

Impact of specialty of admitting physician and type of hospital on care and outcome for myocardial infarction in England and Wales during 2004-5: observational study

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Abstract

Objective To examine process of care and outcome for patients admitted with acute myocardial infarction to hospitals in England and Wales in relation to type of consultant care and type of hospital.

Design Observational study of 88 782 patients admitted with myocardial infarction during 2004-5, using records from the national audit of myocardial infarction project (MINAP) database.

Outcome measures Use of reperfusion treatment and secondary prevention drugs, use of angiography, and 90 day mortality of patients admitted under the care of cardiologists and non-cardiologists in hospitals with and without facilities for coronary intervention.

Findings 36% of patients were admitted under the care of a cardiologist and 20% to a hospital with coronary interventional facilities. Patients admitted under cardiologists had fewer comorbidities than other patients and were more likely to have reperfusion treatment (12 266/14 433 (85%) *v* 13 682/17 064 (80%)) and appropriate secondary prevention drugs. Overall, 27 431/79 374 (35%) of patients had angiography. Relatively more patients admitted to interventional hospitals (8167/14 661; 56%) than to other hospitals had angiography (19 264/64 713; 30%). The adjusted risk of death by 90 days for patients treated in interventional compared with non-interventional hospitals was 0.93 (95% confidence interval 0.82 to 1.06). The adjusted risk of death at 90 days for patients admitted under cardiologists compared with non-cardiologists was 0.86 (0.81 to 0.91).

Conclusions Patients cared for by cardiologists had less comorbidity than other patients. They were more likely to receive proved treatments and angiography, and they had a lower adjusted 90 day mortality. Large differences existed in the use of angiography between interventional and non-interventional hospitals. These findings show wide variations in the management and outcome of patients with myocardial infarction in England and Wales.

Introduction

The United Kingdom has few cardiologists per capita. In 2000, the latest available data, there were 12 cardiologists per million population, the second lowest in Europe.¹ For a patient admitted to hospital with acute myocardial infarction, the involvement of a cardiologist is not routine, and some patients have no contact with a cardiologist throughout their hospital stay or at follow-up.² Treatment options for the care of acute coronary ischaemic syndromes have become increasingly complex. We therefore questioned whether management of acute myocardial infarction

provided by cardiologists and non-cardiologists had the same outcomes.

We examined records from the national audit of myocardial infarction project (MINAP) database to compare treatment, use of investigations, and 90 day mortality between patients with acute myocardial infarction who were admitted under the immediate care of cardiologists and patients admitted under non-cardiologists.

Methods

The project uses an NHS dataset that allows examination of pre-hospital and in-hospital care of all acute coronary syndromes.³ We analysed records for patients admitted between 1 January 2004 and 31 March 2005 who received a final diagnosis of myocardial infarction. We examined mortality outcome at 90 days.

The term "care under a cardiologist" indicates that the patient was admitted under the direct responsibility of a cardiologist and received care from a cardiologist during at least the first 24 hours of the admission. Where care was initially under a non-cardiologist, we could not establish the subsequent involvement of a cardiologist.

Statistical analysis—We used regression methods to assess 90 day mortality and process measures (reperfusion treatment, angiography, and secondary prevention drugs) to obtain risk ratios adjusted for hospital clustering and covariates (age, sex, smoking status, type of infarction, and 10 comorbid conditions; see bmj.com).

Results

We analysed data on 88 782 patients. Of these, 83 599 were admitted under a cardiologist or a physician whose specialty interest was not cardiology (non-cardiologist), and 80% were admitted to hospitals without facilities for coronary intervention. Of 230 hospitals, 41 (18%) had interventional facilities, with 57% of patients admitted under a cardiologist (hospital median 69%, interquartile range 27-95%). In 189 non-interventional hospitals, 31% of patients were admitted under a cardiologist (hospital median 19%, 9-41%).

Patient characteristics

Patients admitted under a cardiologist were younger, with a median age of 69 (interquartile range 58-78) years, compared with 73 (62-82) years for those admitted under a non-cardiologist, and were more likely to be male, to be current smokers, to have



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electrocardiographic appearances of ST segment elevation, and to have lower comorbidity (see bmj.com). Of all infarctions, 33 163/83 599 (40%) showed ST segment elevation; cardiologists cared for 15 282 (46%) of these patients. By contrast, non-cardiologists cared for 35 335 (70%) of all non-ST elevation infarctions.

Reperfusion treatment for ST elevation infarction

Those admitted under a cardiologist were more likely to receive reperfusion treatment—12 266/14 433 (85%), including primary angioplasty for 1310 (9.1%), compared with 13 682/17 064 (80%) under a non-cardiologist, of whom 107 (0.6%) had primary angioplasty. Overall, reperfusion treatment was used to a similar degree in non-interventional hospitals—20 413/24 686 (83%) against 5535/6811 (81%) in interventional hospitals. In both interventional and non-interventional hospitals, the adjusted risk of not receiving reperfusion treatment was lower for patients cared for by a cardiologist—0.63 (95% confidence interval 0.45 to 0.87) and 0.84 (0.74 to 0.96).

Secondary prevention drugs

The proportion of discharged patients not receiving secondary prevention drugs increased with age but in each age band was lower for patients admitted under a cardiologist. The adjusted ratios for non-use of these drugs after admission under a cardiologist relative to a non-cardiologist were aspirin 1.00 (95% confidence interval 0.86 to 1.15), β blockers 0.92 (0.87 to 0.97), statins 0.83 (0.71 to 0.97), and angiotensin converting enzyme inhibitors 0.98 (0.91 to 1.06).

Use of angiography

Angiography was done for 27 431 (35%) patients. It was done more often in interventional hospitals (56% *v* 30%) and for patients admitted under cardiologists (44% *v* 30%). Use of angiography was strongly associated with age. In non-interventional hospitals, the overall adjusted risk ratio for having angiography after admission under a cardiologist relative to a non-cardiologist was 1.20 (1.07 to 1.38); in interventional hospitals, the adjusted ratio was 1.10 (0.97 to 1.25).

Outcome

All cause mortality was lower for patients admitted under cardiologists, both for those with ST elevation and non-ST elevation infarction and in both interventional and non-interventional hospitals (table 1). The adjusted

Table 2 Adjusted 90 day mortality risk (95% confidence interval) for patients admitted under cardiologists relative to non-cardiologists for ST elevation and non-ST elevation infarction in interventional and non-interventional hospitals

	Interventional hospitals	Non-interventional hospitals	All hospitals
ST elevation infarction	0.76 (0.64 to 0.90)	0.91 (0.84 to 0.98)	0.88 (0.82 to 0.95)
Non-ST elevation infarction	0.82 (0.69 to 0.98)	0.85 (0.78 to 0.92)	0.84 (0.78 to 0.91)
All infarctions	0.81 (0.69 to 0.94)	0.87 (0.82 to 0.93)	0.86 (0.81 to 0.91)

risk ratio for mortality in interventional hospitals relative to non-interventional hospitals was 0.93 (0.82 to 1.06). Adjusted 90 day mortality risk was lower for patients admitted under a cardiologist for both ST elevation and non-ST elevation infarctions in both interventional and non-interventional hospitals (table 2).

Discussion

In English and Welsh hospitals, most patients who had acute myocardial infarction were admitted under the care of non-cardiologists, and the great majority were admitted to hospitals without facilities for coronary intervention. Patients not admitted under a cardiologist had a substantially higher all cause mortality during the 90 days after admission in both types of hospital setting and after adjustment for case mix.

Patient characteristics and selection bias

In 2000 care for myocardial infarction was provided throughout the admission by the physician who admitted the patient in 50% of English hospitals, whereas routine transfer to a cardiologist occurred in only 23%.² Although these figures may have changed with the appointment of more cardiologists, care for most patients is still provided by non-cardiologists. These data do not reveal the degree of cardiological input into the care of patients admitted under non-cardiologists, but when care was reported initially to have been under a non-cardiologist the 90 day mortality outcome was poorer than when care was provided by a cardiologist.

Within this varying pattern of care, cardiologists either select, or have referred to them, a population of patients who are younger, and thus more likely to be male and to have fewer comorbid conditions, and who are more likely to have ST elevation infarction, which has a lower 90 day mortality than non-ST elevation

Table 1 90 day all cause mortality for patients admitted under cardiologists and non-cardiologists and in interventional and non-interventional hospitals (n=76 376). Values are numbers (percentages) unless stated otherwise

	Interventional hospitals			Non-interventional hospitals		
	Cardiologist	Non-cardiologist	Risk ratio*	Cardiologist	Non-cardiologist	Risk ratio*
Age (years):						
<55	26/1498 (1.7)	14/789 (1.8)	0.98	68/3521 (1.9)	122/5511 (2.2)	0.87
55 to 64	63/1673 (3.8)	46/1086 (4.2)	0.89	165/4290 (3.8)	355/7406 (4.8)	0.80
65 to 74	162/1978 (8.2)	189/1607 (11.8)	0.70	535/5446 (9.8)	1175/10 360 (11.3)	0.87
75 to 84	289/1789 (16.2)	431/2065 (20.9)	0.77	912/4812 (19.0)	2986/13 094 (22.8)	0.83
≥85	145/480 (30.2)	385/1079 (35.7)	0.85	461/1498 (30.8)	2068/5971 (34.6)	0.89
Age missing	1/13 (7.7)	1/3 (33.3)	0.23	15/75 (20.0)	67/332 (20.2)	0.99
ST elevation infarction	370/4162 (8.9)	271/1829 (14.8)	0.60	967/9342 (10.4)	1903/14 481 (13.1)	0.79
Non-ST elevation infarction	316/3269 (9.7)	795/4800 (16.6)	0.59	1189/10 300 (11.5)	4870/28 193 (17.3)	0.67
Total	686/7431 (9.2)	1066/6629 (16.1)	0.57	2156/19 642 (11.0)	6773/42 674 (15.9)	0.69
Inter-hospital: median (IQR)	9.2 (6.6 to 12.3)	14.0 (8.4 to 22.7)		10.0 (6.7 to 14.3)	14.3 (10.5 to 18.2)	

IQR=interquartile range.

*Unadjusted risk ratios for 90 day all cause mortality in patients admitted under cardiologists relative to non-cardiologists.

What is already known on this topic

Different outcomes and treatment patterns have been shown for care of myocardial infarction by cardiologists and non-cardiologists in the United States

Whether similar differences exist in England and Wales is not known

Whether differences in care and outcome exist between patients admitted to hospitals with and without facilities for coronary intervention is not known

What this study adds

The third of patients with a myocardial infarction admitted under the care of a cardiologist were more likely to have reperfusion treatment and secondary prevention drugs

Patients admitted under a cardiologist were more likely to have angiography in hospitals both with and without interventional facilities

The adjusted 90 day mortality did not differ between interventional and non-interventional hospitals but was significantly lower for patients cared for by cardiologists than by non-cardiologists

infarction. By contrast, non-cardiologists cared for 70% of patients with non-ST elevation infarction.

These differences reflect a selection bias, which may explain some of the differences in crude mortality data. The apparent “cherry picking” of patients at lower risk and with less comorbidity is not limited to British cardiologists.⁴ We speculate that an inaccurate perception that non-ST segment elevation infarction carries a lower risk of mortality than ST segment elevation infarction might explain the increased likelihood of patients with non-ST segment elevation myocardial infarction being referred to non-cardiologists.

Treatment

Patients admitted under cardiologists were more likely to receive reperfusion treatment for ST elevation infarction than those who were not, and they were more likely to have primary angioplasty. However, the number who had primary angioplasty in this study (4%) was too small to have had any impact on differences in outcome. Cardiologists used secondary prevention drugs more intensively, although these differences were attenuated after adjustment. The effect of these treatment differences is unlikely to account for the differences in mortality. Other studies have confirmed that use of these drugs has not always been associated with lower mortality after adjustment for patients' and hospitals' characteristics.⁵⁻⁷

Angiography

Despite recommendation for early use of diagnostic angiography after acute cardiac ischaemic events,⁸⁻¹⁴ we found that only 18% of hospitals offered interventional facilities and that the overall rate of angiography (35%) was low compared with other regions of the world.¹⁵ Patients admitted to a hospital with interventional facilities were almost twice as likely to have angiography as those who were admitted to other hospitals. However, we found no significant difference in adjusted mortality by 90 days between patients who were treated in hospitals with interventional facilities and those who were not, a finding consistent with a recent registry study.¹⁵

Comment

The relatively small differences in practice between cardiologists and non-cardiologists, and apparent selection bias, do not explain the differences in mortality outcome described here. We speculate that other management differences must exist, which have an impact on mortality. These findings do not support the view that care for myocardial infarction should remain within the remit of the non-cardiologist. In a healthcare system committed to equity of access and outcome, the differences described here should raise questions about the model of care for patients with myocardial infarction in England and Wales.¹⁶

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