

# A BASELINE SURVEY OF FACILITIES FOR THE MANAGEMENT OF ACUTE MYOCARDIAL INFARCTION IN ENGLAND 2000

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## Introduction

The National Service Framework for Coronary Heart Disease establishes clear standards for prevention and treatment of coronary heart disease that will lead to major improvements in quality and access. This survey is a baseline examination of facilities available for the management of acute myocardial infarction (AMI) in England, in response to the publication of the National Service Framework. It should prove helpful to clinicians, health care managers and planners to provide fair access and effective delivery of appropriate health care for patients with AMI. Previous surveys are now some years old in what has become a rapidly moving area<sup>1</sup>. There have been considerable changes and developments in the management of AMI and other acute coronary syndromes in that time,<sup>2</sup> requiring more cardiological expertise, and appropriate management facilities.

**Data collection.** Survey questionnaires (Appendix C) were sent in March 2000 to all hospital Trusts thought to be involved in the management of AMI. These forms were sent to Chief Executives as one of several documents outlining the planned response of the profession to the requirements of the National Service Framework for Coronary Heart Disease. The work of identifying hospitals where AMI was managed was difficult because there was no central list of these hospitals. The continuing mergers of hospitals reduced the anticipated number. In some areas Trusts incorporated two hospitals, and the management of AMI involved both sites, with an Accident and Emergency (A&E) department in one hospital and the cardiac care unit (CCU) in another. This was often an interim arrangement pending a move to one hospital. These instances were rare and we have performed analyses as if they were separate hospitals. Overall the impact on the analysis of this approach is small.

**Data validation.** We performed an interim analysis of data returns from 184 hospitals in June 2000. This provided an opportunity to validate these returns, and data entry was checked by two editors. Time constraints prevented formal data validation of returns arriving after this point, although individual hospitals were interrogated about their returns when there was uncertainty about answers. Data were stored and subsequently analysed using the SPSS statistical package. During the analysis a small number of inconsistencies in responses were noted and where possible from other available evidence, these were corrected at the discretion of the editors, or otherwise treated as missing data.

In Appendix D each hospital has been provided with the answers that they gave to the questions in the survey. Appendix D is available to hospitals only to provide them with access to their own data. Tables and text are linked to the survey questions by the presence of the question number, *viz* (Q6.1).

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<sup>1</sup> A report of a working group of the BCS: cardiology in the district hospital. *Br Heart Journal* 1994; **72**:303-308.

<sup>2</sup> Guidelines for the management of patients with acute coronary syndromes without persistent ECG ST segment elevation. British Cardiac Society Guidelines & Medical Practice Committee and the Royal College of Physicians Clinical Effectiveness and Evaluation Unit. *Heart* 2001; **85**:133-142.

## Overview of results

The following is a summary of the salient points of the survey. The reader should examine the body of the text for more detail. It was not the intention of the editors to offer critical comment on these findings; these data should speak for themselves.

**Response rate.** There was a high response rate; 229/231 hospitals completed the survey. There was a high completion rate for individual questions; where responses were less than 100% we comment in the relevant section. The majority of hospitals, 211/229 responding to this survey were general acute hospitals with A&E departments. Some 27 of these additionally had facilities for coronary interventional work, usually with cardiothoracic surgery on site.

**Hospital catchment populations.** The median hospital catchment population, calculated in 1998, was 202,000 to the nearest 1000 and the interquartile range (IQR) was 160,000–262,000. The median number of patients having a primary discharge diagnosis of AMI in 1998-9 was 406, IQR 294–582.

**Consultant numbers.** Eight hospitals reported having no cardiologist; these hospitals tended to have smaller catchment populations (median 123,471, range 85,627–261,614). The majority of hospitals employed one (30%) or two (36%) cardiologists. In any hospital they might be full-time cardiologists, or physicians with an interest in cardiology, or a combination of the two types. The average available whole time equivalent (WTE) of cardiologists in the 211 hospitals receiving patients with AMI was 1.7.

**Cardiologists in relation to population.** We examined the relation between size of hospitals in proportion to the catchment population and the number of cardiologists employed. We found that in hospitals without coronary interventional facilities the size of the catchment population for each WTE cardiologist rose from 78,000 for hospitals in the lower quartile of size, to 140,000 for each WTE cardiologist for hospitals in the top quartile.

**Management of acute myocardial infarction.** In the majority of hospitals AMI of all age groups was managed by the same clinicians. About one-half were looked after throughout their hospital stay by a physician who was not a cardiologist, and about one-third of these were then followed up by the same physician after discharge. Many, but not all patients, had advice on management given by a cardiologist, either consultant or sub-consultant in grade, during their hospital stay. In 9% of hospitals patients had no recorded cardiological input to their management either during or after the admission. In 41% of hospitals, patients were managed for at least the early part of the episode by a cardiologist. In the majority of these hospitals there were only one or two cardiologists.

**The cardiac care unit.** There will be, by the time of publication, a CCU in every hospital having care of AMI. In 75% of hospitals the facility was described as a dedicated CCU, meaning physically separate from any other unit, and not sharing beds with *eg* an intensive care unit (ICU). The mean number of beds was 7.2, about one bed for every 30,000 population. Hospitals in the lower quartile of size (defined

by catchment population) have more than twice as many CCU beds as hospitals in the top quartile for the needs of their population.

**Admission arrangements for patients with AMI.** About half the hospitals had arrangements for patients to be admitted directly (*ie* without assessment anywhere else in the hospital) to the CCU either after referral by a General Practitioner (GP) or after a call to the emergency service. This arrangement has been shown to provide thrombolytic treatment to eligible patients as quickly as provision in an A&E department<sup>3</sup>. However in some hospitals it is not feasible, and even when this facility is used it is not practicable for all patients. In practice the majority of patients with AMI were first seen in A&E. Seventy percent of hospitals reported that thrombolytic treatment was given in their A&E department, but in about 10% this was to a very small proportion of all eligible patients.

**Admission to CCU.** One-third of hospitals often experienced significant delays (8 or more days per month) in admitting patients to the CCU, because of pressure on beds. This was noted both at hospitals where interventional work was performed, and also in the hospitals where this work was not done.

**Use of thrombolytic agent.** Streptokinase was used for 82% of eligible first AMIs, with about half using tPA (tissue plasminogen activator) for younger patients with AMI. About 60% reported that their use of more expensive thrombolytic drugs such as tPA was in part limited by cost.

**Risk evaluation following AMI.** The majority of hospitals perform exercise testing on patients after discharge, with 28% performing this before discharge. Echocardiographic assessment of left ventricular function was performed in one-third of hospitals before discharge. This was more commonly performed when the patient had been under the care of a cardiologist. Despite the availability of radionuclide scanning in about 50% of hospitals, assessment of left ventricular function, or perfusion scanning was performed in only 7 hospitals. Routine coronary angiography, as opposed to an investigation performed for continuing symptoms, was also performed rarely.

**Coronary interventional work.** Thirty-five hospitals provided this service in England, and of these 6 or 7 hospitals performed this only for their own patients, leaving less than 30 hospitals to receive the referrals from the rest of the country. There were more than 5 referring hospitals for every interventional hospital. We found that there were large numbers of patients in beds in referring hospitals, and in the beds of the hospitals to which patients are referred, awaiting urgent and emergency coronary angiography and coronary interventions. Interventional units described median delays of 7 days between referral and angiography or coronary interventions.

**Rehabilitation.** Eleven percent of hospitals reported that they had no coronary rehabilitation staff. Of those who did have staff about 15% of their time was paid

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<sup>3</sup> Birkhead J S on behalf of the Myocardial Infarction Audit Group. Trends in the provision of thrombolytic treatment between 1993 and 1997. *Heart* 1999;**82**:438-42.

from non-NHS sources. In addition to gym-based physical rehabilitation, which almost all hospitals with rehabilitation staff provided, many also offered home visiting, hospital-based drop-in services, phone advice lines, counselling for partners, support for patients with other cardiac pathology apart from coronary disease, and liaison with community leisure services.

**For much of this report the denominator used for percentages is the number of hospitals in groups 1A, 1B and 1C of Table 1. We have indicated those places where a different denominator is used.**

## Section 1: Hospital characteristics

The majority of hospitals were general hospitals with a 24 hour A&E department taking acute unselected emergencies. They may in addition have a teaching role and have cardiothoracic surgical facilities. Tables 1 and 2 list the numbers of hospitals and the availability of angiographic and coronary interventional facilities.

Type of hospital		Number of hospitals	%
1A	A hospital with 24 hour A&E department taking acute unselected emergencies	197	86
1B	Hospital with A&E department open less than 24 hours/day, but taking acute unselected emergencies	1	-
1C	Hospital without A&E dept but receiving patients with suspected AMI either 999 or from GPs	13	6
1D	Cardiothoracic hospital (not part of an acute hospital with A&E department) accepting suspected AMI from 999 service or GPs	3	1
1E	Cardiothoracic hospital only accepting tertiary referrals	5	2
1F	Minor injury unit where thrombolytic treatment is given	2	1
1G	Other (community hospitals not accepting emergency admissions)	8	4
Total		229	100

Q1

Table 1. Types of hospital.

Type of hospital	Are there on-site facilities for angiography?	Is interventional work performed on-site?	Number of hospitals	%
1A , 1B, 1C	NO	NO	135	59
1A , 1B, 1C	YES	YES	27	12
1A , 1B, 1C	YES	NO	49	21
1D, 1E	YES	YES	8	3
1F,1G	NO	NO	10	4
Total			229	100

Q1, Q8.5a & Q8.7a

Table 2. Availability of angiographic and interventional facilities.

Thirty-six percent (76/211) of hospitals in groups 1A–1C had angiographic facilities on-site.

## Section 2: Demography

It was clear from the answers returned that population characteristics were often difficult to access locally. We have therefore validated these returns using Hospital Episode Statistics (HES) data. Details on how this work was done can be found in Appendix B. The total population for England in 1998 (adjusted to account for non-residents treated in Trusts), within the analyses was 44,519,575. When there were two hospitals within the same Trust, the Trust population and the Trust number of AMI discharges were divided by two to give results for each hospital. This may have produced disparity from the real population and may not represent the true relative proportions of the catchment population.

The percentage of Health Authority residents in 1998 aged 75 years or more, and the Standardised Mortality Ratio (SMR) for coronary heart disease (International Classification of Diseases version 9, 410-414), all ages 1996-1998, were taken from the Compendium of Clinical and Health Indicators 1999 (see Appendix B) and related to Trusts via the Health Authority to which the Trust is linked.

Data for the next 4 tables are for hospitals in groups 1A–1C.

Hospitals	Sum	Mean	Median	IQR
211	44,519,575	210,993	201,832	160,057 – 262,215

Q2a

Table 3. Catchment population for acute admissions (not tertiary referrals), for the year 1998.

Hospitals	Median	IQR	Range
211	7.1%	6.6% - 7.9%	4.8%-11.6%

Q2b

Table 4. Percentage of resident Health Authority population aged 75 years or more.

Hospitals	Sum	Mean	Median	IQR
211	97,855	464	406	294 - 582

Q2c

Table 5. Number of patients with primary discharge diagnosis of acute myocardial infarction; excluding patients transferred from elsewhere, 1998/9 data.

Hospitals	Median	IQR	Range
211	97	91 - 110	66 - 146

Q2d

Table 6. Standardised mortality ratio for coronary disease for all ages in Health Authority.

## Section 3: Staffing in cardiology

### 1. Numbers of consultant cardiologists.

Consultant numbers were calculated for hospitals in groups 1A-1C (n=211), which were those hospitals who accepted patients with AMI. This excluded those hospitals that only dealt with the tertiary care of these patients. Note that the term 'full-time cardiologist' is used to make a distinction from physicians with an interest in cardiology, and has no significance in relation to numbers of sessions worked. This is covered in later tables that consider WTE.

These data represent the position in mid-2000. It was not possible to have a single census date. During the last 12 months (September 1999-August 2000), there were about 25 new consultant appointments in cardiology.<sup>4</sup> It is not known how many of these were included in this dataset, since inclusion would have depended on the date of return of the survey.

		Number of physicians with major interest in cardiology in each hospital (having regular medical on take duties)								
		0	1	2	3	4	5	6	NK <sup>5</sup>	All (%)
Number of full-time cardiologists making up the acute cardiology rota (without on take duties for acute general medicine)	0	8	52	64	8	4	1	-	-	137 (65)
	1	12	10	1	-	-	-	-	1	24 (11)
	2	2	5	9	2	-	-	-	1	19 (9)
	3	7	1	-	1	-	-	-	-	9 (4)
	4	3	-	1	-	-	-	-	1	5 (2)
	5	7	-	-	1	-	-	-	-	8 (4)
	6	4	2	-	-	-	-	1	-	7 (3)
	7	1	-	-	-	-	-	-	-	1 (.5)
	NK	-	-	-	-	-	-	-	1	1 (.5)
	All (%)	44 (21)	70 (33)	75 (36)	12 (6)	4 (2)	1 (-)	1 (-)	4 (2)	211 (100)

Q3c & Q3d

Table 7. Distribution of consultant staff in hospitals admitting patients with acute myocardial infarction. In 4 hospitals with full-time cardiologists the number of physicians with an interest in cardiology was not stated.<sup>6</sup>

Two-thirds of hospitals had 1-2 physicians with an interest in cardiology. However there were some hospitals with a combination of full-time cardiologists and physicians with an interest, while others had full-time cardiologists with no on take duties, but who provided cardiological cover for their hospital.

At the time of the survey there were 481 cardiologists in hospitals accepting patients with AMI (n=211) of whom 283 were physicians with an interest in cardiology and 198 practicing full-time cardiology without general medical on take duties. Eight hospitals reported that they had no cardiologist. The hospitals without cardiologists

<sup>4</sup> British Cardiac Society manpower database.

<sup>5</sup> NK=not known.

<sup>6</sup> For 3 hospitals WTEs were given rather than the number of staff. These WTEs (0.6, 2.5, 4.4) were rounded up to the nearest whole person (1,3,5).

had a mean catchment population of 143,347 (median 123,471, range 85,627–251,614). Some of these hospitals had sessions from cardiologists based elsewhere, but did not have immediate access to a cardiologist based in the hospital.

Tables 8 & 9 show the frequency distribution of cardiology posts in hospitals.

Physicians with major interest in cardiology + full-time cardiologists												
Number of cardiologists/hospital	0	1	2	3	4	5	6	7	8	12	NK	All
Number of hospitals	8	64	76	21	17	10	6	3	1	1	4	211
%	4	30	36	10	8	5	3	2	(-)	(-)	(2)	100

Q3c & Q3d

Table 8. Numbers of consultant cardiologists, (combination of full-time and physicians with an interest).

WTE of physicians with major interest in cardiology + WTE of full-time cardiologists										
WTE of cardiologists	0	0.1 – 0.9	1.0 – 1.9	2.0 – 2.9	3.0 – 3.9	4.0 – 4.9	5.0 – 5.9	>6	NK	Total
Number of hospitals	8	9	66	68	17	20	6	3	14	211
%	4	4	31	33	8	9	3	1	7	100

Q3c & Q3d

Table 9. Whole time equivalents of cardiologists (combination of full-time and physicians with an interest).

**2. Whole time equivalents of cardiologists.** For 197 hospitals the WTE of physicians with an interest in cardiology was 251.7, and for full-time cardiologists 154.8. Assuming a physician with an interest in cardiology spends 70% of available time in cardiology, and the rest in general medical duties, this represents 176.2 WTE (70% of 251.7) available to cardiology. On this basis the number of WTE of consultant cardiologists available to 211 hospitals where AMI is managed is 355.<sup>7</sup> This equates to 1.7 WTE consultants per hospital. Note that this assumption is not used in any of the analyses.

**3. Distribution of cardiologists.** This was examined in relation to the catchment populations of the hospitals which were split into quartiles<sup>8</sup>. Table 10 includes the 27 hospitals in groups 1A-1C where interventional work took place. Overall there were 35 hospitals with interventional facilities and 184 without such facilities. Thus there were 5.3 hospitals referring patients for intervention to each hospital performing interventional work.

<sup>7</sup>(176.2+154.8)\*(211/197)

<sup>8</sup>The quartiles were: 25%, 160,057; 50%, 201,832; 75%, 262,215. For analysis these were rounded to 160,000, 200,000, and 260,000.

	Size of hospital based on catchment population				
	< 160,000	160,000 - 200,000	200,000 - 260,000	>260,000	Total
Number of hospitals	52	51	55	53	211
Population within group	539,0221	919,5095	12,317,719	17,616,540	44,519,575
Mean population/hospital	103,658	180,296	223,959	332,388	210,993
Number of cardiologists in group	70 (51 H)	110 (49H)	133 (54H)	161 (53H)	474 (207H)
WTE cardiologists in group	60.5 (50 H)	86.2 (45H)	123 (53H)	136.7 (49H)	406.5 (197H)
Cardiologists/hospital	1.4	2.2	2.5	3.0	2.3
WTE/hospital	1.2	1.9	2.3	2.8	2.1
Population/cardiologist	76,996	80,436	90,703	109,419	92,653
Population/WTE	87,954	94,633	96,126	120,505	102,768

Q2a, Q3c & Q3d

Table 10. Hospitals (1A, 1B & 1C only) were grouped by the catchment population quartile. The mean population for hospitals in each group was calculated from the total population for the group divided by the number of hospitals in the group. The number of cardiologists, and WTE comprised full-time cardiologists and physicians with a major interest in cardiology. The number in brackets, *viz* (51H) refers to the number of hospitals with data. Only populations from these hospitals were included when computing the population/cardiologist and population/WTE for each group.

	Size of hospital based on catchment population				
	< 160,000	160,000 - 200,000	200,000 - 260,000	>260,000	Total
Number of hospitals	51	49	50	34	184
Population within group	5,243,704	8,828,180	11,199,772	10,768,569	36,040,225
Mean population/hospital	102,818	180,167	223,995	316,723	195,871
Number of cardiologists in group	67 (50H)	102 (47H)	106 (50H)	77 (34H)	352 (181H)
WTE cardiologists in group	58.5 (49H)	80.2 (43H)	98 (49H)	61.2 (30H)	298 (171H)
Cardiologists/hospital	1.3	2.2	2.1	2.3	1.9
WTE/hospital	1.2	1.9	2	2	1.7
Population/cardiologist	78,256	83,148	105,658	139,851	101,399
Population/WTE	88,456	97,138	111,835	157,272	112,584

Q2a, Q3c, Q3d & Q8.7a

Table 11. Hospitals without interventional facilities. Cardiologist numbers in relation to the catchment population served.

Table 11 examines hospitals without interventional facilities (n=184). Forty-nine of these hospitals had angiographic facilities. The population served per WTE cardiologist in the highest population quartile is almost twice that of the lowest quartile.

	Number of hospitals	Number of cardiologists/hospital	WTE cardiologists/hospital	Population/cardiologist	Population/WTE cardiologist
Neither angiography nor interventional facilities on-site	135	1.7 (222/133)	1.5 (185.5/125)	110,153	122,786
Angiography on-site, but no interventional facilities	49	2.7 (130/48)	2.5 (112.5/46)	86,450	98,293
Angiography and interventional facilities on-site	27	4.7 (122/26)	4.2 (108.5/26)	67,419	75,843
All hospitals	211	2.3 (474/207)	2.1 (406.5/197)	92,653	102,768

Q2a, Q3c, Q3d, Q8.5a & Q8.7a

Table 12. Cardiologist numbers related to facilities in hospital. Results were computed using available data only.

In table 12 the larger number of cardiologists in interventional hospitals reflects the interventional workload not only for the local population but also the larger population referred for intervention from elsewhere. The population per consultant cardiologist remains considerably greater than proposed<sup>9</sup> especially in hospitals without angiographic facilities.

#### 4. Non-consultant grades.

**Staff grade.** There were 66 staff grade physicians in cardiology. Most were known to be full-time (48 WTE from 54 staff). The majority, 41/65 (63%) were employed where there were one or two cardiologists.

Number of cardiologists in the hospital	Number of staff grade physicians in cardiology						Total
	0	1	2	3+	NK		
1	42	21	-	-	1	64	
2	55	20	-	-	1	76	
3	16	5	-	-	-	21	
4	10	7	-	-	-	17	
5+	17	2	-	2	-	21	
NK	1	-	1	-	2	4	
All	141	55	1	2	4	203	

Q3c, Q3d & Q3e

Table 13. Staff grade numbers are given against the number of cardiologists with whom they work<sup>10</sup>.

<sup>9</sup> Consultant physicians working for patients. A report of the Royal College of Physicians. *J R Coll Physicians Lond* 1998;32, Supp 1.

<sup>10</sup> For two hospitals WTEs were given rather than the number of staff grade physicians. These WTEs (0.5, 0.5) were rounded up to the nearest whole person (1,1).

**Specialty registrars.** There were 173 specialty registrars working in 206 hospitals. Ninety-six registrars worked in hospitals with angiographic facilities, and 77 where this facility was not available.<sup>11</sup>

Number of cardiologists in hospital	Specialty registrars in cardiology					Number of registrars
	0	1	2	3+	NK	
0	8	-	-	-	-	-
1	42	22	-	-	-	22
2	21	52	3	-	-	58
3	3	10	7	1	-	29
4	2	10	3	2	-	28
5+	4	6	3	5	1	35
NK	1	1	-	-	4	1
						173

Q3c, Q3d & Q3f

Table 14. Specialty registrars are given against the number of cardiologists in the hospital.

**Associate specialists.** There were 34 associate specialists in cardiology who worked a total of 22-29 WTE<sup>12</sup>, this range reflecting the uncertainty of some of the answers given. (Q3g)

<sup>11</sup> For 3 hospitals WTEs were given rather than the number of specialty registrars. These WTEs (0.2, 0.3, 0.8) were rounded up to the nearest whole person (1,1,1).

<sup>12</sup> For one hospital a WTE was given rather than the number of associate specialists. This WTE (1.5) was rounded up to the nearest whole person (2).

## Section 4. Cardiologists and general medical on take duties

The relation between specialty interests and the needs of acute general medicine has become a subject of debate in general hospitals. The increasingly heavy general medical on take commitment has to take priority over specialty needs, and in many hospitals this may have an adverse impact on the provision of specialist cardiac care. There has been local concern where cardiologists do not take part in the general medical on take rota<sup>13</sup>. This occurred in only 36/211 (17%), of hospitals.

	Number of hospitals	Number of physicians in on take rota Median (IQR)	On take rota 1 day in N Median (IQR)
Full-time cardiologists all taking part in medical on take rota	137	9 (7 – 12)	7 (5 – 10)
Full-time cardiologists having no part in on take rota, and NO physicians with major interest in cardiology (non-interventional hospitals)	19	8 (6 – 10)	8 (6 – 10)
Full-time cardiologists having no part in on take rota, and NO physicians with a major interest in cardiology (interventional hospitals)	17	13 (10 – 17)	6 (4 - 9)
Hospitals with mix of physicians with interest and full-time cardiologists	34	10 (7 – 12)	7 (5 – 10)
All hospitals	207	10 (7 – 12)	7 (5 – 10)

Q3a, Q3b, Q3c, Q3d & Q8.7a

Table 15. Medical on take rotas and cardiological involvement. Data were inadequate from 4 hospitals. N=number of days.

In 19 non-interventional hospitals where full-time cardiologists had no part in the acute medical on take rota, the frequency of the on take rota ranged from 5–16 days, and was fairly evenly distributed between these figures. Two-thirds (12/19) of these cardiologists were single-handed and worked in hospitals having a median catchment population of 184,000.

<sup>13</sup> Mather H, Connor H. Coping with pressures in acute medicine – the second RCP consultant questionnaire survey. *J R Coll Physicians Lond* 2000; **34**:371-373.

## Section 5. Management of acute myocardial infarction

In most hospitals patients with AMI of all ages were looked after by the same clinicians. There were separate on take arrangements for elderly patients in 32 (15%) hospitals. For 6 of these hospitals the age cut-off point was between 65-74 years, for 16 it was 75 years, and in 9 it was between 76-85 years. In half of the hospitals, patients with AMI were looked after by the general physician admitting the patient. For one-third of these hospitals (34/106), the same general physician also followed up the patient after discharge. For 19/34 (56%) of this smaller subgroup, there was no daily ward round on the CCU from a consultant cardiologist, or other training grade cardiologist to help with management. This represents 9% of all hospitals.

Although table 16 represents the responses given to a specific question (Q4.2) in the survey, it was clear from additional comments that many different arrangements, involving general physicians, physicians with an interest in cardiology, and full-time cardiologists, existed for the management of AMI. This is reflected in table 16 where a row of data headed 'Other' covers the less easily categorised management arrangements.

Care of patient during admission	Care of patient after discharge				
	General physician who admitted patient	Transferred routinely to care of a cardiologist	Transferred occasionally to a cardiologist	No fixed arrangement	All
General physician who admitted patient	34	11	58	3	106 (50%)
Transferred <i>routinely</i> to care of cardiologist after admission by on take team	1	44	2	1	48 (23%)
Cardiologist has initial care of patient, handing over general physician after CCU	4	9	21	4	38 (18%)
Other	1	9	6	2	18 (9%)
All	40 (19%)	73 (35%)	87 (41%)	10 (5%)	210 (100%)

Q4.2 & Q4.3

Table 16. Care of patient during admission with AMI, and after discharge. In one case the arrangement after discharge was not recorded.

In 86 hospitals patients with AMI were either transferred routinely to the care of a cardiologist after admission by the on take team, or looked after by a cardiologist until discharge from CCU. In 3 of these hospitals the number of cardiologists responsible for care was not available.

Number of cardiologists having care of patients with AMI in each hospital	1	2	3	4	5+	Total
Number of hospitals	19	30	12	10	12	83

Q3c, Q3d & Q4.2

Table 17. The number of cardiologists in those hospitals where a cardiologist had care of patients with AMI for all, or at least part of the admission.

In 49/83 (59%), of hospitals one or two cardiologists had care of patients with AMI for all, or at least the early part of the admission. It cannot be realistic for single-handed cardiologists, or even two cardiologists to assume care of all patients with AMI during an admission without support from junior staff from other teams. Even this arrangement requires a continuous or one in two rota for the consultant cardiologists.

## Section 6. The cardiac care unit

**1. General.** All hospitals had access to monitored beds, and most described their facility as a dedicated CCU. A clearer definition of the term 'dedicated unit' as a stand-alone unit, not physically part of another ward, would have helped respondents. We also failed to ask about the availability of dedicated cardiac beds or wards (without continuous monitoring facilities). It was clear from responses that some hospitals had a cardiac ward with the CCU being part of that facility.

	Number of hospitals	%
Dedicated CCU	158	75
Beds shared with ICU	13	6
Beds shared with a high dependency unit (HDU)	5	2
Monitored area which is part of a general medical ward with dedicated nursing staff for patients with AMI	17	8
Monitored area part of a general medical ward where patients with AMI are looked after by non-specialised nursing staff	9	4
Other	9	4
Total	211	100

Q5.1

Table 18. Types of cardiac care facilities available. Eight hospitals, having described their unit as a dedicated cardiac care unit, also indicated that it was part of a medical ward. These have been counted in table 18 as if a dedicated cardiac care unit.

**2. Number and availability of beds.** The median number of monitored beds in each hospital was 6 (IQR 5-8, n=205 hospitals). Almost all beds were routinely staffed (median 6, IQR 5-8, n=203 hospitals). In 92% of hospitals, (184/201) all beds were routinely staffed. For 6 hospitals the shortfall was 1 bed, for 8 hospitals it was 2 beds, whilst for 3 hospitals the shortfall was 3 out of 14 beds, 4 out of 13 beds and 6 out of 30 beds respectively. One hospital without a CCU, and without any other specialised monitoring facility for patients with AMI is expected to open a dedicated CCU in late 2000, and until then patients with AMI are managed on general medical wards.

Monitored beds	Dedicated CCU	Beds shared with ICU	Beds shared with HDU	Monitored part of medical ward (dedicated CCU nurses)	Monitored part of medical ward (non-specialised nurses)	Other	Total
2				1		1	2
3	1	1					2
4	24	7	1	2	1	1	36
5	22	2	1	1	1		27
6	38	2	2	7	4	1	54
7	9						9
8	23			1	1		25
9	8	1		2			11
10	16			1			17
11	3						3
12	4					1	5
>12	8		1	1	1	3	14
	156	13	5	16	8	7	205

Q5.1 & Q5.2

Table 19. Total number of beds in cardiac care facilities of all types.

The mean hospital catchment population per monitored bed was 33,221 for 205 hospitals (median 30,724, IQR 21,635–42,382). These data were not available for 6 hospitals. Taking England as a whole there were 1478 beds (from 205 hospitals) for a catchment population of 43,308,108, a population of 29,302 per bed.

Tables 20 and 21 describe the number of beds available on the CCU and the relation between the numbers of beds and the catchment population.

Hospital size based on catchment population	Number of hospitals	Number of beds: inter-hospital summary			
		Mean	Median	Interquartile range (IQR)	
<160,000	50	5.5	5	4	6
160,000-200,000	50	8.0	7	6	10
200,000-260,000	54	7.4	6	5	8
>260,000	51	7.9	7	6	9
All hospitals	205	7.2	6	5	8

Q2a & Q5.2

Table 20. Number of beds available for care of acute myocardial infarction in all types of facility, hospitals 1A-1C.

Hospital size based on catchment population	Number of hospitals	Catchment population per bed: inter-hospital summary			
		Mean	Median	Interquartile range (IQR)	
<160,000	50	21,407	21,304	14,172	30,726
160,000-200,000	50	26,741	25,165	18,404	31,453
200,000-260,000	54	37,857	37,949	27,514	47,155
>260,000	51	46,247	45,765	34,599	54,920
All hospitals	205	33,221	30,724	21,635	42,382

Q2a & Q5.2

Table 21. Numbers of population per cardiac care bed in relation to the size of the hospital catchment population.

It is clear that the number of monitored beds in cardiac care facilities is not in step with the increase in hospital size. For the 50 smallest hospitals (catchment population of under 160,000) there were 4.7 beds per 100,000 on average. This is about the level recommended by a British Cardiac Society working group in 1994<sup>14</sup>. In larger hospitals (catchment population of more than 260,000) there were 2.2 beds per 100,000 on average.

<sup>14</sup> A report of a working group of the British Cardiac Society: cardiology in the district general hospital. *Br Heart J* 1994; **72**:303 – 308.

### 3. Staffing arrangements on cardiac care units.

**Qualified nurses.** The median number of routinely staffed beds per qualified nurse on normal day-time shift was 2.0 (IQR 2.0-3.0, range 0.4–7.0, n=198 hospitals). The mean number of beds was 2.4. On night-time shift the median was 2.7 (IQR 2.0-3.5, range 0.4–8.0, n=198). The mean was 2.91. (Q5.3)

**Use of locum nursing staff.** About half of the hospitals regularly used bank, locum or agency nurses. Within a typical month 13% (26/206) said such staff were needed 'most of the time', 42% (87) 'commonly', 37% (77) 'rarely' and 8% (16) 'never'. Whilst the regular or frequent use of locum staff may reflect a lack of adequate nursing numbers, it should not be assumed that this also reflects poor quality of care. The costs to the Trust of locum and agency staff is of course higher. (Q5.4)

**4. CCU facilities.** There was immediate access to radiographic screening facilities on the CCU (or designated facility immediately and conveniently adjacent) for 145/209 (69%) of hospitals. This was unknown for two hospitals. Facilities for telemetry on CCU or in a step down facility were available for 144/209 (69%) of hospitals. Pressure monitoring facilities (Swan Ganz or arterial pressure monitoring) were immediately available on CCU for 165/209 (79%). All 3 facilities were available for 96/209 (46%). (Q5.5a-c)

**5. Use of cardiac enzymes and other markers of myocardial necrosis.** The use of cardiac enzymes/markers to assess myocardial necrosis was as follows:

	Number of hospitals n=209	%
Creatine kinase	193	91
CK_MB	127	60
CK_MB mass	18	9
Troponin T or I	106	50
Myoglobin	10	5
SGOT/AST	138	65
SLDH/HBD	116	55
Other	8	4

Q5.5d

Table 22. Use of cardiac markers and enzymes. SGOT=serum glutamic oxalacetic dehydrogenase, SLDH=serum lactate dehydrogenase. AST=aspartate transaminase, HBD=hydroxy butyrate dehydrogenase.

While creatine kinase (CK) was widely used, troponin estimations were only available in about one-half of hospitals. Near patient testing of some kind was performed in 18% (37) of hospitals. Troponin I or T was used in 34 of these 37 hospitals out of a total of 59 near patient test procedures.

**6. Step down facility.** A step down facility, defined as a number of beds on a ward used preferentially for patients from CCU that might have dedicated staff and extra monitoring facilities, was present in 88/211 (42%) of hospitals. Also some hospitals may have had a cardiac ward providing similar facilities. Data on dedicated cardiac wards were not collected. (Q5.6)

**7. Ward rounds.** Patients remained under the care of a general physician throughout their hospital stay in 106 hospitals. In 49/106 (46%) either a cardiologist, cardiology staff grade physician, associate specialist or cardiology specialist registrar did a regular (*i.e* daily) ward round on the CCU to help with management. (Q5.8)

**8. Written guidelines.** There were written guidelines or protocols for the management of AMI in 204/211 (97%) of hospitals. The use of these guidelines was subject to regular audit in 73% (149) of these 204 hospitals. (Q4.4, Q4.5)

**9. Age policy.** Two hospitals said they had an official age-related policy for admission to their CCU. One cut-off was at 65 years, the other at 75 years. (Q5.7)

## Section 7. Admission arrangements

**1. Direct admission to CCU.** Patients with suspected AMI could be directly admitted to CCU, either after GP referral or brought by ambulance after a 999 call, in 100/210 (48%) of hospitals. (Q6.1)

**2. GP and 999 referrals.** In half of the hospitals the GP referrals with suspected AMI were normally first seen in A&E and in 80% of hospitals the 999 referrals were first seen in A&E.

	Where are GP referrals with suspected AMI normally seen after arrival in hospital?		Where are 999 referrals with suspected AMI normally seen after arrival in hospital?	
	Number of hospitals	%	Number of hospitals	%
A&E	106	51	166	79
Medical assessment unit	40	19	8	4
General ward	2	1	-	-
Direct admission to CCU	61	29	34	16
Unknown	2	1	3	1
Total	211	100	211	100

Q6.2

Table 23. Point of admission for patients with acute myocardial infarction for General Practitioner referrals and emergency (999) calls.

**3. On take arrangements for elderly patients with AMI.** There were separate on take arrangements for the elderly in 32 hospitals (Q4.1). Of these 36% (10/28) said patients with AMI were admitted to CCU only if receiving thrombolytic treatment (Q6.3)

**4. Pressure on beds.** Though it was rare to close the CCU from pressure of beds or lack of nurses, one-third of hospitals commonly experienced significant delays whilst beds were made available (table 24). Significant delays were commonly experienced by one-third of both interventional (9/27) and non-interventional (56/183) hospitals.

	Is CCU ever closed because of pressure of beds or lack of nursing staff?		Experience times when CCU admission is delayed significantly* while a bed is made available?	
	Number of hospitals	%	Number of hospitals	%
Never	157	74	23	11
Rarely (<8 days/month)	45	21	121	58
Commonly (8-21 days/month)	3	1	56	27
Most of the time (>21 days/month)	3	1	9	4
Unknown	3	1	2	1
Total	211	100	211	100

Q6.4a, Q6.4b

Table 24. Closure of cardiac care unit or delay in admission. \*Significant means likely (in judgement of clinicians) to have impact on effective clinical management of the patient.

**5. Where do patients go if there is pressure on beds?** Respondents were asked where patients might be admitted if they could not be admitted to CCU. The survey asked for one of five options to be chosen. More than one option was stated by 37 hospitals, the main combinations being general medical ward/admissions unit (13), admissions unit/wait in A&E (7), general medical ward/admissions unit/wait in A&E (5).

	Frequency	%
General medical ward	66	31
Step down unit	14	7
Dedicated cardiac ward	23	11
Admissions unit	86	41
Wait in A&E	60	28
Unknown	8	4

Q6.4c

Table 25. Where patients are admitted when there is no bed on cardiac care unit.

**6. The impact of interventional work on CCUs.** Coronary interventional work was performed in 27/211 (13%) of hospitals of groups 1A-1C, and in 35/229 (15%) of all hospitals. Hospitals where interventional work was performed were asked whether patients, including those referred from elsewhere, awaiting or following an intervention, contributed to difficulties in admitting other patients with AMI to their CCU. Of these 27 hospitals, 4 hospitals reported that this was 'common' (8-21 days per month), 18 hospitals reported 'rarely', (<8 days per month), and 3 hospitals said 'never'. Data were missing for 2 hospitals. (Q6.5a)

**7. Delays for patients awaiting angiography and intervention.** The increasing demand for urgent angiography and coronary angioplasty for patients with acute coronary syndromes and continuing symptoms following AMI has become a substantial part of the workload of hospitals providing coronary interventions. This is a major problem, both in terms of the availability of sessions in catheter laboratories, also in terms of the blocking of beds by emergency and urgent patients awaiting transfer to the interventional hospital, and after transfer to the interventional hospital. Although we did not enquire about bed blocking other than on the CCU, comments made in replies to the survey indicated that this was also a problem elsewhere in the hospital.

The practical issues of organising the very substantial emergency interventional workload is outside the scope of the survey. Nevertheless coronary interventional work is set to have an increasing impact on the management of AMI. Anecdotal evidence suggests that this emergency work already generates considerable pressures on clinical staff. Each interventional hospital has to deal with emergency work from an average of 5.3 hospitals without this facility, as well as their own emergency workload.

Coronary interventional work was performed in 35 hospitals, of which 6 or 7 did not have in-hospital surgical back up, and as far as can be ascertained, only performed

interventions on local rather than referred patients. Of the 35 hospitals, 27 had A&E departments, and 8 were cardiothoracic hospitals, 5 of which accepted some emergency referrals from GPs and the emergency service, as well as accepting urgent or emergency referrals from other hospitals.

All hospitals performing coronary interventions were asked how many inpatients were on their urgent/emergency waiting list for a coronary angiogram, either with them already, or in a bed in another hospital. Some of these patients waiting in other hospitals may have already had an angiogram in the referring hospital, and were waiting for angioplasty, while others waited for angiography and a possible intervention.

	Hospitals responding	Number of patients waiting		
		Mean	Median (IQR)	Total
Patients waiting at the interventional hospital	30	4.9	4 (2 – 8)	148
Patients waiting at the referring hospital	29	7.0	4 (1 – 13)	204
Waiting on a common list	4	5.5	5 (1 – 10)	22
Total number waiting investigation				374

Q6.5b

Table 26. Numbers of patients awaiting intervention on the date of completion of the survey. All hospitals performing coronary interventional work are included.

Hospitals were asked to estimate how long (in days) they would expect the last patient presently waiting in another hospital on their angiography urgent/emergency waiting list to wait. The hospital median was 7 days (IQR 3-12, range 0-30 days, n=32). (Q6.5c)

**8. Patient delays at referring hospitals.** Hospitals (1A-1C) without interventional facilities were asked to what extent delays in transferring unstable patients to their interventional hospital contributed directly or indirectly to difficulties in admitting patients to their CCU: 28/181 (15%) said 'never', 95 (52%) said 'rarely', less than 8 days per month, 50 (27%) said 'commonly', 8-21 days per month, and 8 (4%) said 'most of the time', more than 21 days per month. (Q6.6)

**9. Numbers of patients awaiting transfer.** Hospitals (1A-1C) without interventional facilities were asked how many patients were awaiting transfer for urgent/emergency angiography on the day of the questionnaire being completed. A total of 464 patients were awaiting transfer from 171 hospitals, mean 2.7 (median 2, IQR 1–4, range 0–12, table 27). The number waiting for transfer was considerably greater than the number reported to be awaiting admission at all the interventional hospitals. The interventional hospitals reported 204 awaiting transfer with another 22 on a common waiting list. This difference was not explained by a lower data return rate from the interventional hospitals (30/35), and the total absence of data from one large interventional hospital. The total for the interventional hospitals appears implausibly low.

Number of patients waiting transfer for urgent/emergency angiography	Number of Hospitals
0	39
1	21
2	43
3	17
4	17
5	14
6	5
7	3
8	6
10	4
12	2
Total	171
Missing data	13
	184 hospitals

Q6.6b

Table 27. Number of patients waiting for transfer to interventional hospitals.

Hospitals were asked how often they found it necessary to arrange emergency angiography for a patient elsewhere because their normal referral hospital was unable to help. Thirty-six percent (67/184) said 'never', 31% (57) said 'rarely', once or twice a year, 22% (41) said 'infrequently', less than once a month, 3% (6) said 'frequently', more than once a month, and 3% (5) said 'routinely', almost every patient. For 8 hospitals (4%) these data were missing. (Q6.6c)

## Section 8. Use of thrombolytic treatment

1. **General.** Thrombolytic treatment was given before admission to hospital in 5 hospitals. These were community hospitals in rural areas; treatment was administered before transfer to a larger unit. Out of hospital treatment by paramedics was not performed, but is likely to increase following recent changes in legislation. (Q6.7a)

Ninety-seven percent (205/211) of hospitals had a written hospital policy concerning the choice of thrombolytic agent used for first AMIs. (Q6.8a)

Streptokinase was used for the majority of eligible first AMIs in 169/207 (82%) of hospitals, with data missing for 4 hospitals. Half (84/169) of these hospitals used streptokinase for the majority of eligible first AMIs with a policy of using tPA for younger eligible first AMIs. (Q6.8b)

In 59% (124/209) of hospitals the choice of thrombolytic agent was reported to be limited by cost to some degree. (Q6.8c)

Respondents were asked what percentage of eligible first AMIs received streptokinase (table 28).

% of patients within hospital	Hospitals	% of hospitals
21-30	2	2
31-40	3	3
41-50	7	6
51-60	23	19
61-70	22	18
71-80	17	14
81-90	32	27
91-100	13	11
Total	119	100%

Q6.9b

Table 28. Percentage of patients receiving streptokinase for first AMIs, for those 119 hospitals using streptokinase who gave this information.

2. **Where is thrombolytic treatment administered?** Respondents were asked to estimate, in percentage terms where thrombolysis eligible patients were treated in their hospital.

% using each place	Fast track from A&E to CCU where thrombolytic treatment given		Given in A&E		Direct admission to CCU (not seen by hospital clinician before reaching CCU)		Given in acute assessment unit or general ward	
	Hospitals	%	Hospitals	%	Hospitals	%	Hospitals	%
0	62	29	55	26	110	52	147	70
1-10	40	19	33	16	22	10	42	20
11-20	14	7	13	6	9	4	7	3
21-30	12	6	4	2	7	3	2	1
31-40	8	4	8	4	7	3	-	
41-50	14	7	10	5	11	5	1	-
51-60	8	4	7	3	5	2	2	1
61-70	4	2	10	5	5	2	-	
71-80	16	8	9	4	5	2	4	2
81-90	13	6	25	12	8	4	-	
91-100	15	7	34	16	17	8	1	-
Unknown	5	2	3	1	5	2	5	2
Total	211	100%	211	100%	211	100%	211	100%

Q6.9a

Table 29. Where thrombolytic treatment is given to eligible patients.

The survey also asked whether thrombolytic treatment was given in the A&E department; 143/205 (70%) of hospitals said 'yes'. Data were missing for 6 hospitals. However from table 29 only 120/209 (57%) of hospitals reported that thrombolytic treatment was given in the A&E department to more than 10% of eligible patients.

In the 143 hospitals where thrombolytic treatment was given in the A&E department, a specially trained nurse practitioner could initiate thrombolytic treatment in 16% (22/139) of hospitals. For 19 of these 22 cases the median percentage of any 24 hour period that the nurse practitioner was available was 50% (IQR 33-63%, range 20-100%). Treatment could be initiated by junior A&E staff in 103/128 (80%) of hospitals. Treatment could only be started after review by an on call medical team in 18% of hospitals (23/128). (Q6.10.2-Q6.10.5)

In 62/205 (31%) of hospitals thrombolytic treatment was not given in the A&E department. Reasons stated for treatment not being given were:

	Hospitals	%
No measurable benefit in terms of delay	21	39
Difficulty in persuading CCU nursing staff of the potential benefits	2	2
Difficulty in persuading A&E clinical staff of the potential benefits	13	21
Training and competency issues in A&E	5	8
Planning to start treatment in A&E soon	3	5
Other	30	44
Total	74	

Q6.11

Table 30. Reasons for not using the A&E department for thrombolytic treatment. Some hospitals gave more than one reason.

In 137/142 (96%) of hospitals, patients who had received thrombolytic treatment in the A&E department were then normally admitted to CCU. (Q6.12a)

## Section 9. Rehabilitation

Coronary rehabilitation is a vital aspect of the management of AMI but its requirements may be underestimated. Eleven percent (24/211) of hospitals reported that they had no rehabilitation staff, and presumably relied on CCU staff to do what was possible whilst the patient was still in hospital. One respondent reported that the CCU sister ran the cardiac rehabilitation service on a voluntary basis. (Q7.1)

There was some uncertainty about how Q7.2 was interpreted. It was intended that the data in table 31 would include the soft money posts listed in table 32. It was not possible to confirm that all hospitals interpreted this question in this way and they may have treated them separately. On the whole the raw data supported the intended interpretation. On this basis, 52.5/343.1 (15%) of WTE audit staff were paid from non-NHS sources.

	Number of hospitals	Sum of WTE of rehabilitation staff
None	24	0
0.1 – 0.9	22	12
1.0 – 1.9	92	110
2.0 – 2.9	39	85
3.0 – 3.9	16	51
> 4	14	85
Total	207	343.1

Q7.1

Table 31. Numbers of cardiac rehabilitation staff.

	Number of hospitals	Sum of WTE of rehabilitation staff funded on soft money
None	139	0
0.1 – 0.9	24	12
1.0 – 1.9	16	18
2.0 – 2.9	5	10
3.0 – 3.9	3	9
> 4	12	4
Total	189	52.5

Q7.2

Table 32. Numbers of cardiac rehabilitation staff paid from soft money sources, (pharmaceutical firms, British Heart Foundation and locally funded).

The rehabilitation process had access to the additional staff listed below:

	WTE						Yes; WTE not stated	Used as needed	NK
	0	0.1- 0.24	0.25- 0.49	0.50- 0.74	0.75- 0.79	1.0+			
Physiotherapist	48	73	17	18	2	23	16	9	5
Dietician	59	89	6	7	-	11	21	12	6
Clinical psychologist	155	30	4	2	-	1	6	6	7
Exercise physiologist	171	16	2	2	-	7	3	4	6
Cardiac liaison nurse	116	5	6	5	1	50	15	5	8
Occupational therapist	131	33	7	5	1	5	14	9	6

Q7.3

Table 33. Other paramedical staff available to the rehabilitation service.

The following services were also provided by rehabilitation services:

	Number of hospitals	
Gym-based physical rehabilitation	189	91%
Home visiting post discharge	99	48%
Hospital based drop-in service	69	33%
Phone based advice service	174	84%
Counselling for partners	163	78%
Support for patients post coronary artery bypass grafting	170	82%
Support for other (non AMI) patients with coronary artery disease	133	64%

Q7.5

Table 34. Services provided by cardiac rehabilitation in 208 hospitals.

In 92% (191/208) of hospitals, the rehabilitation team saw patients with AMI before discharge from hospital. (Q7.6a)

In 74% (153/208) of hospitals, links were established between hospital and community leisure facilities to support coronary rehabilitation. (Q7.6b)

## Section 10. Management after the acute event

### 1. Risk evaluation

**Exercise stress testing.** In 59/210 (28%) of hospitals there was a policy of routine exercise stress testing before discharge for patients with confirmed AMI in whom it was appropriate (age or major co-morbidity). In 172/209 (82%) hospitals there was a policy of routine exercise testing of patients following AMI after discharge. In 32 hospitals both options were used. In 12 hospitals routine exercise stress testing was not performed following AMI. (Q8.1, Q8.2)

**Echocardiography.** There was a policy for routine inpatient assessment of left ventricular function using echocardiography following AMI in 33% (69/210) of hospitals. Patients who were under the care of a cardiologist were more likely to have this investigation than those who were under the care of a physician throughout their hospital stay; 35/85 (41%) vs 29/106 (27%). (Q8.3)

**Radionuclide cardiac imaging.** Facilities for radionuclide cardiac imaging were available in 107/211 (51%) of hospitals. When available, routine evaluation of left ventricular function by imaging after AMI was done before discharge in 7/106 (7%) of hospitals, and after discharge in 1/103 (1%). (Q8.4.a, Q8.4.b)

#### Angiography facilities.

Type of hospital	Are there on-site facilities for angiography?	Is interventional work performed on-site?	No. of hospitals	%
1A , 1B, 1C	NO	NO	135	59
1A , 1B, 1C	YES	YES	27	12
1A , 1B, 1C	YES	NO	49	21
1D, 1E	YES	YES	8	3
1F,1G	NO	NO	10	4

Q1, Q8.5a, Q8.7a

Table 2 (copied from section 1). Availability of facilities for angiography and coronary interventional work.

Facilities for angiography, with or without facilities for interventional work, were present for 84/219 (38%) of hospitals in groups 1A-1E. Seventy-three hospitals had fixed units, 11 used mobile facilities, one used both. (Q8.5)

Angiography was performed after AMI as a clinical policy in 7 hospitals. (Q8.6)

## 2. Coronary intervention

Interventional work was performed in 35/219 (16%) of hospitals in (1A-1E). (Q8.7a)

Of the 35 hospitals who performed interventional work, 87% (26/30) performed rescue angioplasty, and 83% (24/29) performed primary angioplasty. The number accepting tertiary referrals was 21/28. (Q8.7b, Q8.7c)

Laboratory services were available 24 hours a day for 80% (24/30) of hospitals, and for less than 24 hours a day, in 20% (6/30). (Q8.7.d)

## Section 11. Smaller hospitals

There were 10 smaller hospitals in rural areas where patients with AMI were received. Thrombolytic treatment was given in 6, where appropriate, before the patient was moved by ambulance to a larger hospital. The distance between these local hospitals and the main hospital was between 15-30 miles. Small numbers of patients receive thrombolytic treatment in this way. The recent agreement that paramedic crews can administer streptokinase may alter the process of management of AMI in these relatively remote rural areas. Three of these 6 hospitals used an electronic form of communication to send the electrocardiograph to the main hospital for immediate comment before administering treatment. (Q9.1–Q9.4)

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## Appendix A

**Audit arrangements.** At the time that the survey was being written the Myocardial Infarction National Audit Project (MINAP) was also in development. It was considered useful to have some idea of the state of audit of AMI in order to determine the needs of colleagues who would be joining MINAP. The following analyses are based on data from hospitals in groups 1A–1C (n=211).

Table A1 gives the number of hospitals that audited specific items of data, though as shown in Table A2, these audits were not necessarily performed continuously.

	Hospitals recording data	%
Door to needle time	197	93
Pre-hospital delays	106	50
Use of secondary prevention	141	67

Q10.1

Table A1. Hospitals recording audit data.

	Hospitals performing each type of audit	%
Continuous audit	120	57
Intermittent/regular	62	29
Sporadic/occasional	27	13
Missing data	2	1

Q10.2

Table A2. Types of audit performed.

In 134/205 (65%) of hospitals data were stored on a computer database. Of those who used a computer database, 86/134 (64%) used locally written software, 13/134 (10%) had commercially written software, and 35/134 (26%) were part of the National Audit of Myocardial Infarction (NAOMI) group which is supported by a pharmaceutical company. (Q10.3 & Q10.4)

Data collection/entry was performed by nurses in 160/208 (77%) of hospitals, and by audit staff in 64/208 (31%), sometimes in combination. Nurses did this in addition to their other duties, and in 141/157 (90%) of cases were not funded specifically to do this. Ideally data derived from events occurring early in the course of AMI, when most of the patients are still on CCU, can be collected by CCU nurses, facilitated by high quality clinical records. Nurses should not be required to do this work without support. Adequate time, about 0.2 WTE being a typical requirement, should be funded, or if necessary allocated from audit funds, to do this work. (Q10.5)

**Data analysis.** Audit staff were more likely than any other professional group to be involved in data analysis. Sometimes more than one group was involved.

Who most commonly analyses data?	Number	%
Cardiac services lead	19	9
Consultant	51	24
Junior staff	22	10
Audit staff	90	43
NAOMI or other external arrangement	27	13

Q10.7

Table A3. Individuals performing data analysis.

**Regional/sub-regional audit.** Only 62/207 (30%) of hospitals performed audit as part of a regional initiative, *ie* sharing analyses with colleagues in other hospitals. (Q10.11)

**Data dissemination.** Table A4 analyses the extent to which audit data were shared with others.

Who sees the audit results?	Number	% of replies
Medical colleagues	204	98
Nursing staff	190	91
The medical director	118	57
Trust managers	118	57
Health Authority	112	54

Q10.12

Table A4. Colleagues with whom data were shared.

In 146/208 (70%) of hospitals the data were discussed with hospital managers or with the Health Authority. In 36/146 (25%) of hospitals, managers had difficulty in understanding or interpreting the data. In 44/163 (27%) of hospitals, colleagues reported that at some time they had encountered difficulty as a result of misunderstanding or misinterpretation by managers or public health physicians. (Q10.13)

In 23/206 (11%) of hospitals, Trust/Health Authority managers had at some time wished to discuss individual cases. (Q10.14)

**Audit of outcome.** Forty-seven percent (98/207) of hospitals reported that CCU outcome/mortality data were subject to regular audit (*ie* either continuous or at fixed intervals). (Q10.16)

## Appendix B

### Origins of population data

It was clear from the responses to the survey that some problems were experienced in collecting these data locally, and we apologise for any difficulties caused. Fortunately these parts of the survey were available for external validation using routine data, and these have been used in preference to data returned in the survey.

The external validation was performed at Trust level and the Trusts were mapped to Hospital Episode Statistics (HES) data 1998/9. The method of proportionate flow was used to calculate catchment populations for all Trusts (this method is described in the Health Service Indicators Guidance<sup>1</sup>). HES data for 1998/9, general and acute admissions (specialty codes 100-191, 300-460, 502, 620, 800-832, 900, 901) excluding transfers was used to generate a flow matrix. The movement between Trusts in the HES dataset was used as the basis for allocating Health Authority resident populations into Trust catchment populations. The coverage factor as determined in the Trust Data Quality report<sup>2</sup> was used to adjust the HES flow matrix to take account of shortfalls in HES data. A final uplift to the catchment populations was made to account for non-England residents treated in Trusts.

The number of AMI discharges was obtained from the HES data using the following criteria: finished consultant episodes with a primary diagnosis of AMI (ICD-10 121) or subsequent AMI (ICD-10 122). Transfers were excluded.

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1. Department of Health. *Health Service Indicators Guidance: Dictionary*. London: HMSO, 1989 (Appendix B).
2. Department of Health. *NHS performance indicators: July 2000*. NHS Trust Data Quality Indicators.
3. Department of Health. *Compendium of clinical and health indicators 1999*, Centre for Public Health Monitoring, London School of Hygiene & Tropical Medicine, January 2000.