One-year prospective study of cases of suspected acute myocardial infarction managed by urban and rural general practitioners

ANDREW W MURPHY

DONAL MCCAFFERTY

JOHN DOWLING

GERARD BURY

SUMMARY

Background. *The role of the general practitioner in the management of patients with suspected acute myocardial infarction is important and specific. It has been recommended that eligible patients should receive thrombolysis within 90 minutes of alerting medical or ambulance services. The administration of prehospital thrombolysis by general practitioners is controversial. Most research into the management of acute myocardial infarction has been hospital based and has not explored differences between urban and rural general practice.*

Aim. *In 1993–94 a one-year prospective survey was undertaken of samples of urban and rural general practitioners to examine their management of cases of suspected acute myocardial infarction and to determine whether differences in management existed between the two settings.*

Method. *General practitioners were recruited through the continuing medical education faculty network of the Irish College of General Practitioners. Participating general practitioners completed a report form for cases of suspected acute myocardial infarction. Six-week follow-up forms were also completed.*

Results. *A total of 113 general practitioners (54 urban and 59 rural) participated in the study. A total of 57 general practitioners contributed 195 cases, 49 from urban and 146 from rural areas. The mean number of cases of suspected acute myocardial infarction per participant for urban and rural doctors was 0.9 and 2.5, respectively. Median delay time from onset of symptoms to contacting the general practitioner was 90 minutes for both urban and rural patients. Median general practitioner response times for urban and rural doctors were 10 and 15 minutes, respectively. Median estimated journey times from location of the patient to hospital for urban and rural patients were 10 and 40 minutes, respectively (P<0.001). Rural doctors were more likely, in comparison with their urban counterparts, to administer aspirin (given to 40% of patients versus 16%, P<0.01) but less likely to administer intravenous morphine (26% versus 41%, P<0.05). Twenty one patients (11%) died at the scene; follow-up forms were received for 94% of the remaining patients. Of these 163 patients, 99% were admitted to hospital; 49% were discharged with a diagnosis of acute myocardial infarction and a further 25% had final diagnoses consistent with acute coronary heart disease.*

Conclusion. *This study suggests that the management of patients with suspected acute myocardial infarction differs in urban and rural settings. Delay times suggest that in order to meet current guidelines, prehospital thrombolysis must become a reality in rural areas.*

Keywords: myocardial infarction; immediate care; management of disease; general practitioner role.

Introduction

TO reduce patient morbidity and mortality from acute myocardial infarction, a prompt and integrated response by general practitioners, ambulance personnel and hospital staff is required.[1] The role of the general practitioner includes responding rapidly to patients with chest pain, giving aspirin and adequate analgesia, initiating treatment of complications and expediting thrombolysis.[1-4] Assessment of the response of general practitioners to patients with suspected acute myocardial infarction has been mainly performed through retrospective review of hospital notes and has shown wide variations (Appendix 1).[5-8] Although urban and rural general practice differ in many respects,[9,10] no information is available on how these differences affect the management of patients with suspected acute myocardial infarction.

A one-year prospective survey was conducted of a sample of general practitioners from an urban area and a rural area to examine their management of cases of suspected acute myocardial infarction and to determine whether differences existed between the two settings.

Method

General practitioner and patient sample

General practitioners were recruited through one urban and one rural faculty of the continuing medical education network of the Irish College of General Practitioners.[11] General practitioners in the south of Dublin city (75 members) and general practitioners in the rural Donegal faculty in the northwest of Ireland (74 members) were invited to participate in the study. Those who completed a personal/practice profile (which sought information on sociodemographic details, postgraduate qualifications, size of practice, out-of-hours arrangements, access to an electrocardiograph and defibrillator and proximity to a hospital coronary care unit) were included in the study. Local coordinators (D McC and J D) liaised regularly with participating general practitioners.

The one-year study took place between February 1993 and January 1994. All patients with suspected acute myocardial infarction were eligible for the study. Inclusion was left to the discretion of the general practitioner; no clinical or electrocardiographic criteria were specified.

Study procedures

A W Murphy, MICGP, MRCGP, lecturer; D McCafferty, MICGP, Manne Berber research fellow; and G Bury, MD, MICGP, MRCGP, professor, Department of General Practice, University College Dublin. J Dowling, FRCSI, director, Donegal Prehospital Emergency Care Project, Dungloe, County Donegal, Republic of Ireland.

Submitted: 23 February 1995; accepted: 29 May 1995.

Each participating general practitioner was provided with a booklet detailing the study and report forms. A form was completed by the general practitioner for each patient with suspected acute myocardial infarction on which were recorded sociodemographic details, history of symptoms, patient symptom rating (whether patients considered their symptoms to be severe, moderate or trivial), delay times in seeking and receiving medical care, and clinical management. Although prehospital thrombolysis was not a standard treatment in the Republic of Ireland at the time of the study, the patient's eligibility for thrombolysis was evaluated by the general practitioner using standard criteria.[12] Where the general practitioner was unable to establish a patient's eligibility for a given criterion, 'not known' was recorded. Completed forms were forwarded in prepaid envelopes to the local coordinator. To ensure confidentiality, each case was assigned a unique identifying number by the general practitioner. A six-week follow-up form was completed by the general practitioner to determine the outcome of each case and the proportion of patients with a final diagnosis of acute myocardial infarction.

Analysis

Report and follow-up forms were collated and analysed centrally at University College Dublin. Analysis was performed on the *EPI INFO 5.01b* package using chi square tests for comparison of proportions and the Kruskal–Wallis test for analysis of variance between two or more samples.

Results

General practitioner and patient participants

A total of 113 general practitioners (54 urban and 59 rural) participated in the study, comprising 72% and 80% of the membership of the urban and rural faculties, respectively. As not all questions were answered by all respondents, percentages reflect slightly different denominators. Personal and practice characteristics of participating practitioners were similar to those of the national pattern.[13] There were no significant differences between the characteristics of urban and rural practitioners with respect to sex (overall, 82% of the respondents were men), age (78% were aged less than 45 years) and postgraduate qualifications (56% were vocationally trained, 45% were members of the Royal College of General Practitioners, 70% were members of the Irish College of General Practitioners and 21% had completed an immediate care course). There were also no differences between the practice characteristics of the urban and rural practitioners with regard to size of practice population (overall 14% of the respondents had a list size of fewer than 1000 patients and 35% had a list size of 3000 or greater), number of general practitioners in the practice (41% worked in single-handed practices and 15% in practices of four or more partners), out-of-hours arrangements (66% of practices used other practices, other general practitioners or deputizing services) and access to specialist equipment (55% had 24-hour access to an electrocardiograph and 10% to a defibrillator). However, all of the general practitioners in urban areas and 38% of those rural areas were within 30 minutes' drive of a hospital coronary care unit (χ^2 test, $P<0.05$).

A total of 57 general practitioners contributed 195 cases to the study; 22 of the urban general practitioners (41%) and 35 of the rural general practitioners (59%) contributed at least one case. Forty nine patients came from urban areas and 146 patients came from rural areas. The mean number of cases of suspected acute myocardial infarction per general practitioner in urban and rural areas was 0.9 and 2.5, respectively. The mean number of patients among general practitioners who contributed a case was 2.2 for urban doctors and 4.2 for rural doctors.

There were no significant differences between patients from urban and rural areas with regard to sex (64% of all patients were men), age (mean age 66 years, range 30–90 years) or past medical history (27% had had a previous myocardial infarction and 51% had previously suffered from angina). Overall 17% of patients lived alone. However, 35% of the patients in urban areas and 73% of the patients in rural areas were eligible for general medical services, that is, access to free primary care, based on low income (χ^2 test, $P<0.01$).

Clinical details did not differ significantly between patients from urban and rural areas. Mean pulse rate was 81 beats per minute. Mean blood pressure was 127/77 mmHg and in 19% of all patients there were signs of congestive heart failure. Overall, in 82% of all the cases patients were at home when symptoms started and in 6% of cases patients were at work (patients were elsewhere in 12% of cases). Of all of the patients 37% thought they were having a heart attack, 24% thought they had indigestion and the remainder suggested a range of different causes.

The median delay time from onset of symptoms to contacting a general practitioner was 90 minutes (interquartile range 30–300 minutes); this did not differ between urban and rural patients. There was no association between delay times and patient perception of symptom cause. Forty five per cent of all of the patients rated their symptoms as severe, 43% as moderate and 8% as trivial; information not available on 4% of patients. The median delay times from onset of symptoms to contacting a general practitioner for patients who rated their symptoms as severe, moderate or trivial were one, three and six hours, respectively. These differences were significant (Kruskal–Wallis test, $P<0.001$).

The median general practitioner response times (from the time patients made contact to the general practitioners' arrival at the scene) for urban and rural doctors were 10 (interquartile range 5–20 minutes) and 15 minutes (interquartile range 10–20 minutes), respectively; this difference was not significant. The median estimated journey times from location of the patient to the hospital for urban and rural patients were 10 (interquartile range 5–10 minutes) and 40 minutes (interquartile range 30–50 minutes), respectively (Kruskal–Wallis test, $P<0.001$).

General practitioner management of patients

Use of aspirin and intravenous morphine was low overall but some differences in patient management emerged between urban and rural general practitioners (Table 1). Rural doctors were significantly more likely than their urban counterparts to administer aspirin. Although 45% of patients overall received parenteral morphine, the majority of patients (91%) in the urban area receiving morphine were given it by the intravenous route while 42% of the patients in the rural area were given it by intramuscular injection. All patients were referred to hospital; urban general practitioners were significantly more likely to accompany the patient to hospital (Table 1).

A patient's suitability for thrombolysis was determined by the general practitioners (Table 2). There were no differences in responses from urban and rural doctors regarding patients' suitability for thrombolysis. Although 33 contraindications were recorded, the number of patients with at least one contraindication was 26 (13%) as some patients had more than one contraindication.

Follow up

A total of 21 patients (11%) died at the scene. Six-week follow-up forms were completed for 94% of the remaining 174 patients. Of these 163 patients, 99% were admitted to hospital as inpatients. Eighty of the 163 patients (49%) were discharged from hospital with a diagnosis of acute myocardial infarction. A fur-

Table 1. Prehospital management by urban and rural general practitioners[a] of cases of suspected acute myocardial infarction.

Management	% of cases treated by Urban GPs (*n* = 49)	Rural GPs (*n* = 146)	Total (*n* = 195)
Treated with			
Aspirin	*16*	*40* **	*34*
Morphine (intravenous)	*41*	*26* *	*30*
Morphine (intramuscular)	*4*	*19* *	*15*
Nitrates (sublingual)	*45*	*36*	*39*
ECG performed	*13*	*30* *	*27*
Transferred to			
General hospital	*100*	*98*	*99*
Community hospital	*0*	*2*	*1*
GP travelled with patient	*12*	*4* *	*6*

n = number of patients. ECG = electrocardiograph. [a]As not all questions were answered by all respondents, percentages reflect slightly different denominators. Difference between urban and rural GPs: *$P<0.05$, **$P<0.01$.

ther 41 patients (25%) had final diagnoses consistent with acute coronary heart disease, for example unstable angina. Patients who considered themselves to be suffering a heart attack were not more likely than those who did not think they were having a heart attack to have a final diagnosis of acute myocardial infarction.

Of the 80 patients diagnosed as having suffered an acute myocardial infarction, 44% received thrombolysis in hospital and 39% did not; information was not available for 18% of patients. Four patients who were recorded by the general practitioner as having at least one contraindication received thrombolysis in hospital. Three of these patients had been noted by the general practitioner, on their initial examination, to have severe hypertension and the other had a history of cerebrovascular accident. Two patients received thrombolysis who did not have a diagnosis of acute myocardial infarction when they were discharged from hospital; both were categorized as suffering from acute coronary insufficiency.

Table 2. Patients' eligibility for thrombolysis as recorded by both urban and rural general practitioners.

	% of 195 patients with contraindication[a]		
	Yes	No	Not known
Bleeding disorder	*1*	*91*	*7*
Gastrointestinal bleeding/ other internal bleeding in past 6 months	*3*	*89*	*7*
History of cerebrovascular accident	*6*	*89*	*4*
Neurosurgical procedure in past 2 months	*0*	*98*	*2*
Intracranial neoplasm/aneurysm	*1*	*95*	*3*
Surgery/major trauma in past 10 days	*0*	*98*	*2*
Recent cardiopulmonary resuscitation (but not defibrillation)	*1*	*97*	*2*
Severe uncontrolled hyptertension	*2*	*93*	*3*
Heavy vaginal bleeding	*1*	*90*	*7*
Pregnant	*0*	*100*	*0*
Thrombolytic therapy in last 12 months	*2*	*89*	*8*

[a]Rows do not always total 100% as not all criteria were answered for each patient.

At the time of completion of the six-week follow-up form a further 10 patients had died. Thirty one out of all 195 patients died (16%); 10 patients with a diagnosis of acute myocardial infarction died (13%).

Discussion

The main disadvantage of the research method used in this study is possible selection bias of both general practitioners and patients. However, as the characteristics of the patients were similar to those of Irish patients entered into the second international study of infarct survival (ISIS-2)[14] and as the characteristics of the general practitioners were similar to the national Irish pattern,[13] cautious interpretation is possible. General practitioners were recruited through the continuing medical education faculty network of the Irish College of General Practitioners. Over 90% of practising Irish general practitioners are members of this network.

Half of the participating general practitioners contributed to the study a case of suspected acute myocardial infarction. Rural doctors contributed twice as many cases as did urban doctors. The characteristics of the doctors from urban and rural areas were generally similar, as were the characteristics of patients from the two areas. However, Donegal has the highest concentration in the country of patients eligible for free primary care.

The 90-minute median delay time from onset of symptoms to contacting a general practitioner is similar to the two hours reported in a study from Grampian[5] and to the 70 minutes reported in a multicentre study.[15] General practitioner response times are similar to those of the Grampian study (10 minutes)[5] and of the multicentre study (20 minutes).[15] The association between patients' perceived severity of symptoms and their shorter delay times is notable; however, patient perceptions of the cause of their symptoms were not related to delay times.

As in other recent reports,[5-8] this study shows that there is room for improvement in general practitioners' management of patients with suspected acute myocardial infarction, whether in urban or rural settings. Although there was an awareness of the value of early aspirin and intravenous analgesia, neither was commonly being used.

Some important differences between the management practices of rural and urban general practitioners emerged. Rural doctors were significantly more likely than urban doctors to use aspirin; conversely, they were significantly less likely to use intravenous morphine but significantly more likely to use morphine intramuscularly. The reasons for these differences in the use of morphine between urban and rural general practitioners are not clear; unfamiliarity with the use of intravenous morphine is one explanation but concern about morphine causing respiratory depression in a patient who has to undertake a long ambulance trip, or a belief that intramuscular drugs last longer than drugs given intravenously may be other reasons. Qualitative research on the influences on practitioners' management choices would be valuable in clarifying the issue of choice of route for analgesia and would help guide educational responses. As suggested by Grol,[16] attempts to explore such influences may prove more productive than the publication of further guidelines or audits.

The British Heart Foundation working group recommend that

eligible patients should receive thrombolysis within 90 minutes of alerting medical or ambulance services.[1] In both the urban and rural areas studied, median patient and doctor delay times were similar and totalled approximately 100 minutes. However, in the rural area the median estimated ambulance journey time (between location of patient and hospital) of 40 minutes, sometimes in both directions, poses obvious problems in attaining the British Heart Foundation standard for using hospital thrombolysis. The Grampian region study achieved a median call to needle time for general practitioners of 43 minutes which was half that for hospital administration of thrombolytics (median 87 minutes).[5] It was possible to initiate thrombolytic treatment within two hours of the onset of symptoms for 61% of patients treated by the general practitioner but in only 1% of patients treated in hospital. Three months after trial entry there was a relative reduction in deaths of 49% of patients treated by the general practitioner.[5] An RCGP observational study also demonstrated that general practitioners can use thrombolytic treatment both appropriately and safely in the early management of patients with acute myocardial infarction.[17]

In the present study, the hospital thrombolysis rate among patients with a diagnosis of acute myocardial infarction of 44% is similar to rates reported in other studies.[18] Such rates could form a useful focus for discussion between general practitioners and hospital staff about methods to increase uptake of thrombolysis. The two most important factors affecting general practitioners' willingness to use thrombolytic therapy are encouragement from local cardiologists and further training, especially on interpretation of electrocardiographs.[19,20] Over 10% of Irish general practitioners have already participated, through the continuing medical education network, in a one-day course on the management of cardiac arrest.[21] Developing a similar model for teaching general practitioners about the administration of thrombolytic therapy would be feasible. This study suggests that to achieve the target of a call to needle time of 90 minutes for rural practice patients, prehospital thrombolysis must become a reality.

Appendix 1. Results of four studies showing prehospital administration rates of aspirin and intravenous morphine to patients with suspected acute myocardial infarction (AMI) and final diagnosis.

	% of patients given		
Data source	Aspirin	Intravenous morphine	Final diagnosis of AMI
General practice (n = 311)[5]	*84*	*81*[a]	*61*
Hospital (n = 137)[6]	*19*	–[b]	*70*
Hospital (n = 149)[7]	*29*	–[b]	–[b]
Hospital (n = 133)[8]	*3*	*30*	*50*

n = number of patients studied. [a]Not specified whether morphine given intravenously or intramuscularly. [b]Data not provided.

References

1. Weston CFM, Penny WJ, Julian DG. Guidelines for the early management of patients with myocardial infarction. *BMJ* 1994; **308:** 767-771.
2. Hannaford PC, Waine C. Practice policies for responding to patients with chest pain [editorial]. *Br J Gen Pract* 1994; **44:** 195-196.
3. Herbert P. Suspected myocardial infarction and the GP [editorial]. *BMJ* 1994; **308:** 734-735.
4. Rawles J. What should be the general practitioner's role in early management of acute myocardial infarction? [editorial]. *Br J Gen Pract* 1995; **45:** 171-173.
5. GREAT group. Feasibility, safety and efficacy of domiciliary thrombolysis by general practitioners: Grampian region early anistreplase trial. *BMJ* 1992; **305:** 548-553.
6. Moher M, Johnson N. Use of aspirin by general practitioners in suspected acute myocardial infarction. *BMJ* 1994; **308:** 760.
7. Round A, Marshall AJ. Survey of general practitioners' prehospital management of suspected acute myocardial infarction. *BMJ* 1994; **309:** 375-376.
8. Wyllie HR, Dunn FG. Pre-hospital opiate and aspirin administration in patients with suspected myocardial infarction. *BMJ* 1994; **308:** 760-761.
9. Watt IS, Franks AG, Sheldon TA. Rural health and healthcare [editorial]. *BMJ* 1993; **306:** 1358-1359.
10. Cox J. Rural general practice [editorial]. *Br J Gen Pract* 1994; **44:** 388-389.
11. Boland M. My brother's keeper. William Pickles lecture 1991. *Br J Gen Pract* 1991; **41:** 295-300.
12. Hoechst Ireland Limited. *Streptase data sheet.* Dublin, Ireland: Hoechst Ireland Limited, 1993.
13. Comber H. *First national study of workload in Irish general practice.* Dublin, Ireland: Irish College of General Practitioners, 1993.
14. MacGowan GA, O'Callaghan D, Horgan JH and the ISIS-2 Irish collaborators. Medical management of acute myocardial infarction in Irish general practice: information from ISIS-2. *Ir J Med Sci* 1991; **160:** 347-349.
15. Birkhead JS. Time delays in provision of thrombolytic treatment in six district hospitals. *BMJ* 1992; **305:** 445-448.
16. Grol R. Implementing guidelines in general practice care. *Qual Health Care* 1992; **1:** 184-191.
17. Hannaford P, Vincent R, Ferry S, *et al.* Assessment of the practicality and safety of thrombolysis with anistreplase given by general practitioners. *Br J Gen Pract* 1995; **45:** 175-179.
18. Ketley D, Woods KL. Impact of clinical trails on clinical practice: example of thrombolysis for acute myocardial infarction. *Lancet* 1993; **342:** 891-894.
19. Murphy AW, Power R, Ungruh K, Bury G. Prehospital management of acute myocardial infarction. *Ir J Med Sci* 1992; **161:** 593-596.
20. Rawles J. Attitudes of general practitioners to prehospital thrombolysis. *BMJ* 1994; **309:** 379-382.
21. Murphy AW, Bury G, Dowling J. Teaching immediate cardiac care to Irish general practitioners — a faculty based approach. *Med Educ* 1995; **29:** 154-158.

Acknowledgements

We are grateful to all the participating general practitioners in Dublin: M Boyd, D Corboy, M Corcoran, S Collins, P Cosgrave, J Curry, R Doyle, J Duigan, J Fleetwood, E Gallagher, D Gibney, S Graham, J Hastings, B Healy, P Irwin, G Joyce, N Joyce, P Lacey, D Liston, C McCrory, P McMahon, C McNicholas, J McShane, C Maguire, P Marshall, J Martin, M Matthews, A Meade, B Meade, M Mehigan, S Mulvey, D Murphy, J Murphy, S Murphy, T Murray, W O'Brien, N O'Cleirigh, P O'Connor, T O'Cuileanain, E O'Flaherty, J O'Leary, G Ormond, K Perdue, J Redmond, R Regan, M Rice, P Roth, D Rutledge, J Ryan, F Shackleton, F Sheehan, B Sheehy and D Stones; and those in Donegal: P Armstrong, M Birmingham, D Bonar, A Bonner, C Bourke, G Bourke, M Bradley, B Breen, J Brogan, E Caulfield, D Clinton, M Coleman, M Cooke, J Coughlan, M Coyne, M Cuffe, F Curran, K Devlin, F Dobbs, B Forkan, B Gallagher, S Gallagher, E Gavin, J Glynn, K Hanley, D Hegarty, P Henry, C Kelly, R Kerr, D McCauley, B McColgan, F McCurtin, M McFadden, J McFeely, J McGeehan, D McGinley, J McHardy, J Madden, D Mee, P Mitchell, M Morgan, P Moroney, P Murphy, M Murray, S Nic An Bhreithiun, A Noone, T Nunan, S O'Baoighill, S O'Domhnaill, G O'Rourke, E O'Sullivan, K Quinn, E Ralph, P Rhatigan, E Shea, E Stack, P Stewart and P Sweeney. We acknowledge with thanks the funding from the Irish Heart Foundation, North Western Health Board and Irish College of General Practitioners, through the Manne Berber Fellowship, which made this study possible. We thank M Quinn for her invaluable secretarial support to the Donegal section of the study.

Address for correspondence

Dr A W Murphy, Department of General Practice, Royal College of Surgeons of Ireland, Mercer's Health Centre, Lower Stephen Street, Dublin 2, Republic of Ireland