

# Nurse initiated thrombolysis in the accident and emergency department: safe, accurate, and faster than fast track

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**Objective:** To reduce the time between arrival at hospital of a patient with acute myocardial infarction and administration of thrombolytic therapy (door to needle time) by the introduction of nurse initiated thrombolysis in the accident and emergency department.

**Methods:** Two acute chest pain nurse specialists (ACPNS) based in A&E for 62.5 hours of the week were responsible for initiating thrombolysis in the A&E department. The service reverts to a "fast track" system outside of these hours, with the on call medical team prescribing thrombolysis on the coronary care unit. Prospectively gathered data were analysed for a nine month period and a head to head comparison made between the mean and median door to needle times for both systems of thrombolysis delivery.

**Results:** Data from 91 patients were analysed; 43 (47%) were thrombolysed in A&E by the ACPNS and 48 (53%) were thrombolysed in the coronary care unit by the on call medical team. The ACPNS achieved a median door to needle time of 23 minutes (IQR=17 to 32) compared with 56 minutes (IQR=34 to 79.5) for the fast track. The proportion of patients thrombolysed in 30 minutes by the ACPNS and fast track system was 72% (31 of 43) and 21% (10 of 48) respectively (difference=51%, 95% confidence intervals 34% to 69%,  $p<0.05$ ).

**Conclusion:** Diagnosis of acute myocardial infarction and administration of thrombolysis by experienced cardiology nurses in A&E is a safe and effective strategy for reducing door to needle times, even when compared with a conventional fast track system.

There is overwhelming evidence that thrombolytic therapy reduces mortality and morbidity in patients presenting with ST segment elevation or new left bundle branch block myocardial infarction (STEMI).<sup>1-3</sup> These benefits are greatest when thrombolysis is given at the earliest opportunity after symptom onset.<sup>4,5</sup> The National Service Framework for Coronary Heart Disease (NSF CHD) has set standards that by April 2002 75% of eligible patients should receive thrombolysis within 30 minutes of hospital arrival, a target scheduled to fall to 20 minutes by April 2003.<sup>6</sup> Like many hospitals we use a "fast track" system, designed to rapidly identify patients with evolving STEMI in the A&E department and expedite their transfer to the coronary care unit for thrombolysis by the on call medical team. Despite refining the service over a period of years in response to recurrent audit we have found that the involvement of more than one team of doctors and the need for transfer of the patient from one area of the hospital to another before the administration of thrombolysis incurs inevitable delays. It has been shown that in-hospital delays can be minimised by administering thrombolysis in A&E,<sup>7</sup> however, as recently as 1998 only 35% of UK A&Es provided this model of service.<sup>8</sup> While audit data show that A&E medical staff can provide safe and timely thrombolysis, appropriate levels of staffing and a programme of staff education are essential prerequisites.<sup>9,10</sup> A number of audit based papers demonstrate the benefits of a third way, whereby specialist nurses identify patients with evolving STEMI and either collaborate with medical staff to deliver thrombolysis or initiate therapy independently.<sup>11-15</sup> This paper will focus on the successful application of this approach in the A&E department at Diana, Princess of Wales Hospital, Grimsby.

## METHODS

In December 2000 two whole time equivalent G grade acute chest pain nurse specialists (ACPNS) were employed by the Diana, Princess of Wales Hospital, Grimsby as a strategy for reducing the time elapsed between arrival at hospital of a patient with STEMI and the administration of thrombolysis; the so called "door to needle time". Both nurses have wide ranging coronary care experience and have held specialist cardiac posts in the past. The ACPNS service is based in A&E and is available for 62.5 hours/week. Outside of these hours the hospital reverts to a "fast track" system, with rapid transfer of patients to the coronary care unit for thrombolysis by the on call medical team.

A two month preparation period was set aside for the development of the posts by the appointees and the service went "live" in February 2001. During this preparatory period patient group directions (PGDs) for the thrombolytic agents streptokinase and recombinant total plasminogen activator (rt-PA), as well as aspirin and bolus heparin, were written and subsequently approved by the local medicines and therapeutic committee, clinical managers, and senior clinicians. The PGD is a nationally agreed protocol format for the "prescription" of a named medicine in an explicitly identified clinical situation by nurses and other health care professionals.

Those with STEMI and ambiguous indications for thrombolysis, for example an unusual history or equivocal ECG, or with relative contraindications to thrombolysis, are referred to the on call medical registrar or consultant cardiologist on the emergency "fast bleep" system. All doctors have been briefed

**Abbreviations:** STEMI, ST segment elevation myocardial infarction; ACPNS, acute chest pain nurse specialist; PGDs, patient group directions

**Table 1** Month by month comparison of door to needle times (minutes)

Month (2001)	ACPNS n=43			Fast track n=48		
	n	Mean (SD)	Median (range)	n	Mean (SD)	Median (range)
February	7	28.7 (10.9)	29 (11-44)	5	34.6 (16.6)	28 (15-52)
March	5	20.4 (3.8)	20 (17-26)	8	73.8 (49.5)	59.5 (29-155)
April	4	37.8 (22.5)	34.5 (14-68)	8	43.8 (13.0)	41 (27-65)
May	6	30.3 (7.9)	28.5 (23-45)	8	50.8 (22.3)	45.5 (28-82)
June	3	30.3 (18.0)	31 (12-48)	6	74.0 (29.7)	75.5 (28-110)
July	3	24.33 (18.2)	17 (11-45)	5	110.0 (129.8)	57 (19-339)
August	6	24.3 (11.7)	23 (9-45)	3	126.0 (91.7)	133 (31-214)
September	2	18.5 (3.5)	18.5 (16-21)	2	208.5 (23.3)	208.5 (192-225)
October	7	18.3 (9.6)	20 (7-33)	3	60.0 (10.4)	54 (54-72)

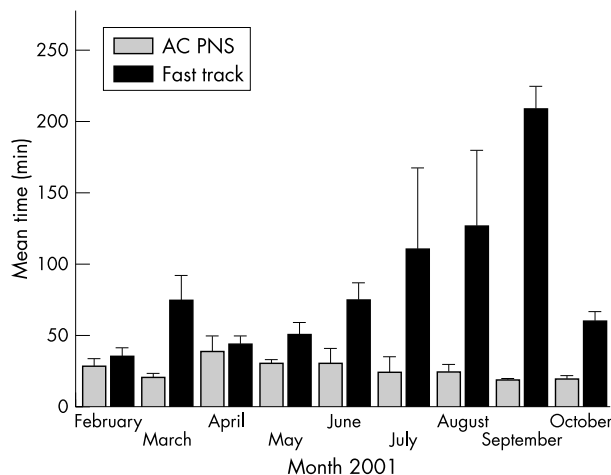
to accord this bleep the same urgency as a cardiac arrest call. However, the majority of patients meet the PGD criteria and are thrombolysed by the ACPNS without recourse to medical opinion.

The paramedic and ambulance technician crews radio ahead details of any patient with ischaemic sounding chest pain in advance of arrival in A&E, requesting that an ACPNS be "standing by" to receive the patient.

The aim of this audit is to evaluate the safety of the ACPNS service and compare performance, in terms of door to needle time for thrombolysis, with the coexisting fast track system. A standard for door to needle was set at 30 minutes, in accordance with the National Service Framework (CHD) target during the period studied.<sup>6</sup> The "door" time is defined as the time of arrival at hospital as recorded by the paramedic crew, or time of registration in A&E for self referrals; the "needle" time is defined as the time of initiation of a thrombolytic infusion. Door to needle times for both systems of thrombolysis delivery, recorded prospectively as part of the hospital's participation in the myocardial infarction national audit project (MINAP), were compared for the nine month period after the inception of the ACPNS service in February 2001. Patients who developed indications for thrombolysis after admission to hospital, that is had a non-diagnostic ECG at presentation to A&E, were not included in the audit. Copies of all documentation for ACPNS initiated thrombolysis were made for retrospective review by a consultant cardiologist, to determine if the decision to thrombolysed was both safe and appropriate at the time.

## RESULTS

Of the 91 patients analysed for the nine month period February 2001 to October 2001, 43 (47%) were thrombolysed in



**Figure 1** Mean door to needle times for both systems of thrombolysis delivery. Error bars show mean (1SEM).

A&E by the ACPNS and 48 (53%) were thrombolysed in the CCU by the on call medical team. The ACPNS achieved a statistically significant faster door to needle time: ACPNS had a median of 23 minutes (IQR=17 to 32) compared with 56 minutes (IQR=34 to 79.5) for the fast track system (Mann-Whitney U test =268,  $p<0.001$ ). Figure 1 shows a month by month comparison of mean door to needle times. The ACPNS thrombolysed a statistically significant higher proportion of patients within 30 minutes: ACPNS thrombolysed 72% (31 of 43) compared with 21% (10 of 48) by the fast track system (difference =51%, 95% confidence intervals =34% to 69%,  $p<0.05$ ). Table 1 gives a month by month breakdown of door to needle times for both systems of thrombolysis delivery.

Of the patients thrombolysed in A&E by the ACPNS, two (5%) experienced primary ventricular fibrillation during infusion of the drug and in each case sinus rhythm was successfully restored. One patient suffered intercranial haemorrhage as a result of thrombolysis and one patient had a single episode of suspected haematemesis, necessitating discontinuation of thrombolysis. In both cases retrospective review revealed that thrombolysis was clinically appropriate and no contraindications existed. A consultant cardiologist judged retrospectively that all ACPNS initiated thrombolysis was appropriate and no patients were missed by the A&E service.

## DISCUSSION

The government has made the reduction of door to needle time an "immediate priority".<sup>6</sup> It has been left to individual trusts and hospitals to introduce strategies to meet the standards set in the NSF CHD. We have demonstrated that our strategy at Grimsby, the development of a cardiology nurse initiated service in A&E capable of administering thrombolysis without a doctor, is an effective means of reducing door to needle time. Not only is the response time shorter for the ACPNS than the fast track system it is more consistent as shown by the smaller standard errors on figure 1.

One patient thrombolysed by the ACPNS service suffered an intercranial haemorrhage and later died and another had a single coffee ground vomit midway through thrombolysis, but went on to make an uneventful recovery. Although these events were attributed to thrombolysis, no factors were identified in either patient's presenting history, or from their medical records, to suggest that they were at particular risk of these complications and neither had absolute or relative contraindications to the treatment. Retrospective review by a consultant cardiologist of the notes of patients thrombolysed by the ACPNS service supported the results of an earlier pilot study by Quinn, which concluded that coronary care nurses can safely and accurately assess a patient's suitability for thrombolysis.<sup>16</sup>

The lack of resources to introduce 24 hour ACPNS cover has allowed us a unique opportunity to compare and contrast the new service with our traditional system of thrombolytic delivery. The second phase of our strategy for reducing door to

needle time at Grimsby will be to introduce in-house training in A&E for existing medical and nursing staff, with a view to providing round the clock thrombolysis in the A&E department. It has been shown that with appropriate education and resources A&E staff can achieve safe and timely thrombolysis.<sup>9,10</sup> This training will be led by the two ACPNS, who are now an integral part of the A&E team.

It should be noted that the benefits of a cardiology nurse led service based in A&E extend beyond a reduction in door to needle time. The ACPNS at Grimsby are also responsible for the risk stratification, initial treatment, and referral on of patients presenting with symptoms of an acute coronary syndrome but without STEMI requiring immediate thrombolysis, a patient group with an unfavourable prognosis. It is beyond the scope of this paper to discuss this area of the ACPNS service, but we are in the process of designing an audit tool for measuring the impact of the new service on this aspect of care delivery.

In conclusion, we have confirmed that the "fast track" transfer of patients from A&E to CCU for thrombolysis of acute STEMI is vulnerable to delay and is not a reliable system for the delivery of rapid thrombolytic therapy. Prescription and administration of thrombolysis by experienced cardiology nurses in A&E provides a safe and timely strategy for reducing Door to needle times with significant benefits compared with a conventional fast track system.

#### Contributors

S M Heath, principal author; collation of audit data; implementation and development of ACPNS service. R J I Bain, co-author; lead clinician in development and implementation of ACPNS service. A Andrews, collation of audit data; implementation and development of ACPNS service. M I Walters, review of audit data; retrospective analysis of medical notes; implementation and development of ACPNS service. S Chida, collation of audit data; implementation of ACPNS service. S I Kitchen, review of audit data; implementation and development of ACPNS service in A&E.

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