



Pre-Hospital Thrombolysis (England and Wales)



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Introduction

This report includes information related to the national audit of pre-hospital thrombolysis (PHT) provided within England and Wales between the years 2000 and 2006.*

** The Scottish Ambulance Service provides PHT but these data have not been collected as part of this audit. The Northern Ireland Ambulance Service doesn't yet provide paramedic PHT.*

A reconfiguration of English Ambulance Trusts took place in June 2006 and for consistency in reporting, all data have been provided by the pre-reconfiguration Trust boundaries.

1. Background

Acute Myocardial Infarction (AMI) is the result of a thrombus or clot forming on top of a ruptured atherosclerotic plaque, blocking the blood flow through the artery. Unless the blood flow can be quickly restored, the muscle supplied by that artery “infarcts”, or dies because of lack of oxygen (ischemia). This muscle damage weakens the heart, and may cause heart failure either early (within a matter of hours) or later (over a period of months or years). It may also lead to other events including fatal heart rhythm disturbances and death. Typical symptoms of AMI include chest pain (often described as crushing), pallor and shortness of breath. Pain is often severe enough for the sufferer to seek help; however older patients or diabetics may experience atypical symptoms and relatively little or less severe pain.¹

Following the introduction of the National Service Framework for Coronary Heart Disease (NSF CHD)² in March 2000 there have been significant improvements in the treatment of CHD within the NHS, in terms of prevention, emergency response and treatment following AMI. Of particular note is the increase in performance of the administration of ‘clot busting’ thrombolytic drugs (the process known as thrombolysis), which dissolve the thrombus and therefore restores the blood supply to the myocardium.

Intravenous therapy with thrombolytic agents (thrombolysis) is an established treatment for AMI with about 50,000 uses each year in the UK. Pre-hospital thrombolysis is the administration of these ‘clot busting’ drugs in the out of hospital setting by ambulance paramedics.

The introduction of newer bolus thrombolytic has greatly simplified the practicalities of pre-hospital delivery, enabling patients to achieve the benefits associated with early thrombolysis and in 2000, the East Midlands Ambulance Service (EMAS) was the first to introduce the pre-hospital administration of thrombolysis (PHT) with paramedics using the double bolus agent reteplase.

The National Institute for Clinical Excellence (NICE) issued guidance in October 2002 which recommended the bolus thrombolytic agents (reteplase or tenecteplase) as the preferred option for pre-hospital thrombolysis.³

In 2004 the Medicines and Healthcare products Regulatory Agency (MHRA) added tenecteplase (TNK) and reteplase (rPA) to the Prescription Only Medicines (POMs) exemption list for paramedics.⁴ Prior to this time any administration of TNK or rPA would have been administered under a Patient Group Direction (PGD).

The majority (90%) of English ambulance services provide PHT, with two more referring to the Emergency Dept for in-hospital thrombolysis, and one service (London) refers all suitable patients directly for primary PCI.

By end December 2006, 7005 patients had received PHT (either tenecteplase or reteplase), of which 3035 administrations were during 2006.

The median 'Call to Needle' time for the group of patients receiving PHT during 2006 was 38 minutes⁵, which demonstrates that paramedics are adequately equipped and educated to acquire and interpret 12-lead ECGs, accurately identify patients suitable for thrombolysis, and well placed to administer the therapy. This is usually conducted in conjunction with decision support by means of telemetry and mobile phones, but as confidence grows more and more ambulance services are moving towards autonomous practice. Recent developments within MINAP and the Central Cardiac Audit Database (CCAD) together with the development of a specific ambulance outcome database, clinical outcomes will soon be correlated with PHT.

A risk of thrombolysis, whether provided pre-hospital or in-hospital is internal haemorrhage including stroke. There is no documented evidence from this audit of adverse incidents directly attributed to pre-hospital administration of thrombolysis, either in terms of inappropriate administration or major haemorrhage. However it should be noted that any adverse reaction to PHT might well not be identified until after admission to hospital and that that given the number of patients that have received PHT (7005) it is unlikely that there have been no adverse incidents as a result of PHT. Any adverse incident information reported from hospitals on PHT will be captured as part of the MINAP data collection.

Although at present PHT accounts for 18% of all patients thrombolysed each year⁷, much progress has been made, with the number of patients receiving PHT rising substantially each year.

The delivery of PHT has been shown to reduce 'call to needle' times substantially and should be supported, however, primary PCI is also emerging as an alternative treatment strategy mainly in urban areas, but the delivery of PHT has been shown to reduce time to treatment substantially and should continue to be supported in those areas where primary PCI is not available.

2. The Audit

The ASA/JRCALC national audit of thrombolysis⁸ commenced in 2004, with the retrospective collection of data from trusts since 2000.

This audit includes all patients presenting with symptoms of acute myocardial infarction (AMI) that were assessed for eligibility by paramedics and provided with thrombolysis in the pre-hospital setting.

Thrombolysis data are reported in a monthly format to reflect the data capture framework of MINAP.

2.1 Methodology

Eligibility for administration for thrombolysis was assessed by paramedics using a checklist of contra-indications as per the JRCALC Clinical Practice Guidelines.⁶ Data were collected by individual ambulance trusts who collected information from the thrombolysis checklists and patient report forms.

Data were requested by the ASA National Clinical Effectiveness Manager and included numbers of patients thrombolysed by each service by month, type of agent used, whether practice was decision supported or autonomous, and any information related to adverse incidents related to PHT e.g. Stroke.

Audit data were collected from all English ambulance services and the Welsh ambulance service. Data were obtained electronically by email or by telephone and collated into a Microsoft Excel™ spreadsheet.

Extrapolated from these data are the numbers of services using different thrombolytic agents (TNK or rPA) and the number of patients treated with each agent.

2.2 Limitations of the Audit

The audit doesn't include data on:

- Patients who presented with symptoms of AMI, but who were not assessed for thrombolysis (i.e. an unknown number of patients who could have benefited from thrombolysis).
- Patients who were assessed and met the eligibility criteria, but who did not receive thrombolysis for other reasons e.g. complex ECG, equipment failure or wrong crew skill mix etc.
- Patients who were assessed for thrombolysis but failed to meet the eligibility criteria due to one or more contra-indications to thrombolysis e.g. hypertension, history of stroke, recent history of surgery etc.
- The number of patients per 100,000 population that receive PHT as a proportion of all patients receiving thrombolysis.

The above are recognised as limitations to this audit as the data collected only provides information related to sensitivity. It is a recommendation that any future audit include the above to provide information related to specificity.

2.3 Reporting Structure / Dissemination

The results of the national audit have been reported in a number of formats, firstly in Ambulance UK Journal, and then electronically to the ASA Clinical Effectiveness Website and more recently on the new ASA Website <http://www.asa.uk.net> . It is currently only available in electronic PDF™ format.

The report is circulated electronically to key partners within the Department of Health, the Myocardial Infarction National Audit Project (MINAP), the Joint Royal Colleges Ambulance Liaison Committee (JRCALC), to Boehringer Ingelheim and Roche (manufacturers of the thrombolytic agents) and to UK and international ambulance services

3. Results

The information shown here outdates any previously reported information, which might vary slightly from that shown here. Any changes from previously reported information reflect late data submission and validation by ambulance services.

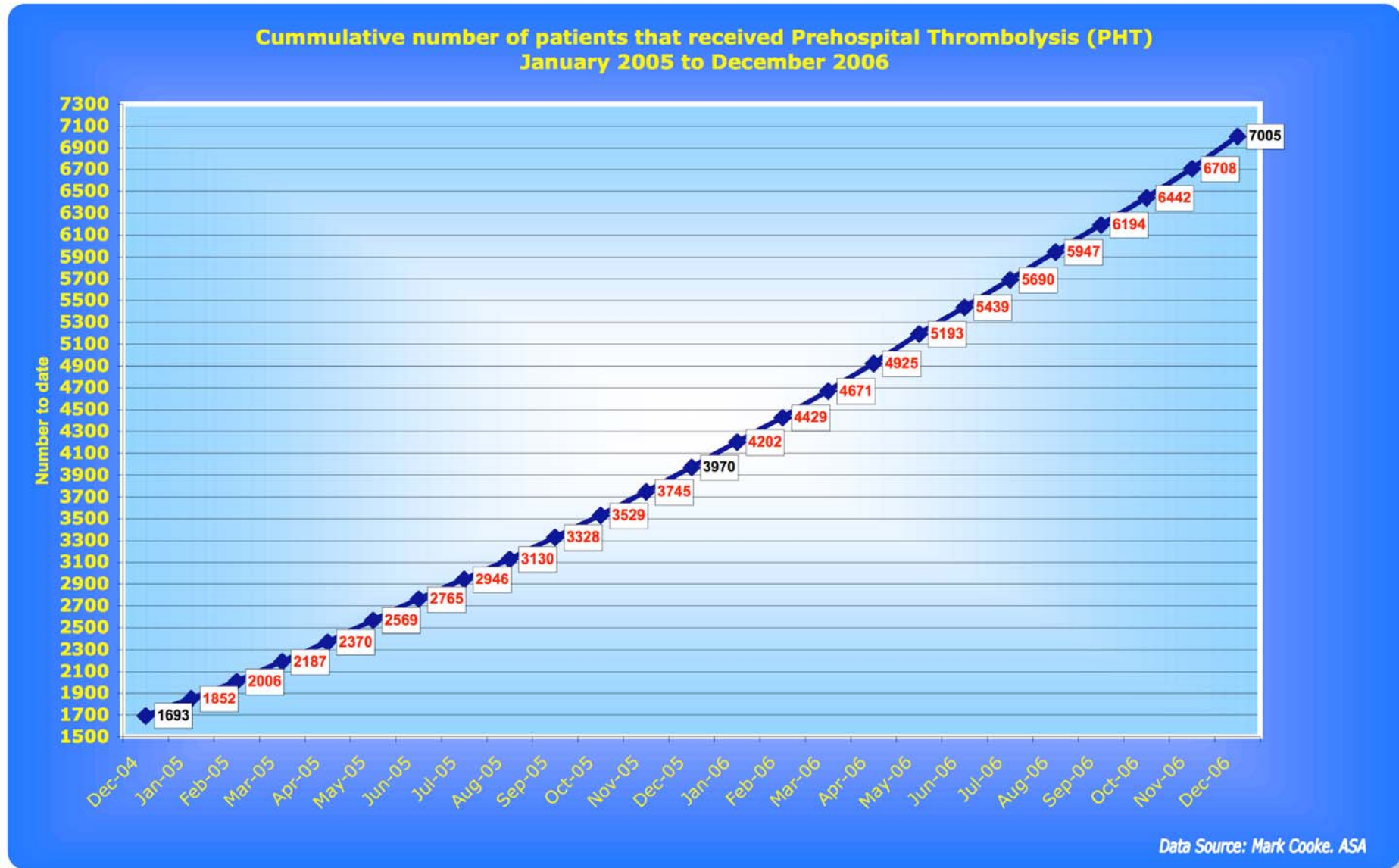
Prior to Jan 2007, there were 28 of the 31 (90%) ambulance services in England (data collected by old Trust boundaries), and the Welsh Ambulance Service providing pre-hospital thrombolysis.

- As opposed to providing thrombolysis in the pre-hospital setting, Greater Manchester Ambulance Service (GMAS) fast track all suitable patients to the hospital receiving unit for in-hospital thrombolysis. Service level agreements exist between hospitals and GMAS and the 'Call to Needle' time performance within this area is high.
- The London Ambulance Service has a protocol where all suitable patients are directly referred to a hospital for primary coronary angioplasty. Patients are transferred directly by ambulance crews to the catheterisation/angioplasty suite to avoid delays to treatment.
- South Yorkshire Ambulance Service doesn't provide pre-hospital thrombolysis.

3.1 Number of patients "by year/to date" that have received pre-hospital thrombolysis (England and Wales)

	<u>Per Year</u>	<u>To Date</u>
➤ Total number of patients thrombolysed prior to 2005	--	1693
➤ Total number of patients thrombolysed during 2005	2277	3970
➤ Total number of patients thrombolysed during 2006	3035	7005

Chart 1 – Number of Patients that received PHT to date (England and Wales) January 2005 to December 2006



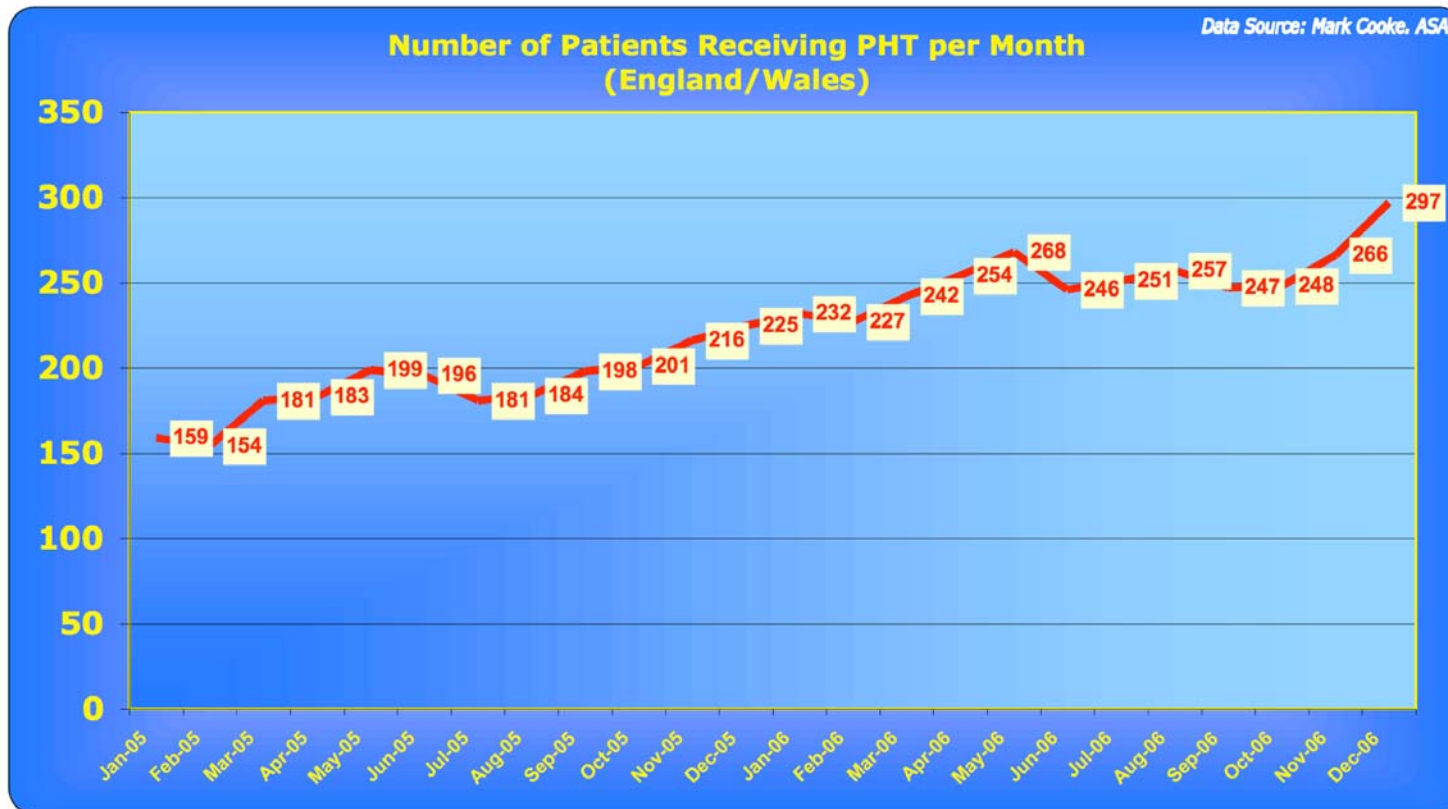
3.2 Number of Patients Thrombolysed per Month

There has been a steady increase in the numbers of patients thrombolysed per month as demonstrated below:

- Mean (average) number of patients thrombolysed per month during 2004 117
 - Mean (average) number of patients thrombolysed per month during 2005 190
 - Mean (average) number of patients thrombolysed per month during 2006 253

 - The median ‘call to needle’ time for pre-hospital thrombolysis 38 minutes* (range 6 to 105 minutes)
- * The national target for thrombolysis is within 60 minutes from call for help (currently 62% in 60 minutes)⁷

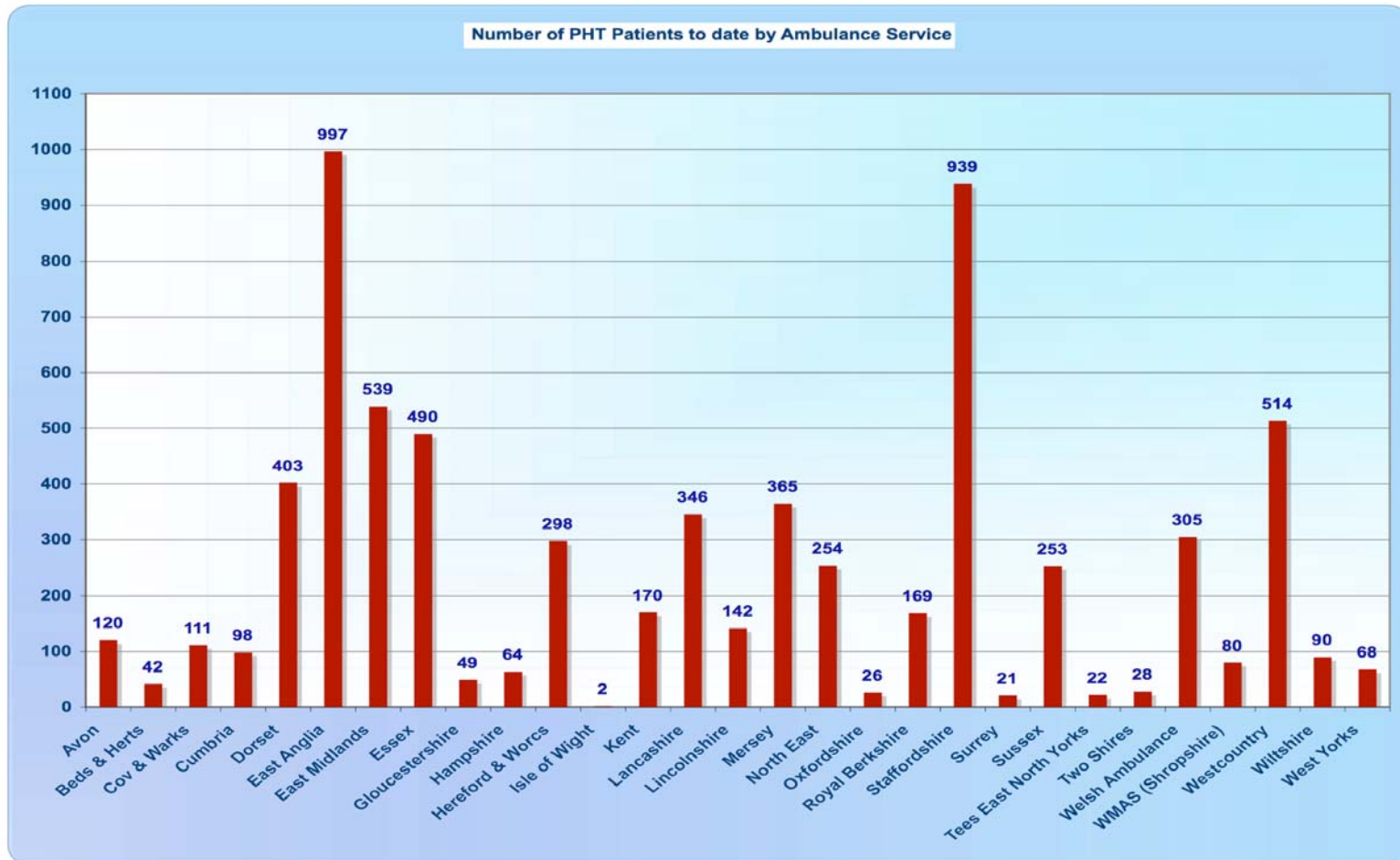
Chart 2 – Number of Patients Receiving PHT per Month (England and Wales) January 2005 to December 2006



3.3 Number of Patients thrombolysed per Ambulance Service

There is much variation between the numbers of patients thrombolysed by each ambulance service. This variation is generally related to the date when PHT was introduced to the service, the services with the highest numbers often being the earliest implementers of the PHT. The variation can be seen in *Chart 3* below.

Chart 3 – Number of Patients thrombolysed per Ambulance Service



3.4 Thrombolytic Agents used by Ambulance Services

There are currently two thrombolytic agents being used by ambulance services and these are Tenecteplase (TNK) and Reteplase (rPA).

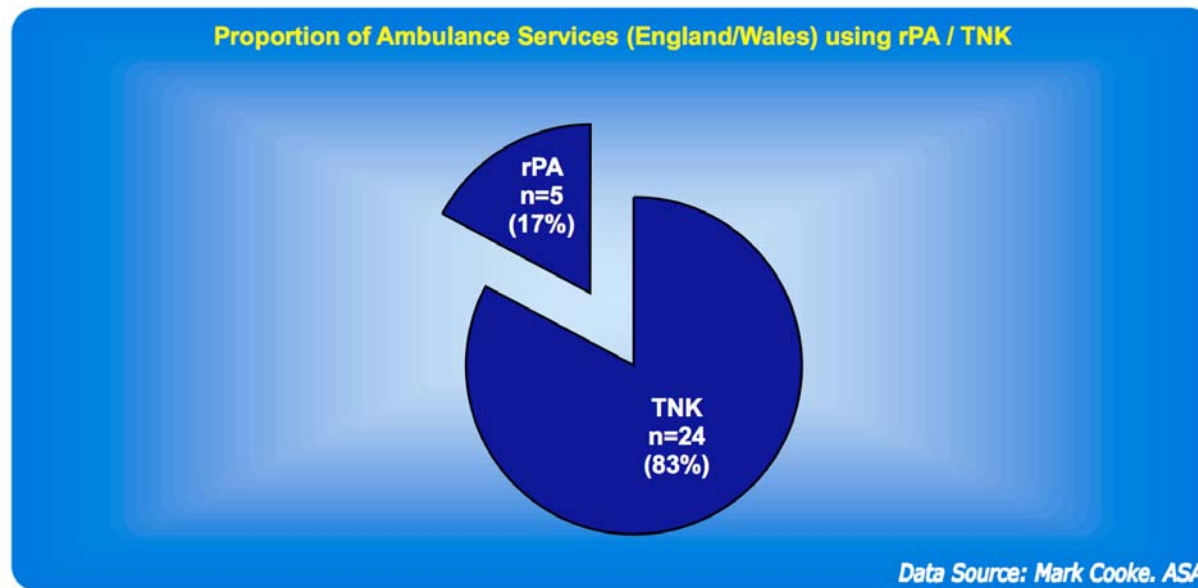
Reteplase (Rapilysin™) is a non-weight adjusted double bolus agent, with each bolus injection being administered 20 minutes apart.

Tenecteplase (Metalyse™) is a weight adjusted single bolus agent given at doses of either 4000 or 5000 units.

Both of these thrombolytic agents are proven to be of equal efficacy and are equally recommended. Both are potent platelet aggregators and should be given in conjunction with heparin to reduce the risk of reocclusion.

The choice of which agent is used is often directed by which agent is most commonly used at the receiving hospitals within that particular service area.

Chart 4 - The Proportion of Ambulance Services using rPA / TNK

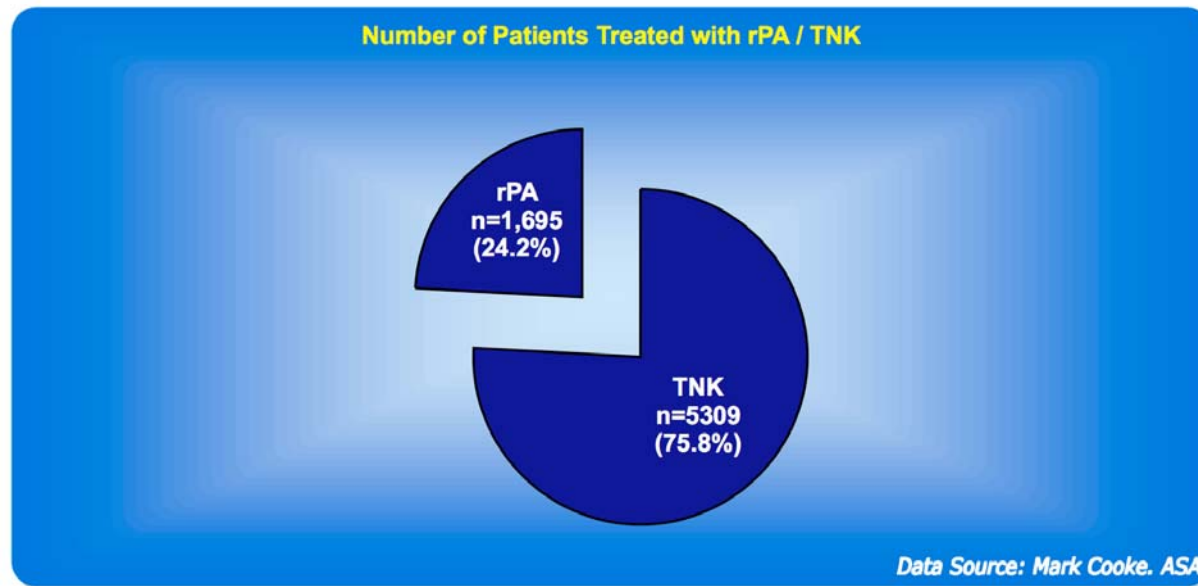


3.5 The Proportion of Patients Receiving rPA/TNK

The proportion of services using rPA/TNK and the proportion of patients receiving rPA/TNK are different and the most likely reason for this is that EMAS and Staffordshire who were two of the earliest implementers of PHT both use rPA. The majority of services, however, use TNK and chart 5 illustrates how many patients have received which thrombolytic agent.

The 5 services using rPA account for 24.2% of all cases of paramedic PHT, with the 24 services using TNK accounting for 75.8% of cases.

Chart 5 - The Proportion of Patients Receiving rPA/TNK



4. Recommendations for future audit

A number of recommendations can be made and these relate to any future audit of pre-hospital thrombolysis as the current arrangements for audit cease in April 2007.

Any future audit should take account of the limitations of this audit and include:

- Patients who presented with symptoms of AMI, but who were not assessed for thrombolysis (i.e. an unknown number of patients who could have benefited from thrombolysis).
- Patients who were assessed and met the eligibility criteria, but who did not receive thrombolysis for other reasons e.g. complex ECG, equipment failure or wrong crew skill mix etc.
- Patients who were assessed for thrombolysis but failed to meet the eligibility criteria due to one or more contra-indications to thrombolysis e.g. hypertension, history of stroke, recent history of surgery etc.

It would also be useful to include audit data on patients with AMI who are directly referred by paramedics for primary angioplasty and additionally those patients referred to a receiving unit for in-hospital thrombolysis. The Audit would then need renaming e.g. The National Audit of Early Reperfusion. The benefits of including these additional data are numerous, but the main advantage would be to achieve a national picture of activity and improvement.

Future audit should link directly with the Royal College of Physicians MINAP and be reported within their public reports⁷ so that any differences in re-occlusion rates between PHT and in-hospital thrombolysis can be identified as well as information linked to survival to hospital discharge.

5. Conclusion

The national audit of pre-hospital thrombolysis has been undertaken since 2004 and has reported dramatic improvements in the provision of PHT with 90% of all English ambulance services now providing PHT. At the end of December 2006, of the 7005 patients thrombolysed by paramedics, 3035 patients were thrombolysed during the previous 12-month period.

The results presented within this audit demonstrate how paramedic led pre-hospital thrombolysis results in an impressive median call to needle time of just 38 minutes, which compares very favourably with the call to needle time from the preliminary 2006/7 in-hospital performance of 62% within 60 minutes⁷.

Further work is required to link these audit data with MINAP and CCAD so that meaningful pre-hospital clinical interventions in the treatment of ST elevation AMI can be linked to clinical outcomes of patients.

6. List of Abbreviations

AMI	Acute Myocardial Infarction
ASA	Ambulance Service Association
CCAD	Central Cardiac Audit Database
ECG	Electrocardiogram
EMAS	East Midlands Ambulance Service
GMAS	Greater Manchester Ambulance Service
JRCALC	Joint Royal Colleges Ambulance Liaison Committee
MHRA	Medicines and Healthcare products Regulatory Agency
MINAP	Myocardial Infarction National Audit Project
NICE	National Institute of Clinical Excellence
PCI	Percutaneous Coronary Intervention
PGD	Patient Group Direction
rPA	Retepase (Rapilysin)
TNK	Tenecteplase (Metalyse)

7. References

1. American Heart Association ACC/AHA Guidelines for the management of patients with acute myocardial infarction; 1999
2. Department of Health, National Service Framework for Coronary Heart Disease; March 2000
3. NICE, Guidance on the use of drugs for early thrombolysis in the treatment of acute myocardial infarction; HTA 52; October 2002.
4. MHRA, POMs exemptions list for paramedics. <http://www.mhra.gov.uk/home>
5. ASA/JRCALC Clinical Effectiveness Programme, National Audit of ST Elevation Acute Myocardial Infarction 2004
6. Joint Royal Colleges Ambulance Liaison Committee (JRCALC) Clinical Practice Guidelines for NHS Ambulance Services*
7. Myocardial Infarction National Audit Project (MINAP). How the NHS Manages Heart Attacks. Fifth Annual Public Report
8. ASA/JRCALC National Audit of Pre-hospital Thrombolysis; <http://www.asa.uk.net>

**The new JRCALC guidelines (version 4) include relaxation of the criteria for eligibility for pre-hospital thrombolysis, including the increase in upper age limit from 75 years to 80 years and an increase in blood pressure upper limits to 110/180mm Hg.*

8. Acknowledgements

The following acknowledgement is made, without whose continued participation and support, this audit would not have been possible:

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