Ambulance Service  
NHS Trust



# **ST Elevation Myocardial Infarction Annual Report: 2010/11**

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Authors: Yvette Thomas & Gurkamal Viridi  
Clinical Audit and Research Unit  
London Ambulance Service NHS Trust  
8-20 Pocock Street, London, SE1 0BW

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

## **Introduction**

From 1<sup>st</sup> April 2010 to 31<sup>st</sup> March 2011, 2,607 patients were diagnosed by London Ambulance Service NHS Trust (LAS) crews as suffering from an ST elevation myocardial infarction (STEMI).

Patient demographics, clinical information, operational performance, treatment details and conveyance information were collected from the Patient Report Forms (PRFs) and 12 Lead ECG rhythm strips recorded by LAS crews on scene and supplemented with data from the Emergency Operations Centre (EOC) Call Log and vehicle Mobile Data Terminals (MDT). Patient outcome data has been obtained primarily from the Myocardial Ischaemia National Audit Project (MINAP) database, but also directly from hospitals where possible.

This report presents data referring to those patients who were attended by the LAS following a 999 emergency call and whose PRF and/or ECG indicated a STEMI as diagnosed by ambulance crews. It does not include patients whose initial ECG was deemed to indicate Left Bundle Branch Block, or other forms of ischaemia (such as ST depression or T-wave changes) or those who were transported by the LAS via inter-hospital transfers.

This report relates to the LAS as a whole, however, more detailed information relating to conveyance destination and response times by Complex is included in the appendices.

## **Patient Information**

### ***Demographics***

All patients attended are asked by crews to provide basic personal and demographic information. Of the 2,607 patients attended the majority were male (75%; n=1,948), with an average age of 60. Female patients were older with an average age of 73 years. These figures remain consistent with previous years for both genders. Overall, the age range of patients was 16-102.

Patients are also asked to provide their ethnicity details, although this is optional. The highest proportion of patients who provide this information fall into a 'White' ethnic group (53%, n=1,375).

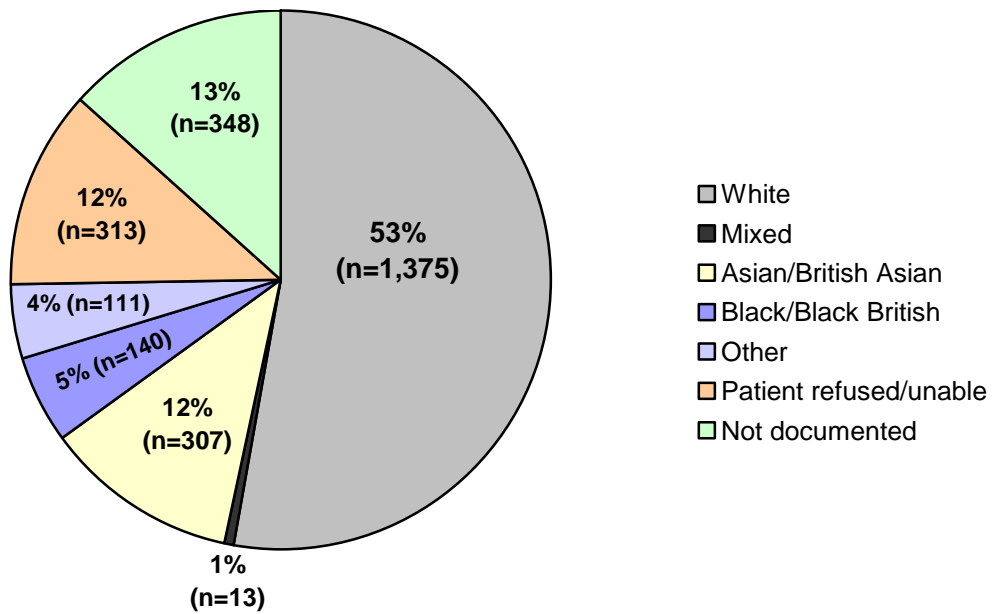


Figure 1. Ethnicity of patients attended

### ***Type of infarct***

Analysis of the type of infarcts documented on the PRF and/or indicated on the ECG shows that the most common type was an anterior infarct (49%), followed by inferior (34%).

Type of Infarct	Frequency
Anterior	49%; n=1,285
Inferior	34%; n=884
Lateral	3%; n=85
Antero-Lateral	8%; n=220
Infero-Lateral	3%; n=67
Only 'STEMI' documented	3%; n=66

Table 1. Type of infarct

## Response Times

### Call to Scene

Table 2 (below) shows the ambulance response times for crews attending STEMI patients in 2010-11. Times are shown based on the Department of Health Category A (8 minute response) target as well as for all patients.

Category	Patients	Range (minutes)	Average (minutes)	% within 8 minute Category A target
Call to Scene** - All Calls	2,607	0*-179^	8	71% (n=1,850)
Call to Scene** - Category A Calls	2,198 (84%)	0*-179^	7	75% (n=1,656)
Call to Scene** - Non Category A Calls	404 (16%)	1-163	13	48% (n=194)

\*Calls with a zero response time refer to running calls.

\*\* Call start times are based on Call Connect, which is the time the call was connected to the ambulance service.

^ The extended time of 179 minutes from call to scene was caused by an incident where the crew were called in advance of the patient being due to land at London Heathrow, causing a delay awaiting the arrival of the flight.

Table 2. Call to Scene times

Overall, the average response time for crews attending STEMI patients was 8 minutes. Based on the information given at the time of the call, 84% (n=2,198) of all calls were assigned as Category A calls. For those calls assigned a Category A response, the average time from the 999 call to arrival on scene was 7 minutes which is within the Department of Health target of 8 minutes. This figure has remained the same for the past two years. However, the percentage of these calls where the response time from call to arrival on scene met the 8 minute target has decreased by 3% from 78% in 2009-10 to 75%. While not being subject to the 8 minute target, crews attending calls which were assigned a lower than Category A response arrived on scene within 8 minutes in 48% of cases.

### On Scene Time

The average time spent on scene with patients on average is 38 minutes with a range of 10 to 115 minutes. This has continued the trend of yearly incremental increases from the 25 minutes seen in 2004-05. The reasons that the average time spent on scene may have increased could be related to the length of time spent on cases where there were delays in accessing the patient, crews

contacting the Clinical Support Desk for advice, difficulty in removing patients from the scene, and incidents where patients were reluctant to travel to hospital and required further persuasion to do so.

## Patient Care

### ***Pain assessment***

Where possible, all patients should have both a pre- and post- treatment pain assessment recorded. Table 3 indicates the levels of assessment. 95% (n=2,467) of patients were recorded as receiving an initial (pre-treatment) pain assessment. Valid exceptions to assessment were documented in 3% (n=72) of cases, leaving 2% (n=68) of patients whose pain was not assessed.

Only 85% (n=2,214) of patients had a final (post-treatment) pain assessment recorded.

	Pre-treatment	Post-treatment
Pain assessment documented	95%; n=2,467	85%; n=2,214
Valid exception to assessment documented	3%; n=72	3%; n=78
No pain assessment or exception documented	2%; n=68	12%; n=315

Table 3. Pain Assessment

Overall, 83% (n=2,171) of patients had both pre- and post-treatment pain assessments recorded, with 3% (n=87) of PRFs having valid reasons documented for being unable to undertake at least one pain assessment. The level of patients who did not receive both assessments was 14% (n=349); an increase of 1% from 13% in 2009-10.

### ***Aspirin and GTN***

The national JRCALC Clinical Practice Guidelines (2006) state that aspirin and GTN should be administered to patients with evidence of myocardial infarction, unless there are valid contraindications.

	Aspirin	GTN
Administered*	88%; n=2,295	75%; n=1,944
Valid exception documented	6%; n=157	22%; n=579
Not administered	6%; n=155	3%; n=84

*\*Administration figures include those patients who received aspirin prior to the arrival of LAS crews.*

Table 4. Aspirin and GTN administration

Of the 2,295 (88%) of patients who received aspirin, LAS crews were responsible for administration in 82% (n=1,885) of these cases. The remainder had taken aspirin prior to the crew's arrival, either

following administration by another healthcare professional (e.g. a GP), on advice given by Emergency Medical Dispatchers based at EOC or self-administration.

A further 6% (n=157) of patients were not eligible to receive aspirin, either due to valid contraindications (such as allergy), which accounted for 5% (n=129) or patient refusal (1%; n=28). The remaining 155 patients (6%) did not receive aspirin, with no valid reasons documented on the PRF.

GTN was administered to 75% (n=1,944) of patients by crews, with a further 22% (n=579) having valid reasons documented as to why they did not receive it. These 22% are comprised of: 5% (n=136) of patients who had taken GTN prior to the arrival of the crew, 14% (n=374) had valid contraindications (such as hypotension), 2% (n=52) had a reduced level of consciousness and could not be given the drug and a final 1% (n=17) of patients refused it. 3% (n=84) of patients, an increase of 1% from last year, did not receive GTN nor did they have any documented valid reasons provided for this.

### ***Clopidogrel***

During 2010-11 Clopidogrel was administered to all patients diagnosed with a STEMI and taken to a Heart Attack Centre for primary angioplasty unless there was a valid exception. Valid exceptions included: age outside the acceptable range of 18 to 75 years, not being conveyed to a Heart Attack Centre or patient refusal.

Clopidogrel was administered to 50% (n=1,297) of patients and a further 42% (n=1,096) of patients were deemed to have a valid exception. 8% (n=214) of patients did not receive Clopidogrel or have a valid reason for this documented on the PRF.

### ***Analgesia***

Morphine Sulphate, in the JRCALC Clinical Practice Guidelines (2006), is currently indicated as the analgesic of first choice for pain which is associated with myocardial infarction. Guidelines for Entonox also indicate that this can be administered to patients while intravenous access for morphine delivery is being established, or where a patient's pain is not severe enough to warrant morphine.

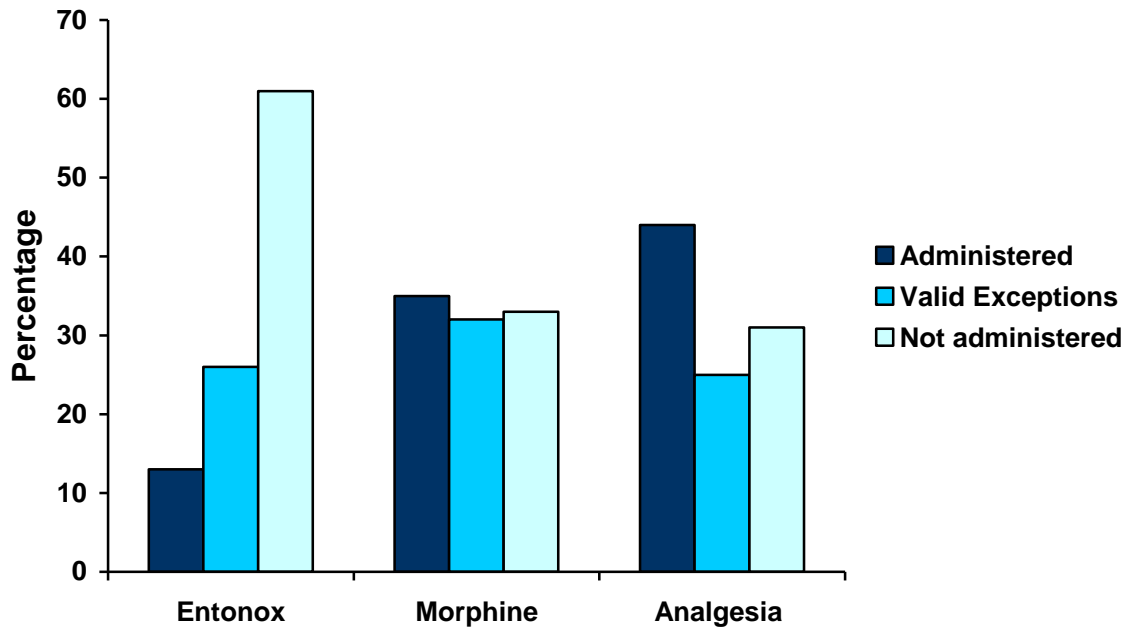


Figure 2. Percentage of patients receiving analgesia

In 2010-11, 39% (n=1,018) of patients received Entonox or had valid reasons documented as to why they did not (e.g. patient refusal or not being in pain), which represents a 5% increase on the 2009-10 figure. The remaining 61% did not receive Entonox.

Morphine was administered to 34% (n=901) patients, while a further 51% (n=1,323) of patients had a documented valid exception. Of these patients, 6% (n=145) had a valid contraindication, 5% (n=118) refused the drug and 16% (n=415) stated that they were not in pain. 645 patients were also classed as having an exception relating to a lack of IV access; 7% (n=170) due to a paramedic crew who were unable to gain the access on the patient, and 18% (n=475) who were attended by technician-only crews who were unable to attempt cannulation due to their skill level.

15% (n=383) of patients did not receive morphine or document any valid exceptions.

When considering the rates of analgesia administration as a whole, 44% (n=1,136) of patients received at least one form of analgesia (with 111 of these patients receiving both Entonox and morphine). 25% (n=663) had documented valid exceptions relating to both drugs, while a further 18% (n=482) had an exception to one form of analgesia but no documentation giving a reason for non-administration of the other. However, 13% (n=326) of patients either received no analgesia or had no valid exceptions documented for non-administration on their PRFs.

## Conveyance

The LAS policy for STEMI patients is that all are taken directly to a Heart Attack Centre for primary angioplasty (pPCI) treatment, unless there is a clearly documented, valid reason as to why this is not appropriate. Of the 2,607 patients, 2,600 patients were conveyed by LAS crews and 7 patients refused to travel to hospital against the advice of LAS staff.

### ***Destination and Response Times***

Of the 2,600 STEMI patients who were conveyed by LAS crews, 89% (n=2,323) were conveyed directly to a Heart Attack Centre. A further 7% had a valid reason for being transported to A&E, giving a total of 96% of patients who were taken to the appropriate location. Of the remaining 4% (n=89) of patients, 71 patients were taken to A&E when the documentation on the PRF indicated that they should have been transported to a Heart Attack Centre. Of these, 59 were initially taken to an A&E department for ECG diagnosis before being conveyed on to the Heart Attack Centre, therefore not following the correct pathway and the remaining 12 patients had no reason documented as to why they were taken to A&E. Documentation regarding the destination was unclear for 18 patients as to whether they were transported to the Heart Attack Centre directly or if they were taken to A&E.

			999 Call* to Arrival at Hospital		Leave Scene to Arrival at Hospital	
			Range (minutes)	Average (minutes)	Range (minutes)	Average (minutes)
All Patients**	2,599	100%	24-303	61	1-64	16
Direct to Heart Attack Centre	2,323	89%	24-303	62	1-64	16
A&E – with valid reason	188	7%	26-153	63	1-42	11
A&E – without valid reason	71	3%	31-93	53	3-19	9
Unsure whether Heart Attack Centre or A&E	18	1%	44-91	58	4-29	14

\*Call start times are based on Call Connect, which is the time the call was connected to the ambulance service.

\*\* Figure excludes 1 patient who had no arrival times available due to MDT failure on the vehicle, and 7 patients who refused to travel with the attending crew.

Table 5. Conveyance location and response times to hospital

Of those patients who were appropriately conveyed, patients who were taken to A&E had an average journey time from the scene to hospital of 11 minutes, 5 minutes shorter than those who



were taken directly to a Heart Attack Centre. However, the average overall time from the 999 call to arriving at hospital is actually one minute longer than for those conveyed directly to the Heart Attack Centre. Potential reasons for this can be found in both the call to scene and on scene times. Patients who are eventually conveyed to an A&E department have an average call to scene time of 10 minutes, as opposed to 8 minutes for those taken to a Heart Attack Centre. However, when studying the categories assigned to the calls it can be seen that whereas 85% (n=1,980) of patients taken to a HAC had their call assigned as category A (and therefore requiring an 8 minute response), only 72% (n=135) of the 188 patients taken to A&E appropriately were assigned this category response. This means that a larger percentage of calls were assigned to call categories with a longer response target and therefore could potentially extend the average time taken from the 999 call to arrival on scene for these patients.

Patients taken to A&E for a valid reason were also seen to have longer on scene times than those taken to a HAC (an average of 42 minutes compared to 37 minutes). However, of this group of 188 patients, over two-thirds were asymptomatic and did not present with a "classic" MI (for example, they may not have had chest pain). It is therefore possible that diagnosis and initial treatment of these patients would take longer than those taken to a Heart Attack Centre due to the nature of their presentation.

Further information on conveyance location and responses at Complex and Area level can be found in Appendices 1 and 2.

## **Reperfusion**

Information on reperfusion is sourced mostly from the Myocardial Ischaemia National Audit Project (MINAP) database, with additional data supplied by hospitals where possible.

Of the 2,600 patients conveyed by crews in 2010-11, information regarding hospital treatment was available for 1,544 (59%) patients. 1,195 were confirmed as receiving reperfusion treatment.

### ***Primary Angioplasty***

Of the 1,195 patients who received reperfusion treatment, 1,192 patients were confirmed as receiving primary angioplasty treatment (pPCI) at hospital.

Of these, 1,169 (98%) were admitted directly to a Heart Attack Centre and 13 (1%) were initially transported to A&E (with a valid reason) by LAS staff. Additionally, there were 6 cases where it was unclear from PRF documentation as to whether the patient was transported to a Heart Attack Centre or A&E, and 4 cases where the crew took the patient to A&E without a valid reason.

On average, the time from the 999 call to the primary angioplasty procedure (call to balloon time) was 114 minutes, which is an improvement of 1 minute from last year. The portion of this time which is accounted for by the hospital has also decreased, from 57 minutes to 53.

	Number of patients	Average Time (minutes)	Range (minutes)
999 call* - primary PCI ( <i>call to balloon</i> )	1,157	114	35-573
Arrival at hospital - primary PCI ( <i>door to balloon</i> )	1,157	53	4-519

\* Time when the call was connected to the ambulance service (*Call Connect time*).

Table 6. Time to reperfusion for patients receiving primary angioplasty

There were a number of extended door to balloon times (the time from arrival at hospital to the angioplasty procedure) this year. In some cases a reason was provided by the hospital for delays to treatment. Of these, the most common reasons were delays in accessing the Heart Attack Centre (for example, if another patient was already being treated there), delays activating Heart Attack Centre teams and the patient having other complications prior to the pPCI procedure being carried out. However, a number of cases which indicated an extended time at the hospital had no reasons provided for this.

Door to balloon delays also impacted on the call to balloon times, however there were a number of cases where delays prior to reaching the hospital caused the extended times. The most commonly occurring reasons found for these were delays in dispatching an ambulance due to lack of availability, cases not being reported as a cardiac problem and therefore receiving a lower than category A response, ST elevation developing on the ECG while the crew were treating the patient for another condition and patients going into cardiac arrest and requiring resuscitation. Again, however, there were cases where no explanation was given for extended pre-hospital times.

### **Thrombolysis**

Three STEMI patients were confirmed as receiving thrombolytic treatment; all were taken directly to a Heart Attack Centre. Two of the three patients had reperfusion times available.

National guidelines state that thrombolysis should be given within 60 minutes of the call for help (call to needle time). In the two cases with available data, the average time from the 999 call to treatment was 91 minutes. Of this, the time from arrival at hospital to treatment (door to needle time) was 37 minutes. For both patients, the hospital recorded delay information; one patient was delayed whilst hospital staff considered pPCI as an option for the patients treatment, while there was a delay in accessing the Cardiac Catheter Laboratory at the Heart Attack Centre for the other.

### **Patient Outcome**

From the 1,544 patients with treatment information available, data on hospital stay and patient outcome was available for 1,475 patients.

Figures show that 97% (n=1,426) were discharged alive. This remains consistent with the survival rates reported over the past three years.

Information on the length of hospital stay was available for all but one of the 1,426 patients discharged alive. The average length of stay in hospital for surviving patients was 4 days, which has remained the same as 2009-10.

## Discussion

The number of patients who are being attended and diagnosed with a STEMI by LAS crews continues to increase, with there being an increase of a quarter from the number of patients recorded in 2009-10 (n=1,976) and a third from that reported in 2008-09 (n=1,788). While there may be several reasons for this, a key area is the continual improvement in STEMI recognition by crews and better recording of illness and destination codes, which ensures that patient data can be collected and analysed accurately. The process of scanning and storing PRFs and ECG strips together as a complete patient record also enables the LAS to collect higher amounts of ECG data than previously. We are constantly working to improve our processes, as a robust data collection methodology will lead to a more accurate picture of the patients we attend and the care we provide.

Our response time performance overall continues to meet the Department of Health Category A response target of 8 minutes, with an average response of 7 minutes. Given that 84% of the calls which led to a diagnosis of STEMI were reported in this category, this shows that we are reaching and attending to our most seriously ill patients in a timely manner. On average, crews are spending slightly longer on scene with the patient and this may mean that call to balloon times are adversely impacted. In some circumstances this is due to the crew contacting the Clinical Support Desk for advice on the most appropriate care, which longer term may be of more benefit to the patient. Call to hospital times remain broadly similar as those seen across previous years at just over 60 minutes.

In terms of the treatment we provide in the pre-hospital setting, crews are once again highly compliant with guidelines for the treatment of STEMI patients. Aspirin and GTN administration levels remain high, and the use of Clopidogrel has increased (although the delivery of Clopidogrel has been withdrawn from April 2011). Both pre- and post- treatment pain assessments remain broadly the same as previous years, although with 14% of patients still not receiving two assessments, there is still some room for improvement in this area.

Where crews are least compliant with guidelines is in the administration of analgesia. Figures indicate that almost one third of our patients are not receiving any form of analgesia, when their condition indicates it would be appropriate to deliver at least one form. Crews should be utilising both forms of available analgesia where appropriate, for example, if a crew cannot obtain IV access to administer morphine, they should offer Entonox as opposed to not providing any form of analgesia. Where there are patient refusals, or the patient's overall condition precludes administration, then this should be documented. It is possible that this issue is partly documentation-related, where crews may be detailing the treatment they have provided when the reasons for treatment that was not given are just as important.

Compliance with the STEMI pathway remains high, with 96% of patients either taken directly to a Heart Attack Centre or to A&E with a valid reason. It was noted however, that of the 71 patients who were taken to A&E without a valid reason, 59 of these were taken by crews to diagnose the

ECG. Where the crew feel the ECG is indicative of a STEMI, and there is no other clinical reason for conveyance to A&E, crews should convey to the Heart Attack Centre. Such patients can be highly time-critical and it is advisable to ensure that the patient is taken to a centre where they can receive the most appropriate care in all circumstances.

The level of outcome data which is available to the LAS has once again increased. In terms of those outcomes collected directly from the MINAP database, this is a result of the amount of patient data entered by hospitals, especially for those patients undergoing reperfusion therapy. We also continue to build relationships between the LAS and hospital staff regarding the exchange of relevant ambulance and outcome data, which benefits both parties in terms of a higher level of accuracy in the data we use and receive regarding our patient care. To this end, the LAS introduced a dedicated email address for the MINAP related data enquiries from hospitals where we aim to provide ambulance response data for patients where hospitals provide the key combined identifier of date and CAD within 2 working days.

In terms of the reperfusion procedures, the overall time from the 999 call to the primary angioplasty procedure in hospital has made a slight improvement over the past year, remaining well within the guidelines of 150 minutes. With early reperfusion being key to increased levels of survival, the fact that the work of the LAS, together with the staff at the Heart Attack Centres, is continually lowering this time shows that our crews provide excellent care in a timely manner. This can be seen in the fact that, for the fourth year running, the percentage of patients discharged alive from hospital stands at 96%. Such positive information on the outcome of patients we attend continues to encourage crews to deliver the highest quality care to patients.

## Points for Action

Staff should be encouraged to facilitate data collection and the reporting of clinical care by:

- Recording both pre- and post-treatment pain assessments in all patients, or clearly documenting those who have valid exceptions.
- Recording all interventions taken by the crew, including reasons explaining why something may not have taken place, especially in the administration of analgesia.
- Considering the use of Entonox either in conjunction with morphine, or where morphine is not appropriate for the patient.
- Where possible reduce time spent on scene.
- Ensuring that all eligible patients are taken directly to a Heart Attack Centre or that a valid reason for conveyance to A&E is clearly documented on the PRF.
- Correctly documenting the destination hospital name and code to allow accurate identification of patients directly transported to Heart Attack Centres.
- Using illness code 87 for all patients with a confirmed MI by 12-lead ECG.
- Submitting a copy of all 12-lead ECGs to Management Information together with the PRF (with requests for clinical feedback, clearly marked on the front of the ECG strip, if desired).

