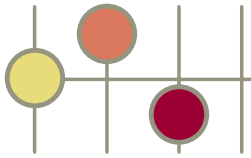

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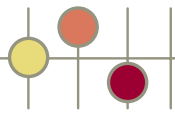
Predictors of delay in seeking medical help in patients with suspected heart attack, and interventions to reduce delay: A systematic review



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Predictors of delay in seeking medical help in patients with suspected heart attack, and interventions to reduce delay: A systematic review

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Executive summary

Background

Coronary heart disease (CHD) is the major cause of morbidity and mortality in the UK for both men and women, with acute myocardial infarction (AMI) being the most frequently identified cause of mortality.

Thrombolytic therapy in the early hours of an AMI provides considerable risk reduction in terms of damage to the heart and, depending on the agent used, leads to beneficial effects in survival. The effectiveness of thrombolytic therapy is dependent on prompt administration, which has led to increasing attention on the period between the onset of symptoms and treatment. Three different components are involved: patient decision time, transport time, and hospital time from admission to treatment. Patient decision time, defined as the time from onset of signs and symptoms of an AMI to the time when medical assistance is sought, has been found to account for most of this delay. Patient decision time combined with transport time is referred to as pre-hospital delay.

The scope for reduction in morbidity and mortality that could result from shortening patient decision time has prompted researchers to investigate what influences patient decision time. Numerous studies have highlighted factors that may be associated with patient decision time, which in turn have prompted the implementation of interventions to improve peoples' knowledge of the symptoms of AMI and the correct action to take when experiencing such symptoms.

Objectives

To carry out two linked systematic reviews; one to identify the factors associated with patient decision time (referred to as patient delay), and one to evaluate the effectiveness of interventions aiming to reduce patient or pre-hospital delay. In particular, two research questions were addressed:

1) What are the factors that influence the time to seeking medical help following the onset of signs and symptoms of an AMI?
2) How effective are interventions that aim to reduce the time from the onset of signs and symptoms of an AMI to seeking medical help/arrival at hospital?

Methods

Fifteen electronic databases and the Internet were searched. In addition, the bibliographies of retrieved papers that met the inclusion criteria were scanned for any additional references.

Studies reported in all languages and conducted in all settings were considered for inclusion. To be included in the review of factors, studies were required to measure patient delay and include individuals with signs and symptoms of an AMI. All study designs were eligible for inclusion, however studies were required to use multivariate analyses. To be included in the review of interventions, studies had to assess an intervention aimed at reducing the time from the onset of signs and symptoms of an AMI to seeking medical help and/or arrival in hospital. Interventions could target individuals of all ages at an increased risk of an AMI, or the whole community. Studies were required to measure either patient or pre-hospital delay. Randomised controlled trials, controlled trials (with baseline assessment), or before-and-after studies were eligible for inclusion.

All titles and abstracts were assessed independently by two reviewers. Disagreements were resolved by discussion, and where no agreement could be made the paper was obtained. Retrieved articles were assessed for inclusion independently by two reviewers. Data were extracted by one reviewer and checked by a second independent reviewer. Quality assessment of intervention studies was conducted by one reviewer and checked by a second. For inclusion assessment, data extraction and quality assessment, disagreements were resolved through discussion, and if necessary, by recourse to a third reviewer. The results were synthesised narratively.

Results

Factors

Eleven studies, all observational in design, met the inclusion criteria. There was some evidence that the following factors might be associated with longer delay time: symptom onset beginning at home, less people present, being female, being of older age, experiencing less pain, and not attributing symptoms to an AMI or the heart. However, due to the poor quality of the studies and the small number of studies that investigated each type of predictor, it was difficult to draw any firm conclusions.

Interventions

Eleven studies (two RCTs, one controlled trial and eight before-and-after studies) met the inclusion criteria. Five of these studies (the controlled trial and four before-and-after studies) reported the interventions to have statistically significant positive effects on delay time, whilst the other six (the two RCTs and four before-and-after studies) reported no statistically significant effect. In general, the quality of these studies was poor, with the majority of the studies being before-and-after in design, and only three of the studies employing a control group.

With regard to secondary outcomes, the three studies that reported the percentage of persons using ambulance or medic transport showed that the intervention had no statistically significant effect on this outcome. Both of the studies that reported the number of calls made to 911 or switchboard for medical emergencies reported an increase in this outcome during the intervention. Of the five studies that examined the number of emergency department (ED) visits for chest pain, three reported an increase in this outcome as an effect of the intervention. Mortality was not statistically significantly affected by the intervention in the two studies that examined this outcome. Of the three studies examining receipt of reperfusion therapy, two reported an increase in this outcome after the intervention.

Discussion and conclusions

There is some evidence that a number of factors might be related to longer delay time. However, due to the poor quality of the studies and the small number of studies that investigated each factor, it is difficult to draw any firm conclusions.

There is very limited evidence that community interventions may be successful in reducing delay time. Evidence also suggests that interventions may result in an increase in emergency calls, ED visits and lysis. However, due to the methodological deficiencies of these studies, it is unclear how much weight can be given to these findings, particularly as evidence to support a reduction in delay time comes mainly from before-and-after studies.

1. Introduction

Coronary heart disease (CHD) is the major cause of morbidity and mortality in the UK for both men and women, with acute myocardial infarction (AMI) being the most frequently identified cause of mortality.[1]

Evidence suggests that individuals who experience an AMI should receive treatment as quickly as possible,[2] given that the benefits of prompt admission to hospital are well documented.[2,3] Thrombolytic therapy in the early hours of an AMI provides considerable risk reduction in terms of damage to the heart[4] and, depending on the agent used, leads to beneficial effects on survival.[2,3] However, many patients do not reach hospital quickly, resulting in heart damage and poorer prognoses.[5,6]

Delay in receiving thrombolytic therapy has been found to be related to three factors: patient's decision time, transport time, and hospital time from admission to treatment.[7] Patient decision time has been found to account for most of this delay.[8] Patient decision time has been defined as the time from onset of signs and symptoms of an AMI to the time when medical assistance is sought.[9] The effectiveness of thrombolytic therapy is dependent on prompt administration, which has led to increased attention on the period between the onset of symptoms and treatment, sometimes referred to as 'the golden hour'.[5] Median patient decision time derived from studies conducted over the past 20 years ranges between 1.5 and 6.5 hours.[8,10] Studies conducted in the USA have documented mean patient decision times that exceed seven hours and median delay times of two to four hours after the onset of symptoms of AMI.[11] A consequence of long patient decision times is that a large proportion of patients admitted with AMI are not eligible or may not benefit from thrombolytic or reperfusion therapy.[11]

The National Service Framework (NSF) for CHD reports that between a third and two thirds of deaths from AMI in the UK take place outside hospital.[1] Many deaths occur due to ventricular fibrillation, and many lives could be saved by prompt defibrillation. The Government is trying to address this by setting standards on the availability of defibrillators and reducing the time from call to ambulance arrival to eight minutes.

The NSF also recommends local models of care for patients with CHD and states that they should include details of 'public education programmes encouraging people to call 999 for an ambulance in the event of symptoms suggestive of myocardial infarction'. It is therefore important to establish the effectiveness of interventions to reduce delay time in order to inform Primary Care Trusts on how best to educate the public about the correct actions to take in the event of symptoms suggestive of AMI.

Furthermore, the NSF has defined a minimum standard for 'call to needle' time of less than 60 minutes for patients with suspected AMI. This is in recognition of the beneficial effects on survival from the use of therapies in the early symptomatic period. In order that strategies can be identified which might expedite the time a patient takes to seek professional help, there needs to be an understanding of factors associated with delay in seeking medical help. This knowledge can then be used to tailor advice to those who may be at risk of an AMI about how to recognise and respond to symptoms.

A number of socio-demographic, clinical and personality factors have been suggested as reasons for the variation in patient decision time.[12,13] Numerous studies have examined the social context in which symptoms occur, the role of others present at the onset of symptoms, knowledge and appraisal of symptoms, and the cognitive and emotional processes that bring about the decision to seek help.[8,14-22] Psychological theories including the Self Regulation Model[23] and the Care Seeking Model[20] have been employed to explore and explain patient decision time. These studies highlight the many inter-related variables which may be associated with, and moderate, patient decision making processes; which in turn has prompted the implementation of interventions to improve peoples' knowledge of the symptoms of AMI and the correct action to take when experiencing such symptoms. However, the effectiveness of public awareness campaigns and patient education to decrease delay time is uncertain.[7] Some studies report that whilst mass media campaigns and patient education may increase knowledge, it is unlikely to change behaviour.[24-26] Other studies report some reduction in the median time from onset of symptoms of AMI to arrival in hospital.[27,28] Some studies do not separate patient decision time from transport time and combine those two time periods, calling it 'pre-hospital delay'.

It has also been reported that patients with a second AMI take as long to seek help as those experiencing their first AMI, which suggests there is more to decision making than knowledge of symptoms.[25,29,30] The scope for reduction in morbidity and mortality that could result from shortening patient decision time has prompted a large number of research studies investigating patient decision time.

In order to evaluate this research, we undertook two linked systematic reviews. One review aimed to identify the factors associated with patient decision time (referred to here as patient delay), and the other to establish the effectiveness of interventions to shorten both patient and pre-hospital delay.

Findings from the reviews will enable recommendations to be made about effective interventions in primary care, coronary care units (CCUs) and the community.

1.1 Objectives

Two systematic reviews were conducted to:

1) Identify the factors that are likely to affect the time to seeking medical help in individuals with signs and symptoms of an AMI, and
2) Evaluate the effectiveness of interventions aiming to reduce patient or pre-hospital delay.

In particular, two research questions were addressed:

1) What are the factors that influence the time to seeking medical help following the onset of signs and symptoms of an AMI?
2) How effective are interventions that aim to reduce the time from the onset of signs and symptoms of an AMI to seeking medical help/arrival at hospital?

2. Methods

These two linked systematic reviews were undertaken using methods outlined in the NHS Centre for Reviews and Dissemination Report 4.[31]

2.1 Search strategy

The following electronic databases were searched to locate articles on both factors related to patient delay and interventions to reduce patient/pre-hospital delay:

ASSIA
Cochrane Library CD-ROM
Cumulative Index to Nursing and Allied Health Literature (CINAHL)
Database of Abstracts of Reviews of Effects (DARE)
EMBASE
Educational Resources Information Center (ERIC)
MEDLINE
Mental Health Abstracts
National Research Register (NRR)
NHS Economic Evaluation Database (NHS EED)
PsycINFO
Science Citation Index
System for Information on Grey Literature in Europe (SIGLE)
Social Science Citation Index
Sociological Abstracts

Individual search strategies were developed for each electronic database. Searches were conducted from inception until January 2001. The full search strategy is presented in Appendix A.

There were two search strategies; one used to retrieve 'factor' records and the other to find 'intervention' records.

The 'factor' search strategy used two facets; terms for 'myocardial infarction' combined with terms for 'delay'. The initial searches were very sensitive, so a third facet using terms for 'hospital/emergency services' was added to give greater precision. The 'intervention' search strategy used three facets; broader 'heart disease' terms combined with 'delay' terms, with an additional facet of 'intervention/health promotion' terms.

There was a substantial overlap in the records found from both search strategies, so the records were de-duplicated.

Searches were also carried out on the Internet using medical search engines such as BIOME (http://biome.ac.uk/) and the Health Development Agency (HDA) HealthPromis database (http://healthpromis.hea.org.uk), meta search engines such as Copernic (http://www.copernic.com/) and The BigHub.com (http://www.isleuth.com/) and general search engines such as Alta Vista (http://www.altavista.com/) and Google (http://www.google.com/). Specialist heart related sites were also searched.

The bibliographies of retrieved papers that met the inclusion criteria were scanned for any additional references.

2.2 Inclusion criteria

For both of the reviews, studies reported in all languages and conducted in all settings were included.

2.2.1 Predictor studies

Predictors and their measurement

Factors associated with delay in seeking medical help following the onset of signs and symptoms of an AMI are referred to as *predictors*. For the purposes of this review, the term does not imply causality. Studies that used 'intention to act' (i.e. a proxy outcome) as the main outcome were excluded. In addition, studies focusing on clinical predictors (e.g. left ventricular function), defined here as 'factors the individual is unaware of' were excluded.

Participants
Individuals of all ages with signs and symptoms of an AMI.

Outcomes
Studies were included if they measured patient delay, defined as the time from signs and symptoms of an AMI to the call for medical help (to the patient's doctor, an ambulance, or the emergency medical services (EMS) etc.). Studies were excluded if they measured time from seeking medical help to arrival at hospital where patient delay could not be separated from transport delay. The reason for this is that transport delay (time from call to medical help to arrival at hospital) is not within the patient's control.

Study design
All study designs were eligible for inclusion, however only studies using multivariate analyses were included in the review. Multivariate analysis[a] was defined as an analysis involving one dependent variable (delay time) and two or more independent variables. Numerous factors may influence patient delay, many of which may be interrelated. It can be inappropriate and misleading to examine individual predictors of delay time in isolation, without using some form of multivariate analysis to consider the influence of confounding factors. Analysis of Covariance (ANCOVA) was not considered multivariate because covaried variables are not examined in association with delay time - their effects are merely removed from the analysis.

2.2.2. Intervention studies
Intervention
All interventions that aimed to reduce the time from the onset of signs and symptoms of an AMI to seeking medical help/arrival at hospital. Interventions could be aimed at individuals or entire communities.

Participants
Individuals of all ages at an increased risk of an AMI, or the whole community.

Outcomes
The primary outcome of interest was the time from the onset of signs and symptoms of an AMI to seeking medical help (patient delay) or the time of onset of signs and symptoms of an AMI to time of arrival at the hospital (pre-hospital delay). The main rationale for including studies with pre-hospital delay as an outcome was that most interventions are aimed at reducing pre-hospital delay and not just patient delay. The majority of interventions highlight the need to seek help quickly and to call an ambulance if signs and symptoms of an AMI are experienced. Studies that used 'intention to act' as the primary outcome were excluded. Studies evaluating outcomes associated with a change in the delivery of health services e.g. pre-hospital cardiac services or mobile CCUs (MCCUs), were excluded.

Study design
Randomised controlled trials (RCTs), controlled trials (with baseline assessment) and before-and-after studies.

Procedure
All titles and abstracts identified from the searches of electronic databases were assessed independently by two reviewers. Disagreements were resolved by discussion, and where no agreement could be made the paper was obtained.

Two reviewers independently assessed retrieved articles using the inclusion criteria detailed above. Disagreements were resolved through discussion, and if necessary, by recourse to a third reviewer.

2.3 Data extraction
Study details were extracted by one of four reviewers into an Access database and checked by one of three reviewers. Any disagreements were resolved through discussion and if necessary, by recourse to a third reviewer. Where there were multiple publications from the same study, all publications were examined to ensure that all the relevant data for that study were recorded.

[a] Note that the word 'multivariate' is used inconsistently. Its looser definition refers to any method that examines multiple variables at once. Under this definition, multiple regression (for example) is a multivariate method. A more strict definition of the word 'multivariate' refers only to methods that simultaneously examine several outcomes. Multiple regression for example, is used to predict or model one outcome from multiple explanatory variables, thus it is not a multivariate method under the strict definition. Motulsky H. *Intuitive Biostatistics*. Oxford: Oxford University Press, 1995.

2.3.1 Predictor studies

The following data were extracted from predictor studies:

- Author, year, country and language
- Authors' objectives
- Setting
- Participant inclusion/exclusion criteria
- Participant details, e.g. age, gender, race, history, symptoms, and onset time
- Study design and duration
- Predictors that may influence the time from the onset of signs and symptoms of an AMI to seeking medical help: sociodemographic; knowledge, behaviour, attitudes and beliefs; barriers and facilitating conditions; social influences; health status
- Method of evaluation of predictors and delay time
- Sample size and details of power calculations, where performed
- Details of statistical analyses, where performed
- Details of refusals/missing data
- Results
- Authors' conclusions

2.3.2 Intervention studies

The following data were extracted from intervention studies:

- Author, year, country and language
- Authors' objectives
- Intervention details e.g. type, content, setting, frequency, duration, information about person(s) delivering intervention
- Participant inclusion/exclusion criteria
- Participant details, e.g. age, gender, race, history, symptoms, and onset time
- Study design and duration
- Method of randomisation or control group selection (where not randomised)
- Sample size and details of power calculations, where performed
- Outcomes
- Method of evaluation of outcome
- Confounding factors
- Details of statistical analyses, where performed
- Details of refusals/missing data
- Results
- Authors' conclusions

2.4 Quality assessment

Quality assessment for the predictor studies was not carried out because we were unable to identify a widely accepted checklist for assessing this type of study. It was beyond the scope of this project to develop such a tool. However, the proportion of participants with suspected AMI for whom information on predictors or delay time could not be collected was recorded at the data extraction stage.

Intervention studies were assessed using a checklist adapted from CRD report 4[31] and a previous review examining factors associated with the uptake of screening.[33] Quality assessment was conducted by one reviewer and checked by a second reviewer. Discrepancies were resolved by discussion or, when agreement could not be reached, by consultation with a third reviewer. Quality assessment was recorded into an Access database.

The following aspects of methodological quality were assessed for intervention studies (see Appendix B for a list of possible responses for each quality assessment criterion and definitions of these responses):

RCTs only

Were the intervention and control groups randomly selected?
Was allocation concealed?

RCTs and controlled trial only

Were the groups comparable at baseline?

Were the groups treated identically other than the named interventions?
Were the outcome assessors blind to allocation?
Was the method of measuring delay time reported?
What (if any) was the percentage of missing data?
Were appropriate statistical analyses used?
Was a sample size/power calculation performed?

Before-and-after studies only
Was the method of measuring delay time reported?
Was there adjustment for the effect of any confounding factors?
Was a sample size/power calculation performed?
Were appropriate statistical analyses used?

2.5 Data synthesis

2.5.1 Predictor studies

A narrative synthesis of studies examining the association between predictors and delay time is presented. The following seven categories were developed in order to incorporate all the factors that were investigated: sociodemographic, psychosocial, access to/use of services, clinical, knowledge, symptoms/evaluation of symptoms and attempts at self-treatment. Decisions as to which factors fell under which category were made independently by two reviewers. Disagreements were resolved through discussion, and if necessary, by recourse to a third reviewer. A summary table of the factors investigated by each study is provided.

2.5.2 Intervention studies

A narrative synthesis of results is presented. Results are grouped according to study design. Summary tables are provided for intervention content, duration of the intervention and outcome measurement period, quality assessment, and cost information.

3. Results of predictor studies

See Appendix C for a list of excluded studies and reasons for exclusion. Eleven studies, all observational in design, met the inclusion criteria.[9,34-43] One of these studies[41] had an associated paper[44] that presented an analysis of a subset of data from the main study. Further details relating to the included predictor studies are presented in Appendices D and E.

3.1 Details of participants and setting

Number of participants

Six studies reported a sample size of less than 501 or less participants.[9,34,35,38,39,43] Four studies reported a sample size between 1000 and 2000 participants,[37,40-42] and one study included over 5000 participants.[36]

Characteristics of participants

All but two studies[37,39] provided information on the gender of participants. Of the studies that did provide such information, all included both male and female participants. Of the eight studies that provided the percentage of men for the total group, this ranged from 39.5% to 79%. One study reported the percentage of males for black and white participants separately as 33.8% and 45.3%, respectively.[41]

All but one study[37] provided information on the age of participants. Of the five studies that provided the mean age for the total group, this ranged from 56 to 64 years.[34-36,39,43] Two studies reported the mean age of males and females separately. This was 58 and 64 years, respectively, in one study,[9] and 58 and 60 years, respectively, for the other study.[38] Respectively, two studies reported 8.2% and 15.7% of participants to be 44 years or under, 50.3% and 53.3% to be within the ages of 45 to 64 years, and 41.6% and 31.0% to be 65 years or older.[40,41] One study reported the mean age for black and white participants separately as 56 years and 58.8 years, respectively.[42]

Five studies did not provide any information on the race of participants.[36-39,43] In five of the six studies that did provide such information, white participants constituted 69.5% or more of the total group.[9,34,35,40,42] All six studies had non-white participants, including the categories of black, African-American, Hispanic, Asian, Latino and other. The percentage of non-white participants in these six studies ranged from 10.8% to 65.2%.

The studies varied in participant details relating to history of disease, symptoms, and inclusion/exclusion criteria.

Setting

Six of the studies were carried out in the USA and the settings ranged from centres, hospitals and cardiac referral centres to inner city neighbourhoods.[9,34,35,40-42] One study was based in mobile emergency units in 15 European countries and Canada,[36] one in 39 hospitals in the Piedmonte region of North Italy,[37] one in three hospitals in Rotterdam in The Netherlands,[38] one in a CCU in Stockholm in Sweden[43] and one in a CCU in Aberdeen in Scotland.[39]

3.2 Description of studies

Outcome assessment of patient delay

Eight studies examined patient delay as a continuous variable,[34-37,39-42] and three studies examined this as a categorical variable.[9,38,43]

Factors investigated

Studies investigated a diverse range of factors related to delay, which were classified into seven categories (see Table 3.1).

In many of the studies, univariate analyses had been carried out prior to the use of multivariate statistics in order to explore which variables to enter into the multivariate analyses. Table 3.2 shows the number of factors within each predictor category investigated by each study by univariate and multivariate analysis. Note that on average, the more variables entered into multivariate analysis, the higher the percentage of explained variance is likely to be. However, a greater number of variables also leads to an increased likelihood of chance findings.

Table 3.1 Examples of factors within each of the seven predictor categories

Socio-demographic	Access to/use of services	Psycho-social	Clinical	Symptoms/ evaluation of symptoms	Attempts at self-treatment	Knowledge
Race, age, gender, socio-economic status (SES), education	Geographic location, insurance, time of week (weekday/ weekend), time of day, transportation, satisfaction with care, recent consultation with a clinician, who was called	Health beliefs, vulnerability, fear, beliefs about use of services, talking to someone else, having someone else present, location (work/home), propensity to seek help	Diabetes, hypertension, smoking, medical history, diagnosis, other clinical variables that the individual may be unaware of such as ventricular fibrillation or shock	Symptoms, severity of pain, how expected the symptoms were, symptom attribution, perceived seriousness of symptoms, patients' self-diagnosis	Ingesting medication for relief, resting for relief	Knowledge of symptoms, of what to do, of who to call, of risk

All eleven studies examined socio-demographic factors; three using univariate analysis only,[38-40] three using multivariate analysis only[35,37,42] and five using both.[9,34,36,41,43] Five studies examined factors associated with access/use of services; one using univariate analysis only,[35] one using multivariate analysis only[42] and three using both.[37,41,43] Seven studies examined psychosocial factors; two using multivariate analysis only[40,42] and five using both univariate and multivariate analysis.[34,35,38,39,43] Nine studies examined clinical factors; two using univariate analysis only,[38,40] two using multivariate analysis only[9,42] and five using both.[34,36,37,39,43] Three studies examined factors related to knowledge, one using univariate analysis only,[38] one using multivariate analysis only[42] and the other using both univariate and multivariate analysis.[43] Ten studies examined symptoms/evaluation of symptoms, one using univariate analysis only,[38] four using multivariate analysis only[9,40-42] and five using both.[34-36,39,43] Two studies investigated the relationship between attempts at self-treatment and delay, both using univariate and multivariate analysis.[34,43]

Multivariate analyses used

In the reporting of the results, we have adopted the statistical terms used by the authors of the primary studies. We have attempted to classify the type of statistical analyses used according to the information presented in the original studies.

Eight studies used some form of multivariate regression including multiple regression (stepwise and non-stepwise), logistic regression and linear regression.[9,34-37,39,41,42] One study used multiple non-linear analysis,[43] one study used multivariate analysis of variance (MANOVA),[38] and one study used a procedure known as Automatic Interaction Detector (AID).[40]

All but one study performed both univariate and multivariate analyses with patient delay as the dependent variable.[42] At least two studies[9,41] did not use univariate analyses for its intended purpose. One study did not carry out any univariate analysis, only multivariate analysis was performed.[42] One study performed univariate and multivariate analysis simultaneously using the same set of variables for both analyses.[43] Another study carried out univariate analysis on only one of the nine variables entered into the multivariate analysis.[9] Two studies used one set of variables in univariate analysis, and a different set of variables in multivariate analysis.[38,40] In three of the predictor studies it was unclear if the findings were statistically significant, either due to the type of analyses carried out[40,43] or because this information was not reported.[9]

3.3 Categories of predictors

Only the findings of multivariate analyses are reported here. The results of univariate analyses and further details regarding the analyses used in each study are presented in Appendix D. Results from each study are presented under the most appropriate predictor category, and are reported in order of type of analyses used. The summary sections for each predictor category synthesise the findings (factors that were investigated by two or more studies (an arbitrary number in order to summarise the results)), which are statistically significant unless otherwise stated. For ease of presentation, and readability, author names have been used to report the results of predictor studies.

Table 3.2 Number of factors within each predictor category investigated by studies

Author (year), country	Socio-demographic		Access/use of services		Psychosocial		Knowledge		Clinical		Symptoms/ evaluation of symptoms		Attempts at self treatment		Total	
	UV	MV	UV	MV	UV	MV	UV	MV	UV	MV	UV	MV	UV	MV	UV	MV
Sjogren (1979),[43] Sweden	3	3	1	1	6	6	1	1	1	1	2	2	2	2	16	16
Alonzo (1980),[40] USA	2	?	X	X	X	5	X	X	2	?	X	2	X	X	4	7*
Rawles (1990),[39] Scotland	1	X	X	X	1	1*	X	X	2	1	2	2*	X	X	6	4*
Martiny (1992),[37] Italy	X	2	3	2	X	X	X	X	1	1	X	X	X	X	4	5
Crawford (1994),[42] USA	NA	3	NA	3	NA	1	NA	1	NA	3	NA	2	NA	X	0	13
Bleeker (1995),[38] Netherlands	3	X	X	X	4	11	3	X	1	X	1	X	X	X	12	11
Burnett (1995),[35] USA	X	2*	4	X	9	4*	X	X	X	X†	3	2*	X	X	18	8*
Ell (1995),[41] USA	3*	1*	1*	4*	X	X	X	X	X	X	X	2*	X	X	4*	7*
Fowler (1997),[34] USA	4	4	X	X	4	4*	X	X	3	3*	2	2	1	1	14	14*
Leizorovicz (1997),[36] France	2	2	X	X	X	X	X	X	6	6	2	2	X	X	10	10*
Ashton (1999),[9] USA	1	4*	X	X	X	X	X	X	X	3*	X	2*	X	X	1	9*

UV univariate analysis; MV multivariate analysis; X no variables entered; ? unclear if socio-demographic and clinical factors were entered into multivariate analysis; NA not applicable (i.e. univariate analysis not conducted); * exact number of variables entered is unclear; † clinical factors entered into separate non-stepwise multiple regression model, but not into main stepwise multiple regression

3.3.1 Psychosocial factors

Seven studies examined the relationship between psychosocial variables and patient delay in multivariate analyses.[34,35,38-40,42,43]

Four studies investigated psychosocial predictors using some type of regression analyses.[34,35,39,42] Burnett et al.[35] found that shorter delay times were associated with more comfort in seeking medical assistance (β=-0.24, p<0.0001), symptom onset outside of the home, but not at work (β=-0.76, p<0.0001) and perceived inability to control the symptoms (β=-0.11, p<0.037). Comfort in seeking medical assistance was the second most statistically significant predictor of delay time (after perceived seriousness of symptoms), and it reduced delay time by 55 minutes. Anxiety was not statistically significant. Similarly, Rawles et al.[39] found that anxiety was not statistically significantly related to delay time.

In a study by Fowler[34] it was unclear which psychosocial variables were entered into multiple regression, but it appeared that the following variables were studied: fear, trait anxiety, fear levels in patients with no subsequent conformation of heart disease and fear levels in patients with subsequent confirmation of heart disease. The analysis also included a number of interaction effects (see Appendix D). Of all the psychosocial variables entered into the multiple regression, two interaction effects were statistically significant. These were the interactions of belief in cardiac origin of symptoms with total scores on the revised Health Fear Inventory (β=0.010288, p=0.027) and revised Health Fear Inventory scores with gender (β=-0.013426, p=0.041). It is unclear how the interaction of these variables predicted changes in delay, and none of the variables were independently associated with delay.

Using multivariate linear regression, Crawford et al.[42] investigated general propensity to seek care. They found that those who would seek care for six symptoms (swelling of the ankles, chronic fatigue, shortness of breath, fainting spells, chest pain and persistent coughing) had a statistically significantly shorter delay time (coefficient=-0.95, 95% CI: -1.60 to –0.30).

Three studies investigated psychosocial factors with analyses other than regression.[38,40,43] Sjogren[43] conducted multiple non-linear analysis with long delay (>6 hours) as the dependent variable. The variables examined, with their squared beta values (multivariate) in brackets were: psychological activity before onset (0.07), patient called for help (0.03), presence of another person (0.02), high degree of anxiety (0.02), patient initiative to call for help (0.02), and high degree of impatience (0.02). A larger squared beta indicates a stronger association of the variable with delay time, but it is unclear which of these variables are statistically significant. All of these factors were inversely associated with delay time, apart from high degree of impatience, which was positively associated with delay time.

Bleeker[38] carried out multivariate analysis of variance (MANOVA) on ‘coping in general’ and ‘denial’. The coping scales showed a statistically significant multivariate effect (F=2.53; p=0.016). Patients who sought help within half an hour were active problem solvers (t=2.2, p=0.031, Bonferroni 90% CI=-0.07; 1.10), sought more social support (t=2.0, p=0.047, Bonferroni 90% CI=-0.08; 0.76) and had more easing thoughts (t=2.8, p=0.006, Bonferroni 90% CI=0.04; 0.76) than those who sought help after more than 30 minutes. However, after Bonferroni adjustment, only easing thoughts remained statistically significant. The following variables were not statistically significant: palliative reaction, avoiding, expressing emotions and depressive reaction. No overall effect was found with the denial scales. Of those variables entered into the denial MANOVA, the short delay group were less likely to deny their feelings of resentment (t=-2.3, p=0.024, Bonferroni 90% CI=-1.00; -0.03) and vital exhaustion (t=-1.99 p=0.048, Bonferroni 90% CI=-1.5; 0.09). Only resentment remained statistically significant after Bonferroni adjustment. Dependency and anxiety were not statistically significant.

Alonzo[40] used the Automatic Interaction Detector to determine which psychosocial variables were involved in the shortest and longest pathways to seeking medical care, but it was unclear if these were statistically significant. Patients’ intention to turn over the situation to lay others (as opposed to informing lay others and seeking advice) formed part of the shortest medical care decision duration. The longest medical care decision phase occurred when lay others did not usurp control of the situation, when lay secondary advice was to seek physician consultation (as opposed to hospital emergency room or EMS), and when patients tended to ask for advice about symptoms. Number present at acute symptom onset (zero to three versus greater than four) and place of acute symptom onset (home versus work, office, public) were not involved in either the longest or shortest pathway to medical care decision. However, delay time was longer if onset began at home, or if there were less than four people present, but it was unclear if these findings were statistically significant.

Summary of psychosocial factors
One of four studies[43] that investigated the relationship between anxiety and delay time found that a lower level of anxiety was associated with longer delay, but it was unclear if this was statistically significant. The remaining three studies[35,38,39] found that there was no statistically significant relationship between anxiety and delay time.

In one study,[35] the shortest delay occurred when the place of onset of symptoms was outside the home, but not at work. Another study[40] found that delay time was longer when onset began at home as opposed to at work, the office, or a public place, however, it was unclear if this difference was statistically significant.

One study[40] found that if there were four or more people present at onset of symptoms, delay time was shorter than if there were less than four. Another study[43] found delay time was longer when there was not another person present. In both studies it was not clear whether these findings were statistically significant.

3.3.2 Sociodemographic factors
Eight studies investigated the relationship between sociodemographic predictors and patient delay.[9,34-37,41-43]

Seven of these examined the relationship between sociodemographic factors and delay using some type of regression analysis.[9,34-37,41,42] Using stepwise multiple regression, Burnett et al.[35] found that being married (β=-0.29, p<0.003) was associated with shorter delay time, and Martiny et al.[37] found that gender and age were not statistically significantly associated with delay. However, Ell[41] found that females had a longer delay time than males (coefficient=0.40, standard error=0.18, p=0.03). It is likely that age and race were also entered into this analysis, but were not found to be statistically significant.

Using multiple regression, Fowler[34] found that age, education, race, and gender were not statistically significantly associated with delay time. However, the interaction of revised Health Fear Inventory scores with gender (β=-0.013426, p=0.039) was statistically significant. It is unclear how the interaction of these variables was associated with delay time.

Using polytomous logistic regression, Ashton[9] reported that gender, age, marital status and income source were not highly related to delay (statistical significance was not reported).

Crawford et al.[42] investigated several demographic factors in multivariate linear regression including: black race (men only, women only), female sex (whites only, blacks only) and SES (currently employed, very difficult paying for basics). The only variable found to be statistically significant was SES, where those who were currently employed had a longer delay time (coefficient=0.97, 95% CI: 0.35 to 1.59).

In linear regression analyses, Leizorovicz et al.[36] found that patients over 65 years old (p=0.0001) and women (p=0.003) were likely to wait longer before calling for an ambulance.

Sjogren et al.[43] entered three sociodemographic variables into a simultaneous univariate/multivariate analysis, known as multiple non-linear analysis. These were, with their squared beta values in brackets: high professional group (0.04), high age (0.02) and male sex (0.01). Long delay was positively associated with high age, but inversely related to high professional group and male sex. As mentioned previously, the authors only reported squared beta values greater than or equal to one and it is unclear if these findings were statistically significant.

Summary of sociodemographic factors
Of seven studies[9,34,36,37,41-43] that entered gender into multivariate analysis, three found that females delayed longer than males.[36,41,43] However, in one of these studies,[43] it was unclear if this finding was statistically significant. The remaining four studies[9,34,37,42] found that gender was not statistically significantly related to delay. However, one of these studies[42] only assessed female gender by race (i.e. did not look at male gender).

Six studies investigated age in multivariate analysis.[9,34,36,37,41,43] Two of these found that older people (defined in one study simply as 'high age' and in the other as greater than 65 years of age) delayed longer than younger people.[36,43] In one study it was unclear whether this finding was statistically significant.[43] The remaining four studies found that age was not statistically significantly related to delay.[9,34,37,41]

All three studies that investigated the relationship between race and delay found that race was not statistically significantly associated with delay.[34,41,42] One of these studies[42] investigated the interaction of black race with gender, and female sex with race, and thus did not examine race alone.

Four studies[9,34,42,43] investigated the relationship between various measures of SES and delay time. In one study[9] income source was not found to be highly related to delay. One study[42] found that being currently employed was associated with longer delay, while another[43] found that belonging to the lower socioeconomic strata was associated with longer delay. It was unclear whether the latter finding was statistically significant. The remaining study[34] found that there was no statistically significant association between education and delay.

One study[35] found that being married was associated with shorter delay, while another[9] found that marital status was not highly related to delay.

3.3.3 Access/use of services factors

Four studies examined the relationship between access/use of services and patient delay.[37,41-43]

Three of these studies used some type of regression analyses.[37,41,42] Martiny et al.[37] entered time of symptom onset and geographical location of residence into stepwise multiple regression. Geographical location was not statistically significant. A statistically significantly shorter delay occurred when symptom onset was during the day (6am to 6pm) rather than during the night (regression coefficient=-48).

Ell[41] investigated the following variables in a stepwise multiple regression: consulted medical professional (yes versus no), transportation (paramedic versus other), hospital type (public versus private health maintenance organisation (HMO)) and insurance (yes/no). It was found that consultation with a medical professional (coefficient=1.02, standard error=0.20, p=0.001), public hospital locus (coefficient=-0.83, standard error=0.32, p=0.01) and having no medical insurance extended the decision duration (coefficient=-0.80, standard error=0.34, p=0.02). In contrast, use of paramedic transport reduced the decision duration (coefficient=1.62, standard error=0.24, p=0.001).

In a study conducted by Crawford et al.[42] an insurance status of uninsured, difficulty in reaching care and satisfaction with care (it is unclear whether this is satisfaction with previous or current care) were investigated using multivariate linear regression. Statistics were not reported for any of these variables and it was therefore assumed that they were not statistically significant.

Using multiple non-linear analysis, Sjogren[43] found that those who had consulted a physician recently (squared beta=0.03) had a longer delay time than those who had not. Due to the nature of this type of analysis, it was unclear whether this was statistically significant.

Summary of access/use of services factors

Of two studies[41,42] that investigated the relationship between insurance status and delay, one[42] found that insurance status was not related to delay and the other[41] found that not having insurance was associated with increased delay. One of these studies[41] also found that public hospital patients had longer delays than private hospital patients.

One study[37] found that geographical location was not associated with delay and another[42] found that difficulty in access to reach care was not associated with delay.

One study[41] found that those who consulted a medical professional while encountering a suspected AMI had longer delay times than those who did not. Another[43] reported that those who had consulted a physician recently had longer delay, but it was unclear if this was statistically significant.

3.3.4 Knowledge factors

Two studies investigated various factors related to knowledge.[42,43]

Crawford et al.[42] entered MI knowledge into multivariate linear regression. Statistics were not reported for this variable and it was therefore assumed that it was not statistically significant. In multiple non-linear analysis, Sjogren et al.[43] found that calling the correct agency was unexpectedly related to longer delay (squared beta=0.01), but it was unclear whether this was statistically significant.

Summary of knowledge factors
Only two studies examined the relationship between knowledge factors and delay in multivariate analysis, and they investigated different aspects of knowledge.

3.3.5 Clinical factors
Seven studies examined the relationship between clinical factors and patient delay.[9,34,36,37,39,42,43] Six of these studies used some type of regression analyses.[9,34,36,37,39,42] Martiny et al.[37] examined diagnosis in stepwise regression and found that patients delayed more in the presence of an acute AMI (regression coefficient=32) and less in the presence of pulmonary oedema (regression coefficient=-38). The mean patient delays were 85 minutes (median=45 minutes) for acute pulmonary oedema, 111 minutes (median 47.5 minutes) for cardiac arrhythmia, and 143 minutes (median 60 minutes) for AMI.

Using multiple regression analysis, Rawles et al.[39] found that patients with higher cardiac enzyme levels delayed less ($p<0.05$). Fowler[34] found that chronic disease status (presence of angina, diabetes and hypertension) versus non chronic disease status, history of ischemic heart disease, and subsequent confirmation of ischemic myocardial disease for admission were not statistically significantly associated with delay time in multiple regression analyses.

Ashton[9] entered the following clinical variables into polytomous logistic regression: smoking, diabetes, and diagnosis. The author reported that of all study variables considered, smoking was one of two variables most highly related to delay (the other was number of symptoms), although it was not clear if this was statistically significant. The states of having previously smoked or currently smoking were associated with less delay for both men and women.

Using multivariate linear regression, Crawford et al.[42] investigated the following risk factors: current smoking, hypertension, and elevated cholesterol. Elevated cholesterol was associated with longer delay (coefficient=0.86, 95% CI: 0.21 to 1.50). Statistics were not reported for current smoking status and hypertension, and it was therefore assumed that they were not statistically significant.

Leizorovicz et al.[36] entered the following variables into linear regression analysis: acute pulmonary oedema, cardioversion after inclusion, previous angina, previous MI, shock, and ventricular fibrillation. Results indicated that those with previous pulmonary oedema were statistically significantly more likely to wait longer before calling for an ambulance ($p=0.02$). In contrast, those with previous MI were statistically significantly more likely to have a shorter delay ($p=0.03$). Those with ventricular fibrillation ($p=0.02$) and those in shock were statistically significantly more likely to have a shorter delay ($p=0.0001$). There was no statistically significant relationship between previous angina or cardioversion after inclusion and delay time.

In multiple non-linear analysis, Sjogren et al.[43] found that no previous history of CCU care (squared beta=0.01) was associated with longer delay, although it was unclear if this was statistically significant.

Summary of clinical factors
In terms of current diagnosis, one study[9] found that diagnosis was not highly related to delay, and similarly another[34] found that subsequent confirmation of ischemic heart disease for this admission was not statistically significantly related to delay. In contrast, one study[37] found that patients delayed more in the presence of an acute AMI and less in the presence of a pulmonary oedema.

Three studies investigated the relationship between delay time and factors concerned with a history of heart problems.[34,36,43] One of these[34] found that a history of ischemic heart disease was not related to delay. No previous CCU care was associated with longer delay in one study,[43] (unclear if statistically significant) and previous AMI was associated with decreased delay in another.[36] Previous pulmonary oedema, on the other hand, was associated with longer delay in one study.[36]

One study[34] found that there was no difference between people with a chronic disease status and those with a non-chronic disease status in terms of delay time. In separate studies, presence of diabetes[9] and hypertension[42] were not related to delay time either.

One[42] of two studies that explored the relationship between smoking and delay time found that there was no statistically significant difference in delay time between those who currently smoked versus those who did not. In contrast, the other study[9] found that smoking was the factor most related to delay, although it was unclear if this was statistically significant. The state of having previously smoked or being a current smoker was associated with less delay for both men and women.

3.3.6 Symptoms/evaluation of symptoms factors

Nine studies evaluated the relationship between symptoms or evaluation of symptoms and patient delay.[9,34-36,39-43] Seven of these studies used some type of regression analyses[9,34-36,39, 41,42] Burnett et al.[35] investigated symptom attribution (heart, indigestion, other) and perceived seriousness of symptoms using stepwise multiple regression. Shorter delay times were associated with patients' greater perceptions of the seriousness of their symptoms (β=-0.21, p<0.0001) and attributing symptoms to the heart (β=-0.58, p<0.0005). Perceived seriousness of symptoms was the most statistically significant predictor of delay time and it reduced delay time by 76 minutes. Attributing delay time to the heart rather than to another organ system reduced delay time by 26 minutes.

Ell et al.[41] investigated symptom pattern (continuous versus intermittent) and symptom intensity (increasing versus decreasing) in stepwise multiple regression. A continuous symptom pattern (coefficient=1.00, standard error=0.19, p=0.001) and an increase in symptom intensity (coefficient=0.57, standard error=0.18, p=0.002) were associated with reduced delay time.

In multiple regression analysis, Rawles et al.[39] found that a greater pain score at the time of calling was associated with shorter patient delay (p<0.05). No statistically significant association was found between breathlessness and patient delay. The authors note that the relationship between pain score and delay in calling was weak, and that the pain score accounted for about 4% of the variance in patient delay. In contrast, multiple regression conducted by Fowler[34] found that level of pain was not statistically significantly related to delay. A number of interaction effects (see above section on analyses specific to each study) were also entered into this analysis. The interaction of belief in cardiac origin of symptoms with total scores on the revised Health Fear Inventory (β=0.010288, p=0.027) was statistically significant. It is unclear how the interaction of these variables was associated with changes in delay, and neither were independently associated with delay.

Ashton[9] entered 'previously experienced symptoms' and 'number of symptoms' into polytomous logistic regression. Of all study variables considered, 'number of symptoms' was reported to be one of two factors most highly related to delay (the other was smoking). For both men and women, the more symptoms experienced, the shorter the delay, but it was unclear whether this was statistically significant. 'Previously experienced symptoms' was not reported as being highly related to delay.

Using multivariate linear regression, Crawford et al.[42] examined the relationship between 'symptoms' (serious chest pain, shortness of breath) and delay. Patients with severe chest pain had shorter delay (coefficient=-1.72, 95% CI: -2.39 to -1.05), but shortness of breath was not statistically significantly related to delay. Using the same type of analysis, Leizorovicz et al.[36] found that those who had 'pain in the 24 hours prior to inclusion' were statistically significantly more likely to wait longer before calling for an ambulance (p=0.0001), while 'pain still present' was not statistically significantly related to delay.

Using multiple non-linear analysis, Sjogren et al.[43] found that patients who did not initially believe they had suffered a MI (squared beta=0.15) and those who reported a low degree of pain (squared beta=0.03) experienced a longer delay time. It was unclear if these variables were statistically significant, but the variable that was most strongly related to delay in this study was patient's belief that they had suffered a MI.

Alonzo[40] entered 'symptom course greater or less than 30 minutes' and 'level of incapacitation' (none, curtailed activities, stopped activities versus collapsed or unconscious). As mentioned previously, variables that resulted in the longest and shortest pathways to making a medical care decision were reported, and it was unclear which variables were statistically significant. Level of incapacitation, where the patient became unconscious or collapsed, formed part of the shortest pathway to seeking medical care. A symptom course of less than 30 minutes formed part of the most extended decision time. In the text this is described as 'symptoms began within 30 minutes', but it is unclear what this means.

Summary of symptoms/evaluation of symptoms factors

Five studies investigated the relationship between level of pain and delay time.[34,36,39,42,43] Two studies found that patients with more severe pain had shorter delays,[39,42] and one[43] found that those who reported less pain had longer delay times, although it was unclear whether this was statistically significant. One study found that pain in the 24 hours prior to inclusion was found to delay help seeking, while having pain still present was not associated with delay.[36] The remaining study found that level of pain was not statistically significantly related to delay.[34]

Both studies that investigated the relationship between breathlessness and delay time found that there was no statistically significant relationship.[39,42]

Those who did not initially believe they had suffered a MI experienced a longer delay in one study[43] while in another, delay time was shorter when symptoms were attributed to the heart.[35] In one of these studies it was unclear whether this finding was statistically significant.[43] One study[35] found that the greater the patient's perception of the seriousness of symptoms, the shorter the delay. Another study found that the greater the number of symptoms experienced, the shorter the delay for both men and women,[9] but it was unclear if this was statistically significant. One study found that continuous symptom pattern and an increase in symptom intensity led to decreased delay.[41]

3.3.7 Attempts at self treatment factors

Two studies investigated the effect of attempts at self treatment on delay time.[34,43]

In multiple regression analysis, Fowler[34] found that attempts at self treatment was not statistically significantly associated with delay. Using multiple non-linear analysis, Sjogren et al.[43] found that attempts to relieve pain by resting was positively associated with delay time (squared beta=0.01) and ingesting heart medication for relief (squared beta=0.03) was associated with shorter delay. It was unclear if these findings were statistically significant.

Summary of attempts at self treatment factors

Only two studies examined the relationship between attempts at self treatment and delay in multivariate analysis, and they investigated different aspects of self treatment.[34,43]

4. Results of intervention studies

Before reporting the results of intervention studies, it is important to note that in these studies participants evaluated before the intervention were different to the individuals evaluated during and/or after the intervention.

See Appendix C for a list of excluded studies and reasons for exclusion. Eleven intervention studies met the inclusion criteria. Two of these were RCTs,[25,26] one was a controlled trial[46] and eight were before-and-after studies.[24,27,47-52] Both RCTs had associated publications. One of these[26] had nine associated publications[15,16,53-59] and the other[25] had two.[60, 61] One of the before-and-after studies[48] had seven associated publications.[28, 62-67] Further details about the included intervention studies are presented in Appendix F.

4.1 RCTs and controlled trial

4.1.1 Details of participants

Number of participants

In one RCT, known as the Rapid Early Action for Coronary Treatment (REACT) trial, there were a total of 61043 participants; 29398 in the control group and 31645 in the intervention group.[26] At baseline there was 28.3% and 27.2% missing data for the control and intervention communities, respectively. In the other RCT, referred to as the 'Call fast, Call 911 campaign', there were[5] 444 participants; 1343 in the control group and 4101 in the intervention group.[25] In the controlled trial, known as the Nottingham Heartwatch campaign, the number of participants in the control and intervention groups was not clear.[46]

Characteristics of participants

All studies included male and female participants, and there were more males than females in all studies. The percentage of men in control groups ranged from 54% to 73% and in intervention groups from 52.5% to 73%. In the REACT trial, mean age at follow-up was 65 years (SD=14) in the control group, and 66 years (SD=14) in the intervention group.[26] In the Call fast, Call 911 trial, the majority of participants in both control and intervention groups were aged between 70 to 79 years, followed by 60 to 69 years, followed by 80 years or above.[25] Nottingham Heartwatch reported the mean age for males and females separately.[46] In the control group, the mean age for males and females was 56 and 59 years respectively, and in the intervention group, the mean age for males and females was 61 and 62 years respectively.

The REACT trial included adults who presented to a hospital with a chief complaint of chest pain, and were discharged with a CHD-related diagnosis.[26] The Call fast, Call 911 campaign included patients admitted to the CCU with a diagnosis of 'rule out myocardial infarction',[25] while the Nottingham Heartwatch campaign included patients with chest pain lasting longer than 10 minutes.[46]

4.1.2 Details of interventions

Intervention setting

The REACT trial[26] and Call fast, Call 911[25] were set in the USA, while Nottingham Heartwatch[46] was conducted in England. The REACT trial involved 20 communities (ten matched pairs) in five geographic areas in Alabama, Massachusetts, Minnesota, Texas, and a combined unit in Washington and Oregon.[26] Call fast, Call 911[25] was set in King County in Washington,[25] and Nottingham Heartwatch was set in general practices in Nottingham.[46]

Intervention content

The REACT trial[26] used a mass-media campaign and community and patient education groups, while Call fast, Call 911[25] used a mass media campaign and a direct mailing campaign. Nottingham Heartwatch used a mailing campaign.[46]

The key factors of the content of each intervention are shown in Table 4.1. The REACT trial used a multi-component strategy based on Social Cognitive Theory, Self-regulatory Theory, Diffusion Theory, social marketing, and community organisation principles.[26] Public messages emphasised chest pain or discomfort along with other AMI symptoms. The advice given instructed patients to call 911 for ambulance transport to hospital if any of these symptoms persisted for 15 minutes or longer. There were four intervention strategies: (1) community organisation, in which health professionals and leaders of other relevant organisations in each community constituted a local advisory group; (2) public education, which targeted all residents of the intervention communities, with an 18-month

programme that included 6 themes relating to AMI; (3) professional education, which included physicians, nurses, rehabilitation staff, ED staff, and ambulance staff; and (4) patient education for those with a history of CHD or CHD risk factors who were taught at clinics by physicians.

The Call fast, Call 911 study used a mass media campaign involving public service announcements as well as a mailing campaign.[25] The mass media campaign outlined the symptoms of AMI, listed reasons why patients should quickly call 911 after the initiation of AMI symptoms, and countered excuses patients commonly use to postpone seeking professional treatment. The mailing campaign involved three intervention groups receiving brochures with informational, emotional or social messages. Each of the three intervention groups received one type of brochure, and the control group did not receive any brochures.

The Nottingham Heartwatch intervention consisted of a letter inviting individuals to make use of a system designed to provide early help in the diagnosis and management of symptoms suggestive of AMI.[46] Patients were invited to contact a hospital-based team on an easy-to-remember number that served a direct telephone line to the hospital CCU. The team could visit any patient with persistent chest pain.

Table 4.1 Key factors of the intervention content of RCTs and controlled trial

Author (year), country, trial name	Importance of quick/ immediate action	Emphasis of signs and symptoms of AMI	Importance of calling emergency services	Emphasis of treatment such as lysis	Use of a specific slogan
Meischke (1997), [25] USA, Call fast, Call 911	✓	✓	✓	✓	✓
Luepker (2000),[26] USA, REACT	✓	✓	✓	✓	X
Rowley (1992),[46] England, Nottingham Heartwatch	✓	X*	✓†	✓	✓

✓ yes; X no; * intervention content emphasised chest pain; † intervention content emphasised importance of calling a special telephone number

Duration of intervention and outcome measurement periods

The duration of the intervention period and the outcome measurement periods are shown in Table 4.2. The REACT trial[26] and Nottingham Heartwatch[46] used a baseline measurement period, while Call fast, Call 911 did not.[25] In the REACT trial[26] and Nottingham Heartwatch,[46] outcome measurements were taken for the duration of the intervention period, but data were not collected after the intervention. In Call fast, Call 911, data were collected for two months following each mailing (a total of one year), and then for an additional year following the intervention.[25]

Table 4.2 Duration of intervention and outcome measurement of RCTs and controlled trial

Author (year), country, trial name	Intervention period	Pre-intervention measurement period	Intervention measurement period	Post-intervention measurement period
Meischke (1997), [25] USA, Call fast, Call 911	7wk + 10m	None	10m	14m
Luepker (2000),[26] USA, REACT	18m	4m	18m	None
Rowley (1992),[46] England, Nottingham Heartwatch	32m*	3m*	32m*	None

m month(s); wk week(s); * duration not specifically stated but deduced from information presented in the study

4.1.3.Outcomes assessed

The REACT trial[26] and Call fast, Call 911[25] measured pre-hospital delay, while Nottingham Heartwatch[46] measured patient delay. The REACT trial[26] reported *mean* delay, while Call fast, Call

911[25] reported both *mean* and *median* delay. In the Nottingham Heartwatch campaign, only the percentage of patients calling within 30 minutes of onset of symptoms was reported.[46]

The REACT trial[26] and Call fast, Call 911[25] examined the secondary outcome of use of medical services. The REACT trial reported the rate of EMS use, total ED presentations, ambulance use, the proportion of patients admitted with suspected CHD, and the proportion of patients who were hospitalised and subsequently diagnosed with a noncardiac diagnosis.[26] Call fast, Call 911 reported number of 911 calls, number of ED visits for chest pain, CCU admissions with admitting diagnosis of rule out MI, and number of patients discharged from EDs because their symptoms were non-cardiac in nature.[25] Nottingham Heartwatch reported the number of people in intervention practices who had called the direct line versus their own doctor for those with and without definite or probable infarction.[46]

In terms of other secondary outcomes, the REACT trial reported rates of reperfusion and angioplasty, as well as survival and case fatality rates.[26]

4.1.4 Quality of studies

Nine quality criteria were used to assess RCTs and seven were used to assess the controlled trial. Table 4.3 shows which studies met each of the criteria.

Table 4.3 Quality assessment for RCTs and controlled trial

Author (year), country trial name	Random selection of groups	Concealment of allocation	Comparability at baseline	Identical treatment of groups	Blinding of outcome assessors	Reporting of method for measuring delay	% missing data	Appropriate statistical analysis	Power calculation
Meischke (1997), [25] USA, Call fast, Call 911	✓	NR*	✓	✓	NR	✓	I+C: 31%	✓	✓
Luepker (2000),[26] USA, REACT	✓	NR*	✓	✓	NR	✓	I:27.2% C:28.3%	✓	✓
Rowley (1992),[46] England, Nottingham Heartwatch	NA	NA	✓	✓	NR	X	NR	NR	NR

✓ yes; X no; NA not applicable; NR not reported/insufficient information; I intervention; C control; * authors were contacted for concealment of allocation information, but responses were unclear

4.1.5 Effectiveness of interventions

4.1.5.1 Primary outcome: Delay time

In the REACT trial, median delay time decreased in both control and intervention groups after a mass-media campaign and community and patient education.[26] In the control group, delay time decreased from 140.3 minutes at baseline to 126.2 minutes at trial end and in the intervention group from 140 minutes at baseline to 130.3 minutes at trial end. The mean delay trend in intervention communities (-4.7% per year (95% CI: -8.6%, –0.6%)) statistically significantly declined, but did not statistically significantly differ from the trend in control communities (–6.8% per year (95% CI: -14.5%, 1.6%)).

The Call fast Call 911 campaign also found no statistically significant differences in delay time between informational, social and emotional intervention groups and the control group.[25] Median delay time in the control group was 146 minutes, compared with 160 minutes for the informational intervention, 150 minutes for the emotional intervention and 140 minutes for the social intervention. In Nottingham Heartwatch, only within group comparisons were made.[46] This study found that patients in the intervention practices called their GP earlier as a result of the intervention (37% had called within 30 minutes from onset of symptoms compared with 24% before the intervention; $p<0.05$). For patients with definite and probable infarction in the intervention practices, 22% called for help within 30 minutes

before the intervention and 44% during the intervention (p<0.05), and 24% before and 23% during the intervention for the control practices.

4.1.5.2 Secondary outcome: use of medical services

In the REACT trial, EMS use did not change in the control communities, but increased steadily and statistically significantly in the intervention communities (16% per year (95% CI: 2%, 32%)).[26] The net effect was a 20% increase in EMS use in intervention communities compared with control communities (odds ratio=1.20 (95% CI: 1.07, 1.34), p<0.005). During the intervention period, total ED presentations for chest pain declined in both the control and intervention communities. The decline was greater in the control areas, but the differences were not statistically significant. The proportion of patients who were hospitalised and subsequently discharged with a non-cardiac diagnosis did not statistically significantly differ between control and intervention communities during the intervention. The proportion of patients admitted with suspected CHD increased in both the intervention and control communities, but the differences were not statistically significant.

Call fast Call 911 reported the overall effect of the intervention on use of medical services, but did not provide these figures separately for intervention and control groups.[61] During the campaign period there were statistically significant increases in the number of 911 calls, the number of ED visits for chest pain, the number of CCU admissions with admitting diagnosis of rule-out MI, and the number of patients discharged from EDs because their symptoms were noncardiac in nature. The number of 911 calls remained statistically significantly higher for 3 months after the campaign, and the other outcomes remained higher than pre-campaign levels, but not statistically significantly so.

In Nottingham Heartwatch, the number of people who called their GP fell for both intervention and control groups after the Heartwatch intervention. This is likely to be because the intervention encouraged participants to call a hospital based telephone number when experiencing a possible AMI.

4.1.5.3 Secondary outcome: receipt of thrombolysis/fibrinolysis

The REACT trial measured reperfusion therapy within one and six hours of ED arrival and angioplasty as initial reperfusion therapy.[58] During the intervention period the intervention group was more likely to receive reperfusion therapy less than or equal to one hour from ED arrival, the control group was more likely to receive reperfusion therapy less than or equal to six hours from ED arrival, and the intervention group was more likely to receive angioplasty as initial reperfusion therapy. However none of these tendencies were statistically significant.

4.1.5.4 Secondary outcome: mortality

The REACT trial measured case fatality[26] and survival[58] rates as outcomes. Case fatality rates decreased from 2.66% at baseline to 1.78% at trial end in the control and from 3.23% to 2.43% in the intervention group. However this decrease was not statistically significant for either group. In terms of survival, there was no difference between intervention and control hospital death rates.

4.1.5.5 Process outcomes

The REACT trial[26] and Call fast Call 911[25] reported process outcomes while Nottingham Heartwatch did not.[46]

In the REACT trial,[26] a random digit dial telephone survey provided an indication of the intervention effect on knowledge, attitudes, and beliefs of community residents. A total of 4389 adults were contacted in four surveys and participation rates were approximately 60%. There was a progressive increase in unaided recall of the REACT name with 6% of respondents in intervention communities providing unaided recall at the last survey compared with 0% in the control communities (p<0.001). At the end of the intervention, 44% of the surveyed population in the intervention communities recognised the REACT name when it was presented, whereas 15.1% recognised it in the control areas (p<0.002). The recognition of the REACT name in control communities was probably related to erroneous recall of other unrelated problems or contamination between communities. There was a low but increasing level of received messages about MI symptoms (2.7% versus 1.8%, p<0.03) and a higher percentage of correct answers to appropriate action for AMI among persons residing in the intervention communities compared with control sites (32.6% versus 22.8%, p<0.006).

In the Call fast, Call 911 campaign, there were no statistically significant differences between the three intervention groups in the number of people who remembered or who had read at least one of the brochures.[60] Overall, 67 people (22%) in the intervention group remembered receiving a brochure and 55 (18%) had read one of them. Ten individuals in the control group (10%) reported remembering a brochure dealing with how to respond to chest pain. However, only half of those people said they had

read the brochure and/or could remember anything about the brochure. Only two people who reported having read the brochure remembered aspects of the brochure and these did not seem to fit the content of the intervention brochures (i.e. diet and smoking).

4.1.5.6 Cost information

None of the studies reported a cost-effectiveness evaluation, but the REACT trial[26] and the Call fast, Call 911[25] campaign reported cost information. The costs involved in these studies are shown in Table 4.4.

Table 4.4 Costs of RCTs

Author (year), country, trial name	Type of intervention	Duration of intervention	Total cost of intervention
Meischke (1997), [25] USA, Call fast, Call 911	Mass media and direct mailing campaign	7wk + 10m	Cost was U.S.$245250 for the mass-media campaign only, which did not include costs for the mailing campaign
Luepker (2000),[26] USA, REACT	Mass media, small media and community and patient education campaign	10m	For a typical town with 100000 residents, the annual cost of the REACT intervention would be U.S.$156000 to U.S. $294000. The cost includes local staff, supplies, and media distribution. Differences between cities were a function of local labour, rent, media and distribution costs. See REACT website (http://www.epi.umn.edu/react/) for more cost information

m month(s); wk week(s)

4.1.5.7 Summary

In summary, the two RCTs (the REACT trial[26] and Call fast, Call 911[25]) reported that the interventions they used were not beneficial. However the controlled study (Nottingham Heartwatch[46]), reporting only within group comparisons, found that the intervention statistically significantly reduced delay time, at least for those who called their GPs. The REACT trial found that EMS use did not change in the control group, but increased steadily and statistically significantly in the intervention communities.[26] Call fast, Call 911 found statistically significant increases in the number of ED visits for chest pain throughout the campaign period.[61] ED visits decreased after the campaign, but remained above the pre-campaign mean.

4.2 Before-and-after studies

4.2.1 Details of participants

Number of participants

Numbers reported are after adjustment for missing data and refusals. One study included less than 500 participants.[50] Four studies included between 500 and 1000 participants.[24,47,49,52] The remaining three studies included over 1000 participants,[27,48,51] with two of these studies including over 2000 participants.[27,48]

Characteristics of participants

All studies included both male and female participants. The percentage of men in before groups ranged from 45% to 70%, and in after groups, ranged from 45% to 67%. The percentage of men was higher than the percentage of women in all but one study.[51] The mean age of participants ranged from 57 years to 67 years in before groups, and from 55 years to 67 years in after groups. One study calculated median age and this was found to be 70 years in the before group and 72 years in the after group.[48] Another study calculated the mean age for men and women separately.[51] This was found to be 54 years and 61 years, respectively, for the before group, and 55 years and 59 years, respectively, for the after group.

Six of the eight studies included participants presenting or diagnosed with chest pain.[24,27,47,50-52] In addition to chest pain, one of these studies included participants diagnosed with rule-out AMI or angina,[24] one included persons presenting with 'other heart attack symptoms',[50] and another included persons reporting with any of another 79 selected complaints suggestive of AMI.[51] The participant inclusion criteria of one study was patients with suspected AMI,[49] and for another study, was persons who developed AMI during their first three days in hospital.[48]

4.2.2 Details of interventions

Intervention setting

Two of the studies were set in the USA; one in King County, Washington and the greater metropolitan Seattle area including nine hospitals,[24] and the other in the rural town of Jacksonville, central Illinois employing one hospital serving a total population of 55,000.[51] Two of the studies were set in Germany.[49,52] One was based in 36 towns of the district of Arnsberg using the emergency units of 48 community hospitals,[49] and the other was set in the regions of Ludwigshafen and Frankenthal using 4 hospitals.[52] One study, set in the city of Goteborg, Sweden with 450,000 inhabitants, employed one hospital.[48] One study was based in the canton (province) of Geneva, Switzerland, an urban area with 380,000 inhabitants.[27] One study targeted 300,000 persons in Canada who were served by a large hospital.[50] One study was based in Australia and used 22 CCUs.[47]

Intervention content

All eight studies used public education/media campaign based interventions. One study did not provide any detail on the content of the intervention.[49] The key factors of the content of each intervention for those seven studies that did provide information is presented in Table 4.5.

Table 4.5 Key factors of the intervention content of before-and-after studies

Author (year), country	Importance of quick/ immediate action	Emphasis of signs and symptoms of AMI	Importance of calling emergency services	Emphasis of treatment such as lysis	Use of a specific slogan
Mitic (1984),[50] Canada	✓	✓	✓	X	X
Ho (1989),[24] USA	✓	✓	✓	X	✓
Moses (1991),[51] USA	✓	✓	X	X	X
Rustige (1992),[52] Germany	✓	✓	X	X	X
Bett (1993),[47] Australia	✓	X	X	✓†	✓
Blohm (1994),[48] Sweden	✓	X*	✓	X	✓
Gaspoz (1996),[27] Switzerland	✓	X*	✓	✓	✓

✓ yes; X no; * intervention content emphasised chest pain; † intervention content emphasised benefits of early treatment

Duration of intervention and outcome measurement periods

The duration of the intervention period and outcome measurement periods before, during and after the intervention for all eight studies is shown in Table 4.6

Table 4.6 Duration of intervention and outcome measurement of before-and-after studies

Author (year), country	Intervention period	Pre-intervention measurement period	Intervention measurement period	Post-intervention measurement period (time to commencement after intervention ceased)
Mitic (1984),[50] Canada	8wk	4wk	8wk	1wk (3m)
Ho (1989),[24] USA	2m	4.5m	None	4.5m
Moses (1991),[51] USA	24m	12m	24m	None
Rustige (1992),[52] Germany	9m (1st period) 18m (2nd period)	6m	9m	6m (after 1st period) 18m (ongoing with 2nd period)
Bett (1993),[47] Australia	1wk	2m	None	1m (1m)
Blohm (1994),[48] Sweden	14m	21m	14m	36m
Gaspoz (1996),[27] Switzerland	12m	12m	12m	None
Maeso-Madronero (2000),[49] Germany	6m	6m	6m	None

m month(s); wk week(s)

4.2.3 Outcomes assessed

All eight studies reported data concerning the primary outcome of delay time: pre-hospital delay[27,48-52] and patient delay.[24,27,47] Of these studies, five reported the outcome of median pre-hospital delay,[27,48,49,51,52] two reported median patient delay,[27,47] two reported the percentage of persons exhibiting pre-hospital delay within certain time periods[49,50] and two reported the percentage of persons exhibiting patient delay within certain time periods.[24,47]

Four studies reported data concerning the secondary outcome of use of medical services.[24,27,48,51] Of these studies, three reported the percentage of patients using ambulance/medic transport,[24,27,48] three reported the number of ED visits[27,48,51] and one reported the percentage of patients calling switchboard for medical emergencies as the first alert.[27] Two studies reported the secondary outcome of receipt of thrombolysis/fibrinolysis.[47,52] One study reported the secondary outcome of mortality rate.[48]

4.2.4 Quality of studies

Four quality criteria were used to assess the before-and-after studies. Table 4.7 shows which studies met each aspect of quality assessment.

Table 4.7 Quality assessment for before-and-after studies

Author (year), country	Reporting of method for measuring delay	Adjustment for confounding factors	Power calculation	Appropriate statistical analysis
Mitic (1984),[50] Canada	P	NA	X/NR	✓
Ho (1989),[24] USA	P	X NR	X/NR	✓
Moses (1991),[51] USA	P	NA	X/NR	NA
Rustige (1992),[52] Germany	✓	NA	X/NR	NA
Bett (1993),[47] Australia	✓	NA	X/NR	NA
Blohm (1994),[48] Sweden	✓	X/NR	XNR	✓
Gaspoz (1996),[27] Switzerland	P	X/NR	X/NR	✓
Maeso-Madronero (2000),[49] Germany	✓	NA	X/NR	✓

✓ yes; X no; NA not applicable; NR not reported/insufficient information; P partial

4.2.5 Effectiveness of interventions

4.2.5.1 Primary outcome: delay time

All eight before-and-after studies examined the effects of public education/media campaign based interventions on reducing pre-hospital or patient delay.

Five studies examined the effects of interventions on pre-hospital delay.[27,48,49,51,52] Three of the five studies reported a statistically significant decrease in this outcome from before to after the intervention began.[27,48,49] One study, which evaluated a media campaign, found a statistically significant decrease in median pre-hospital delay from before (4 hours) to during (2.9 hours) the six months of the campaign ($p=0.007$).[49] One study, which also employed a media campaign showed a statistically significant decrease in median pre-hospital delay from 3 hours before the intervention to 2 hours and 20 minutes during the 14 months of the intervention ($P<0.001$).[48] This delay remained at 2 hours and 20 minutes, three years after the intervention had ended. See Appendix F, Table 3 for further results of sub-group analyses. The other study that employed a multimedia public campaign reported a statistically significant decrease in median pre-hospital delay from before to during the 12 months of the campaign by twenty five minutes ($p<0.001$).[27] See Appendix F, Table 3 for further results of sub-group analyses and mean values. One of the five studies employed an intensive educational programme using mass media.[52] The study did not report any statistical analysis, but showed a difference between groups assessed before and after the intervention. Median pre-hospital delay time dropped from 4.2 hours before the campaign to 2.8 hours for the first year after the first part of the campaign had ended. However this difference did not remain for the second year after the first part of the campaign had ended, during which the second part of the campaign was running, with median pre-hospital delay time rising to 4.1 hours. Median decision time then dropped again to 3 hours, during the third year after the first part of the campaign had ended, the year in which the latter part of the campaign also ended. Another of the five studies that used a public education campaign did not

report any statistical analysis with regard to pre-hospital delay, but appeared to show little difference between before and after groups.[51] See Appendix F, Table 3 for values.

Two studies examined the effects of interventions on patient delay.[27,47] One study found a statistically significant decrease in median patient delay from before (86.5 minutes) the campaign to during (60 minutes) the 12 months of the campaign ($p<0.001$).[27] See H, Table 3 for mean values. One study that used a public education campaign and professional education found that there was no change in median patient delay between one month before the intervention took place (1 hour) and during the second month after the intervention had stopped (also 1 hour).[47]

Four studies examined the effect of interventions on the percentage of persons exhibiting pre-hospital or patient delays within certain time periods.[24,47,49,50] Two of these studies reported statistically significant differences in this outcome from before to after the intervention began.[49,50] One study employing a mass media campaign reported a statistically significant increase in the percentage of persons exhibiting pre-hospital delay of two hours or less from before (15.8%) to during (31.3%) the eight weeks of the intervention ($p<0.05$).[50] No statistically significant change in the percentage of persons with delay times of two hours or less occurred between during the campaign itself and after the campaign was stopped ($p<0.79$). One study showed a statistically significant increase in the percentage of patients admitted within 1 hour and within 6 hours from before (15.5% and 58.5 %, respectively) to during (23.2% and 66.0%, respectively) the six months of the intervention ($p=0.01$ and $p=0.05$, respectively).[49] Two studies reported the percentage of patients exhibiting patient delay within certain time periods.[24,47] Neither of them found statistically significant differences in this outcome.

4.2.5.2 Secondary outcome: use of medical services

Four studies did not report any outcomes related to use of medical services.[47,49,50,52]

Three studies reported the percentage of persons using ambulance/medic transport.[24,27,48] None of them found statistically significant differences in this outcome.

Three studies assessed ED visits.[27,51, 63] Two studies showed a statistically significant difference in this outcome from before to after the intervention began.[27, 63] One study showed a statistically significant increase in the mean number of persons with chest pain per day in the ED from before ($n=10$) to the first week during ($n=25$) the intervention ($p<0.001$), and from before to the first month during ($n=19$) the intervention ($p<0.001$).[63] However, there was no statistically significant difference in this outcome before and during the first year of the intervention. One study found a statistically significant increase in the mean number of visits to the ED for chest pain per week before ($n=22.2$) and during the first week ($n=49$) of the campaign ($p<0.01$).[27] This increase in ED visits remained statistically significant for the first six ($p<0.005$) and 12 months ($p<0.005$) of the intervention. The increase in ED visits for chest pain during the first week was the result of a more than twofold increase in visits for AMI and unstable angina ($p<0.01$) and visits for chest pain of non-cardiac origin ($p<0.05$). At six ($p<0.02$) and 12 months ($p<0.02$) the increase in ED visits per week for AMI and unstable angina was still statistically significant, whereas it was not statistically significant for visits owing to non-cardiac chest pain. One study found no statistically significant difference in the number of ED visits before and during the intervention.[51]

One study examined the percentage of persons calling switchboard for medical emergencies as the first alert.[27] The percentage statistically significantly increased from before (13%) to during (20%) the 12 months of the intervention ($p<0.001$).

4.2.5.3 Secondary outcome: receipt of thrombolysis/fibrinolysis

Two studies examined outcomes related to the receipt of thrombolysis/ fibrinolysis.[47,52] One study reported a statistically significant difference in this outcome from before to after the intervention.[47] 34.4% of individuals with AMI received fibrinolysis one month before compared to 53.1% during the second month after the intervention had stopped ($p<0.0001$). One study did not report any statistical analysis but showed an increase in the percentage of patients with cardiac infarction receiving thrombolysis therapy from before (27%) to the first year after (38%) the first part of the intervention had stopped.[52] The figure increased even further (47%) for the second year after the first part of the intervention had stopped, during which the second part of the campaign was running and further still (51%) during the third year after the first part of the campaign had stopped, the year in which the latter part of the campaign was also stopped.

4.2.5.4 Secondary outcome: mortality

One study examined outcomes related to mortality.[48] Overall one-year mortality rate among patients with AMI was reported to be the same for before, during and after the intervention (25%). See G for further results of sub-group analyses. In-hospital mortality among patients with AMI did not change during (13%) compared to before (14%) the intervention. See Appendix F, Table 3 for further results of sub-group analyses.

4.2.5.5 Process outcomes

Four studies did not report any process outcomes.[27,49,51,52]

In one study, an evaluation of process outcomes taken after the intervention had been completed, for individuals matching the study inclusion criteria, revealed that statistically significantly more people in the post-message period (73.2%) than the pre-message period (50.9%) had heard new information about AMI (p=0.0001).[24] Of those who reported hearing new information, statistically significantly more people in the post-message period (54.2%) than the pre-message period (37.7%) reported hearing about one of the components of the message, symptoms of AMI (p=0.002). When limited to those hearing one of the key components of the message from one of the media sources used in the campaign, the difference remained statistically significant. There was no statistically significant difference between pre-message and post-message periods in the proportion of patients who reported hearing the importance of time or of calling 911. There was also no statistically significant difference between the two periods in the reported source of new information (television, radio or newsprint).

In one study, measurements taken after the intervention had stopped, for a selection of persons meeting the study inclusion criteria, showed that 72% had been aware of the campaign, but for them the median delay (one hour) was the same as it was for those who had been unaware of it.[47] Only 42% stated that they had been influenced by the campaign in their decision to seek help, but even for them the median delay was one hour, and those with a past history of MI did no better (1.3 hours).

In one study an evaluation of a random selection of individuals matching the study inclusion criteria, conducted during the latter part of the campaign, showed that 68.2% of persons had seen or heard a radio or television advertisement that explained what to do if they thought they were experiencing a heart attack.[50] Of those who had been exposed to the advertisement, 90% reported that they had viewed the advertisement on television, 6.7% had heard the message on the radio and 3.3% had been informed through a relative or friend. Of those exposed, 93.3% were able to remember the two components of the media message, while 6.6% were unable to remember one or both of the components. Of those exposed, 73.3% reported decision times of two hours or less, and 50% of those in the unexposed group reported decision times of two hours or less ($p<0.05$). Of the exposed group, 40% reported that the message had persuaded them to act sooner than if they had not been exposed to the programme, 30% reported that it had reinforced what they already knew and 30% reported that it had no effect on their behaviour. 83.3% of persons who stated that the campaign had caused them to act, reported decision times of two hours or less ($p<0.05$), whereas only 33% of those who stated that the campaign did not cause them to act, reported decision times of two hours or less ($p<0.05$). All of those persons who stated that the campaign had reinforced their previous knowledge reported decision times of two hours or less. Of persons not exposed to the media campaign, 50% reported decision times of more than two hours and 50% reported decision times of two hours or less.

In one study, process outcomes in a random selection of persons from the targeted population were evaluated during the campaign on two occasions.[64] 60% and 71% of the persons, respectively, reported that they had heard of the campaign. The messages that reached the most people were those on the poster advertisements on buses and trams and the articles and advertisements in newspapers. Only 46% and 58%, respectively, thought that they could interpret the message of the campaign, of those, 31% and 33%, respectively, spontaneously remembered all parts of the message at the two evaluations. They comprised 15% and 19%, respectively, of all those who were interviewed. More than 80% of the persons who had heard of the message thought that the campaign was useful, whereas 1% were frightened by it or uninterested.

During the campaign the process outcomes of a selection of individuals meeting the study inclusion criteria were also measured. 65% had heard of the campaign but only 31% of those who had heard of it thought that the campaign had influenced them to get to the hospital faster. 46% were aware of the campaign via newspaper, 45% via bus or tram, 25% via hospital, 11% via radio, 11% via pharmacy, 5% via post office and 4% via bank. 58% were aware of the campaign during the first quartile of the campaign, 69% were aware of it during the second quartile, 67% were aware of it during the third quartile, and 67% were aware of it during the last quartile.

4.2.5.6 Cost information

None of the studies included an economic evaluation. However, as Table 4.8 shows, four of the studies did state the total cost of the intervention.[24,27,48,51]

Table 4.8 Costs of before-and-after studies

Author (year), country	Type of intervention	Duration of intervention	Total cost of intervention
Ho (1989),[24] USA	Public media education campaign	2 months	U.S.$139272
Moses (1991),[51] USA	Public education campaign	24 months	U.S.$10000
Blohm (1994),[48] Sweden	Media campaign	14 months	U.S.$412000
Gaspoz (1996),[27] Switzerland	Multimedia public campaign	12 months	300000 SFrancs

4.2.5.7 Summary

Four of five studies examining pre-hospital delay showed a decrease in this outcome from before to after the intervention. Three of these studies found a statistically significant decrease in pre-hospital delay from before to during the intervention,[27,48,49] and one study, in which no statistical analysis was reported, showed a decrease in pre-hospital delay from before to after the intervention had stopped.[52] One of two studies investigating patient delay showed a statistically significant decrease in this outcome from before to during the intervention.[27] Both studies examining pre-hospital delay within time periods found a higher percentage of patients were admitted to hospital within shorter time periods during the intervention than before.[49,50] Neither of two studies investigating percentage of persons exhibiting patient delay within time periods showed an effect.[24,47]

4.3 Summary of results of intervention and predictor studies

In the eleven studies investigating predictors of delay, such a range of factors were investigated, that it was difficult to summarise them and draw any meaningful conclusions. Table 4.9 reports the factors that could be associated with longer delay. These factors were selected based on the fact that two or more studies found them to be associated with longer delay.

Table 4.9 Factors that could be associated with longer delay

	No of studies that investigated each factor	Number of studies that found factor to be associated with longer delay	Number of studies that found the factor was not associated with delay
Symptom onset beginning at home	2	2*	0
Less people present	2	2†	0
Being female	7	3*	4
Being of older age	6	2*	4
Experiencing less pain	5	3*	2
Not attributing symptoms to an AMI or the heart	2	2*	0

* unclear if finding was statistically significant in one of the studies; † unclear if findings were statistically significant in both studies

Due to the poor quality of the predictor studies and the small number of studies that investigated each type of predictor, these findings should be viewed with caution.

Of the eleven studies (two RCTs, one controlled trial and eight before-and-after studies) investigating interventions aimed at reducing delay time, five reported the intervention to be effective, whilst the other six showed no statistically significant effect. Of those studies that reported statistically significant positive findings, one was a controlled trial and four were before-and-after studies. The six studies that showed no statistically significant effect were two RCTs and four before-and-after studies. Overall, there is very limited evidence that the community interventions evaluated reduced delay time. The evidence for effectiveness comes mainly from studies using a before-and-after design, and it is not possible to determine if any observed effects have resulted from the intervention or other factors that may have taken place at the same time as the intervention.

A qualitative assessment suggests that there were no differences between studies that were effective in reducing delay time and those that were not in terms of intervention type and duration, the year in which the study was conducted, and baseline delay time. Of interest is the observation that all four studies (two RCTS, two before-and-after studies) conducted in the USA did not reduce delay time.

5. Discussion

By evaluating the effects of interventions to reduce delay time, and attempting to identify factors that are likely to impact on delay time, this systematic review aimed to provide useful information and help in achieving the goals stated in the NSF for CHD.[1] The findings and methodological limitations of intervention and predictor studies are discussed below together with implications for research and practice.

5.1 Predictor studies: results

Eleven studies investigated a diverse range of predictors of delay time. Based on the limited evidence available the following factors might be related to longer delay: symptom onset beginning at home, less people present, being female, being of older age, experiencing less pain, and not attributing symptoms to an AMI or the heart. However, due to the fact that only a small number of studies investigated each factor, and the studies had a number methodological problems, it was difficult to draw any firm conclusions.

5.2 Predictor studies: methodological issues

In terms of methodological limitations, all of the studies were retrospective in nature, thus the memory of patients may have been distorted with regard to events preceding hospital admission. However a prospective design would be virtually impossible, given that an AMI is a low probability event in the general population. Either a very large sample, or an at risk population would be needed.

Another limitation of the studies is that they did not report an *a priori* rationale for investigating their chosen predictors. None of the studies reported using a theoretical model to guide their choice of variables, and often they appeared to be those of interest to the researcher. In addition, no studies reported using qualitative research to inform their choice. Due to the open-ended nature of questions used in qualitative research, such studies could probably play a role in selecting variables to investigate in quantitative analysis. This systematic review identified seven qualitative studies (see Appendix C), however these were not included in the review as only studies using multivariate techniques were included.

One of the included studies examined only symptom scores and cardiac enzyme levels in regression analysis, making it difficult to get a full picture of predictors of delay.[39] In addition, some regression analyses did not include important predictors such as age and gender, thus the significance of included variables was evaluated without removing the possible confounding effects of age or gender.[35,39]

In a number of studies it was unclear which predictor variables had been entered into multivariate analysis, usually because the authors only reported those variables found to be statistically significant.[35,36,41,68] Some studies failed to report the level of statistical significance of variables,[9,37] or due to the type of analysis used, it was unclear which variables were statistically significant.[40,43] One study reported coefficients and confidence intervals for some variables and not others.[42] In this study it was assumed that predictors without statistics were those eliminated in stepwise and backward elimination procedures. The majority of studies used some type of regression analysis, but some failed to report the percentage of explained variance.[9,36,42,43] This is important because it informs the reader how much of the delay can be explained by the statistically significant predictors in the regression model. Future research should clearly report which variables are entered into the analysis, which are statistically significant and which are not, the statistical significance level reached, and in the case of regression analyses, the percentage of variance explained.

In addition, at least two studies did not use univariate analyses to explore which variables are statistically significant in order to determine which to enter into multivariate analysis.[9,41]

It is unclear if the findings can be generalised to a UK population, as none of the studies were conducted in the UK. The majority of studies were undertaken in the USA, where predictors are likely to differ from those in the UK, especially with respect to access to services, where issues such as insurance coverage are not as important.

Finally, it is important to note that some well conducted studies investigating predictors of delay may have been excluded on the grounds that they examined pre-hospital delay rather than patient delay.

An example is the REACT trial, which examined predictors of pre-hospital delay in the context of an intervention.[16]

5.3 Intervention studies: results

Primary outcome: delay time

Of the eleven intervention studies included in this review, five (four before-and-after studies and one controlled trial) showed the intervention to be effective in reducing delay time. A qualitative assessment suggests that studies that were effective in reducing delay time were similar to those that were not in terms of the duration of the intervention, the component of delay time measured, the year in which the study was carried out, and the length of baseline delay time. Half of those studies examining patient delay as an outcome and half of those studies examining pre-hospital delay as an outcome found the interventions to be effective. Studies with shorter baseline delay time did not appear to be less likely to find interventions to be effective, as was suggested in one study.[26] As most of the interventions were of the same type, namely public education/media campaigns, it was not possible to determine if intervention type was related to intervention effectiveness.

All four intervention studies that were conducted in the USA[24,26,46,51] did not reduce delay time (interventions that were successful were carried out in England, Canada, Germany, Sweden and Switzerland). One possible explanation for this is that virtually all citizens in communities throughout the USA receive a constant and intense barrage of health related information.[26] As such it is likely that the messages of an intervention aimed at reducing delay time are more likely to be lost. Another possible reason as to why all the interventions that took place in the USA were unsuccessful is the difference in health-care related financial barriers between the USA and other countries.

A qualitative assessment suggests that studies conducted before the advent of thrombolysis in approximately 1990 (depending on location) are similar to those conducted after 1990 in terms of median baseline delay time. Thus if the public are aware of reperfusion therapy and the need to seek this treatment as soon as possible after symptoms begin, this awareness does not appear to have resulted in reduced delay time. Alternatively, it is likely that the public are not aware of the benefits of receiving prompt reperfusion therapy.

Only the two RCTs[25,26] based the interventions on a theoretical model, and both of these interventions were ineffective in reducing delay time. Furthermore, most intervention studies identified in this systematic review focused on educating people in terms of knowledge of symptoms, what to do and who to call. However, given the findings of the predictor studies, there is no evidence that increased knowledge is associated with decreased delay time.

Secondary outcomes

With regard to secondary outcomes, the three studies that reported the percentage of persons using ambulance or medic transport, showed that the intervention had no statistically significant effect on this outcome.[24,27,48] Both of the studies that reported the number of calls made to 911 or switchboard for medical emergencies reported an increase in this outcome during the intervention.[27, 61] Of the five studies that examined the number of ED visits for chest pain,[26,27,51, 61, 63] three reported an increase in this outcome as an effect of the intervention. Mortality rate was not statistically significantly affected by the intervention in the two studies that examined this outcome.[26,48] Of the three studies examining receipt of thrombolysis,[52] fibrinolysis,[47] or reperfusion therapy,[26] two reported an increase after the intervention.[47,52] These findings suggest that interventions may result in an increase in 911 calls, ED visits and lysis.

Process outcomes

A qualitative assessment of the six studies that investigated process outcomes[24,26,47,50, 60, 64] suggests that the reported level of awareness of the intervention is not associated with its effectiveness. However, of the three studies that compared the delay time of those individuals aware of the intervention with the delay time of those that were unaware,[28,47,50] two showed that those individuals with awareness of the campaign had shorter delay times than those without.[28,50]

5.4 Intervention studies: methodological problems and inadequacies of the interventions

It is unclear how much weight can be placed on the findings of intervention studies due to a number of methodological limitations.

Inadequacies associated with actual interventions

Four of the five studies that found the intervention to have no statistically significant effect on delay time concluded that a more prolonged campaign was probably required in order for the intervention to reduce delay time.[24,26,47,51] The duration of these studies ranged from one week to 18 months. Two of these studies had the shortest durations of all the studies. However the intervention periods of the other two studies were substantially longer than several studies that showed the interventions to be successful. Thus the success of the intervention is not necessarily dependent on the duration of the intervention period. However, it is possible that intervention success is related to intervention intensity (i.e. the frequency of exposure to the intervention) or a combination of intervention duration and intensity. It has been suggested that in addition to a more prolonged intervention period, for a campaign to be successful, programmes need to be repeated at frequent intervals,[24] and involve a more intense intervention.[26] However, as not all studies provided information on intervention intensity it is not possible to draw firm conclusions about this. As well as specifying the intervention duration period, future studies examining the effects of interventions on delay time should also specify intervention intensity.

In one RCT[25] in which the intervention was found to be unsuccessful in reducing delay time, both the control and intervention groups were exposed to the public media campaign component of the intervention (but not the direct mailing component). Exposing the control group to part of the intervention is likely to reduce the chances of finding a difference between the control and intervention groups.

Inadequacies associated with reporting of information about the intervention or the sample

One study failed to report any details concerning intervention content.[49] Such information is useful for people planning future interventions in order to examine what does and does not work.

Some studies did not adequately report details relating to the sample. For instance, two of the before-and-after studies that were effective in reducing delay time[49,52] did not provide any participant details. Therefore it was not possible to determine if the before and after groups were comparable. In addition, the sample sizes for the control and intervention groups in one study[46] were not explicitly stated and could not be determined from the information presented.

Methodological problems associated with sample used

In one study,[24] which showed the intervention to be unsuccessful, there were statistically significantly more individuals in the pre-message period with a discharge diagnosis of AMI and a history of AMI or angina than in the post-message period. These differences may have masked a trend toward seeking early care and activating the EMS, but these potential confounders were not controlled for in the analysis.

In one study,[47] different CCUs were used in pre-intervention and post-intervention surveys. To avoid possible bias, it would have been more appropriate to include patients from the same CCUs in each survey. Another limitation identified in some studies was the broad inclusion criteria used. For example, in one study[51] participants were included if they reported to the ED with one or more of 80 possible complaints, including symptoms that alone may not have indicated onset of an AMI, such as neck pain, upper abdominal pain, indigestion, jaw pain, and stomach pain. It is difficult to compare the findings of this study with those of other studies, given that the inclusion criteria were so wide.

Inadequacies associated with statistical analyses used

Two of the studies did not report any statistical analysis of the main outcome of interest, delay time.[51,52] In one controlled trial, only within-group comparisons were conducted for delay time.[46] Between group comparisons are necessary in order to determine whether any observed reduction in delay time is due to the intervention rather than some other confounding factor.

Methodological problems associated with outcome assessment

Five studies, three of which reported positive findings[27,46,49] measured delay time during the intervention as opposed to after the intervention had ceased.[26,27,46,49,51] Hence it was only possible to determine if the intervention was effective in the time period in which it was running. Any longer term effects of the intervention would have remained undetected in these studies.

In one RCT[25] no baseline measurements of delay time were taken.[25] Baseline measurements are necessary in order to ensure that delay time is comparable in the control and intervention groups prior to the intervention. Baseline measurements also enable trends in delay over time to be compared between control and intervention groups.

Of six studies reporting process outcomes, only one took baseline measurements, and this indicated that over a third of individuals in the pre-message period had heard a component of the campaign message which described symptoms of an AMI.[24] Similarly, two other studies reported that individuals in the control groups reported some sort of awareness of the intervention.[26, 60] Because some individuals that have not been exposed to the intervention claim to be aware of it, it is important for studies to take baseline measurements of process outcomes.

6. Implications for research

6.1 Points to consider when investigating predictors of delay

Based on the findings of this review, the following points are suggested for consideration in studies investigating predictors of delay in seeking help for signs and symptoms of an AMI:

- If a retrospective design is used, then predictive factors should be measured as soon as practical after the patient has been admitted to hospital.
- What rational has been used for choosing the predictors of delay that are being investigated? Has the decision been based on a relevant theoretical model or on an *a priori* hypothesis?
- Have all predictor variables that were analysed been reported?
- Has it clearly been reported which variables were statistically significant and which were not (along with significance values)?
- In the case of multiple regression analyses, has percentage of explained variance been reported?
- Has the median decision time been reported? It is good practice to report both the median and mean delay time, but the median is particularly important as it tends not to be as skewed by outliers (those with excessively long delay) as the mean.

6.2 Points to consider when designing an intervention

Based on the findings of the review, the following points are suggested for consideration in studies reporting an intervention aiming to reduce delay in seeking medical help for suspected AMI.

Intervention design

- Is a controlled design being implemented? Without a control group it is difficult to determine whether any observed decrease in delay is due to the intervention or other factor(s).
- Have the control and intervention groups been adequately randomised? If not, any observed differences between the control and intervention groups could be due to differences between groups rather than the effect of the intervention.
- Particularly in the case of controlled trials, have baseline measures of delay time been taken?
- What component of delay time will be measured? It is important to report whether patient delay, pre-hospital delay, or some other component of delay has been measured.
- Is it possible to measure survival as well as time factors?
- Will process outcomes be measured in order to determine what percentage of the intervention group received and understood the intervention?
- Is it feasible to include an economic evaluation?

The messages/actions delivered

- Is the intervention based on a relevant theoretical model or findings from studies investigating factors that predict delay in seeking medical help?
- Are the intended messages culturally and educationally appropriate for the target group? If a mass-media campaign is being considered, is the message understandable to people of all educational levels?
- How many component messages will be involved? Will all recipients be given the same messages, or will different groups of people receive different messages?
- Will the messages be repeated? If so, how often?
- Are the messages likely to be strongly contested by medical services, etc. who may be concerned about increasing numbers of patients due to false alarms? If so, what might be done to counteract this?

Length of intervention and follow-up

- For what duration of time will the intervention take place?
- For what duration will the effects of the intervention be investigated? A long follow-up period is desirable, so that the long-term effects of the intervention can be examined.

How and where the messages are delivered

- Will the messages be delivered by a mass-media type campaign, or to at risk groups? No research identified in this systematic review focused on at risk groups, thus this is an important area for future research.
- Where will the intervention be delivered? Example settings for interventions tailored to at risk groups include GP clinics, CCUs, health centres, and in the home. The degree to which the setting is accessible to and acceptable by the target audience must be taken into account. Examples of ways in which mass media campaigns could be disseminated are by television, radio, newspaper and mail, or by a combination of these methods.
- Who will deliver the messages? (e.g. health professional, community volunteer, trained peer). What personal skills, training and support might these people need?

7. Implications for practice

The National Service Framework for CHD recommends public education for patients with CHD that encourage people to call for an ambulance promptly when they experience symptoms suggestive of an AMI.

There is limited evidence to suggest that interventions to date to reduce delay time are effective. Those studies that demonstrated a reduction in delay time were not controlled or did not conduct between group comparisons, therefore it is unclear whether this effect was due to the intervention or other factors. Effective and ineffective interventions appeared to be similar in terms of intervention type and duration, and baseline delay time.

EDs and switchboards for emergencies should be aware that interventions may result in an increase in use of medical services, particularly during the intervention, and be prepared for this. There is limited evidence that certain factors may be associated with longer delay. If interventions were to be targeted at specific groups, they could stress the benefits of seeking early help for symptoms of AMI to at risk groups such as women, those of an older age and those who live alone. Many people do not suffer the classic symptoms of a heart attack, thus it is difficult to know what advice to give people without overloading medical services. As the presence of another person at time of onset of symptoms was shown to reduce delay time, it may be beneficial to target family members of at risk people in educational campaigns.

8. Conclusions

It appears that there is limited evidence to indicate that interventions can be effective in reducing both pre-hospital and patient delay. However, it is unclear how much emphasis can be placed on these findings, due to the nature of the evidence, which mostly came from before-and-after studies, and the methodological limitations of these studies. Neither of the RCTs found the interventions evaluated to effective.

There is some limited evidence to suggest that certain factors were associated with increased delay time, but the small number of studies investigating each factor suggests that the findings should be interpreted with caution.

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Appendix A: Search strategy

Databases searched:

Applied Social Sciences Index and Abstracts (ASSIA)
ASSIA indexes and abstracts around 600 English language social science journals. It aims to provide information on social services, employment, health, education, penal services and other areas. Coverage: 1987 to date. Produced by Bowker-Saur, New Providence, NJ, USA.

Cochrane Library CD-ROM
The Cochrane Library is the premier resource for information on the effectiveness of health care interventions. It is a collection of information put together by the Cochrane Collaboration, the NHS Centre for Reviews and Dissemination, and others. The Cochrane Library includes the **Cochrane Database of Systematic Reviews (CDSR)** which has the full text of completed reviews carried out by the Cochrane Collaboration, plus protocols for reviews currently in preparation, the **Database of Abstracts of Reviews of Effects (DARE)** which has abstracts of quality assessed systematic reviews published elsewhere in the medical literature, the **Cochrane Controlled Trials Register (CCTR)** which has references to randomised controlled trials, and the **NHS Economic Evaluation Database (NHS EED)** which has abstracts of economic evaluations. Produced by Update Software, Oxford, UK.

Cumulative Index to Nursing and Allied Health Literature (CINAHL)
The CINAHL database covers nursing, allied health, biomedicine, and healthcare literature. It corresponds to the Cumulative Index to Nursing & Allied Health Literature printed index, which indexes English-language and selected foreign-language journals covering nursing and other specialised health care areas. The database also includes relevant materials from seventeen allied health disciplines, plus biomedicine, management, behavioural sciences, health sciences librarianship, education, and consumer health. Coverage: 1982 to date. Produced by Cinahl Information Systems, Glendale, CA, USA.

EMBASE
This is a major bibliographic database, which covers worldwide biomedical journals, with emphasis in the areas of drugs and toxicology. Inclusion of European material is particularly strong. Coverage: 1980 to date. Produced by Elsevier Science B.V., Amsterdam, The Netherlands.

Educational Resources Information Center (ERIC)
ERIC is a national education database sponsored by the U.S. Department of Education, Office of Educational Research and Improvement (OERI). It contains over 700,000 citations covering research documents, journal articles, technical reports, program descriptions and evaluations, and curricular materials in the field of education. Coverage: 1966 to date. Produced by ERIC Processing and Reference Facility, Laurel, MD, USA.

MEDLINE
This database corresponds to three print indexes: Index Medicus, Index to Dental Literature, and International Nursing Index. Additional materials not published in Index Medicus are included on MEDLINE in areas of communication disorders, and population and reproductive biology. MEDLINE is the National Library of Medicine's (NLM) premier bibliographic database covering the fields of medicine, nursing, dentistry, veterinary medicine, and preclinical sciences. Each record is indexed using NLM's controlled vocabulary, MeSH (Medical Subject Heading). Coverage: 1966 to date. Produced by the National Library of Medicine, Bethesda, MD, USA.

Mental Health Abstracts
This database cites worldwide information relating to the general topic area of mental health. Coverage: 1967 to date. Produced by IFI CLAIMS Patent Services, Wilmington, DE, USA.

National Research Register (NRR)
The National Research Register is a database of ongoing and recently completed research projects funded by, or of interest to, the United Kingdom's National Health Service. Produced by Update Software, Oxford, UK.

PsycLIT
This database provides access to the international literature in psychology and related behavioural and social sciences, including psychiatry, sociology, anthropology, education, pharmacology, and linguistics. PsycLIT contains all records from the printed Psychological Abstracts, plus material from Dissertation Abstracts International and other sources. Publication types indexed include journal articles, dissertations, reports, books and book chapters. Coverage: 1887 to date. Produced by American Psychological Association, Washington, DC, USA.

Science Citation Index
This database is an international, multidisciplinary index to the literature of science, technology, biomedicine, and related disciplines. SciSearch contains all of the records published in the Science Citation Index, plus additional records from the Current Contents publications. Coverage: 1974 to date. Produced by the Institute for Scientific Information (ISI), Philadelphia, PA, USA.

System for Information on Grey Literature in Europe (SIGLE)
This is a bibliographic database covering European non-conventional (grey) literature in the fields of pure and applied natural sciences and technology, economics, social sciences, and humanities. SIGLE also includes FTN database for German grey literature, published in the printed abstract journal Forschungsberichte aus Naturwissenschaft und Technik/Reports in the Fields of Science and Technology. Coverage: 1976 to date. Produced by EAGLE (European Association for Grey Literature Exploitation).

Social Science Citation Index
This database is an international, multidisciplinary index to the literature of social, behavioural, and related sciences. Social SciSearch contains all of the records published in the Social Sciences Citation Index. Coverage: 1972 to date. Produced by the Institute for Scientific Information (ISI), Philadelphia, PA, USA.

Sociological Abstracts
This database covers sociology and related disciplines in the social and behavioural sciences. Coverage: 1963 to date. Produced by Cambridge Scientific Abstracts, Bethesda, MD, USA.

Delay Predictor Search Strategies

MEDLINE: Silverplatter. CD-ROM. 1966-2000/11. 20th November 2000.

The MEDLINE 'delay predictors' search covered the date range 1966 to November 2000. The search was carried out on 20th November 2000 and identified 2,684 records.

#1 explode "Myocardial-Infarction"/ all subheadings
#2 myocardial infarct* in ti,ab
#3 ami in ti,ab
#4 mi in ti,ab
#5 (acute near mi) in ti,ab
#6 explode "Heart-Arrest"/ all subheadings
#7 (heart attack* or heart failure) in ti,ab
#8 heart arrest* in ti,ab
#9 (cardiac arrest* or cardiac failure) in ti,ab
#10 (cardiac symptom* or cardiac event*) in ti,ab
#11 (coronary symptom* or coronary event*) in ti,ab
#12 "Chest-Pain"/ all subheadings
#13 chest pain* in ti,ab
#14 (acute near coronary near event*) in ti,ab
#15 (acute near coronary near episode*) in ti,ab
#16 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15
#17 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti, ab
#18 (time near (interval or elaps* or length)) in ti,ab
#19 #17 or #18
#20 "Time-Factors"
#21 explode "Transportation-of-Patients"/ all subheadings
#22 explode "Emergency-Service-Hospital"/ all subheadings
#23 "Emergencies"/ all subheadings
#24 "Patient-Admission"/ all subheadings
#25 (hospital or hospitali?ation) in ti,ab
#26 (prehospital or pre hospital or pre-hospital) in ti,ab
#27 (gp* or general practitioner* or doctor*) in ti,ab
#28 emergency medical service* in ti,ab
#29 (emergency near service*) in ti,ab
#30 ambulance* in ti,ab
#31 (accident near emergency) in ti,ab
#32 emergency room in ti,ab
#33 (access* near service*) in ti,ab
#34 (911 near (call* or dial*)) in ti,ab
#35 (999 near (call* or dial*)) in ti,ab
#36 (arrival* or presentation* or admission*) in ti,ab
#37 #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36
#38 #19 and #37
#39 late action in ti,ab
#40 early action in ti, ab
#41 (time* near deci*) in ti,ab
#42 ((seek* or ask* or look*) near (treat* or help* or assist* or care or attention)) in ti,ab
#43 #39 or #40 or #41 or #42
#44 #38 or #43
#45 #16 and #44
#46 #45 and (TG = "HUMAN")

EMBASE: Silverplatter. CD-ROM. 1980-2000/10. 20th November 2000.

The MEDLINE search strategy was translated and adapted to run in the EMBASE database. The EMBASE 'delay predictors' search covered the date range 1980 to October 2000 and identified 1,811 records.

#1 explode "Heart-Infarction"/ all subheadings
#2 myocardial infarct* in ti,ab
#3 ami in ti,ab
#4 mi in ti,ab
#5 (acute near mi) in ti,ab
#6 "Heart-Arrest"/ all subheadings
#7 "Acute-Heart-Failure"/ all subheadings
#8 (heart attack* or heart failure) in ti,ab
#9 heart arrest* in ti,ab
#10 (cardiac arrest* or cardiac failure) in ti,ab
#11 (cardiac symptom* or cardiac event*) in ti,ab
#12 (coronary symptom* or coronary event*) in ti,ab
#13 "Thorax-Pain"/ all subheadings
#14 chest pain* in ti,ab
#15 (acute near coronary near event*) in ti,ab
#16 (acute near coronary near episode*) in ti,ab
#17 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16
#18 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti, ab
#19 (time near (interval or elaps* or length)) in ti,ab
#20 #18 or #19
#21 explode "Time"/ all subheadings
#22 "Patient-Transport"/ all subheadings
#23 "ambulance"/ all subheadings
#24 explode "Emergency-Treatment"/ all subheadings
#25 "Emergency-Health-Service"/ all subheadings
#26 "Emergency"/ all subheadings
#27 "Hospital-Admission"/ all subheadings
#28 (hospital or hospitali?ation) in ti,ab
#29 (prehospital or pre hospital or pre-hospital) in ti,ab
#30 (gp* or general practitioner* or doctor*) in ti,ab
#31 emergency medical service* in ti,ab
#32 (emergency near service*) in ti,ab
#33 ambulance* in ti,ab
#34 (accident near emergency) in ti,ab
#35 emergency room in ti,ab
#36 (access* near service*) in ti,ab
#37 ((911 or 9-1-1) near (call* or dial*)) in ti,ab
#38 ((999 or 9-9-9) near (call* or dial*)) in ti,ab
#39 (arrival* or presentation* or admission*) in ti,ab
#40 #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39
#41 #20 and #40
#42 late action in ti,ab
#43 early action in ti, ab
#44 (time* near deci*) in ti,ab
#45 ((seek* or ask* or look*) near (treat* or help* or assist* or care or attention)) in ti,ab
#46 #42 or #43 or #44 or #45
#47 #41 or #46
#48 #17 and #47

Cumulative Index to Nursing and Allied Health Literature (CINAHL): Silverplatter. CD-ROM. 1982-2000/09. 21st November 2000.

The CINAHL ‘delay predictors’ search covered the date range 1982 to September 2000 and identified 324 records.

#1 explode "Myocardial-Infarction"/ all subheadings
#2 myocardial infarct* in ti,ab
#3 ami in ti,ab
#4 mi in ti,ab

#5 (acute near mi) in ti,ab
#6 explode "Heart-Arrest"/ all subheadings
#7 (heart attack* or heart failure) in ti,ab
#8 heart arrest* in ti,ab
#9 (cardiac arrest* or cardiac failure) in ti,ab
#10 (cardiac symptom* or cardiac event*) in ti,ab
#11 (coronary symptom* or coronary event*) in ti,ab
#12 "Chest-Pain"/ all subheadings
#13 chest pain* in ti,ab
#14 (acute near coronary near event*) in ti,ab
#15 (acute near coronary near episode*) in ti,ab
#16 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15
#17 "Treatment-Delay"/ all subheadings
#18 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti,ab,rf
#19 (time near (interval or elaps* or length)) in ti,ab,rf
#20 #17 or #18 or #19
#21 "Time-Factors"
#22 explode "Transportation-of-Patients"/ all subheadings
#23 explode "Emergency-Medical-Services"/ all subheadings
#24 explode "Emergencies"/ all subheadings
#25 "Patient-Admission"/ all subheadings
#26 "Help-Seeking Behavior"/ all subheadings
#27 (hospital or hospitali?ation) in ti,ab
#28 (prehospital or pre hospital or pre-hospital) in ti,ab
#29 (gp* or general practitioner* or doctor*) in ti,ab
#30 emergency medical service* in ti,ab
#31 (emergency near service*) in ti,ab
#32 ambulance* in ti,ab
#33 (accident near emergency) in ti,ab
#34 emergency room in ti,ab
#35 (access* near service*) in ti,ab
#36 ((911 or 9-1-1) near (call* or dial*)) in ti,ab
#37 ((999 or 9-9-9) near (call* or dial*)) in ti,ab
#38 (arrival* or presentation* or admission*) in ti,ab,rf
#39 #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38
#40 #20 and #39
#41 late action in ti,ab
#42 early action in ti, ab
#43 (time* near deci*) in ti,ab,rf
#44 ((seek* or ask* or look*) near (treat* or help* or assist* or care or attention)) in ti,ab,rf
#45 #41 or #42 or #43 or #44
#46 #40 or #45
#47 #16 and #46

PsycLIT: Silverplatter. CD-ROM. 1887-2000/06. 22nd November 2000.

The PsycLIT ‘delay predictors’ search covered the date range 1887 to June 2000 and identified 86 records.

#1 explode "Heart-Disorders"
#2 myocardial infarct* in ti,ab
#3 ami in ti,ab
#4 mi in ti,ab
#5 (acute near mi) in ti,ab
#6 (heart attack* or heart failure) in ti,ab
#7 heart arrest* in ti,ab
#8 (cardiac arrest* or cardiac failure) in ti,ab
#9 (cardiac symptom* or cardiac event*) in ti,ab
#10 (coronary symptom* or coronary event*) in ti,ab
#11 “Thorax"

#12 chest pain* in ti,ab
#13 (acute near coronary near event*) in ti,ab
#14 (acute near coronary near episode*) in ti,ab
#15 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14
#16 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti, ab
#17 (time near (interval or elaps* or length)) in ti,ab
#18 #16 or #17
#19 "Emergency-Services"
#20 explode "Hospital-Admission"
#21 explode "Help-Seeking-Behavior"
#22 "Decision-Making"
#23 (hospital or hospitali?ation) in ti,ab
#24 (prehospital or pre hospital or pre-hospital) in ti,ab
#25 (gp* or general practitioner* or doctor*) in ti,ab
#26 emergency medical service* in ti,ab
#27 (emergency near service*) in ti,ab
#28 ambulance* in ti,ab
#29 (accident near emergency) in ti,ab
#30 emergency room in ti,ab
#31 (access* near service*) in ti,ab
#32 ((911 or 9-1-1) near (call* or dial*)) in ti,ab
#33 ((999 or 9-9-9) near (call* or dial*)) in ti,ab
#34 (arrival* or presentation* or admission*) in ti,ab
#35 #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34
#36 #18 and #35
#37 late action in ti,ab
#38 early action in ti, ab
#39 (time* near deci*) in ti,ab
#40 ((seek* or ask* or look*) near (treat* or help* or assist* or #41 care or attention)) in ti,ab
#42 #37 or #38 or #39 or #40
#43 #36 or #41
#44 #15 and #42

Sociological Abstracts: Silverplatter. CD-ROM. 1963-2000/06. 4th December 2000.

The Sociological Abstracts ‘delay predictors’ search covered the date range 1963 to June 2000 and identified 17 records.

#1 "Heart-Diseases"
#2 myocardial infarct* in ti,ab
#3 ami in ti,ab
#4 (acute near mi) in ti,ab
#5 (heart attack* or heart failure) in ti,ab
#6 heart arrest* in ti,ab
#7 (cardiac arrest* or cardiac failure) in ti,ab
#8 (cardiac symptom* or cardiac event*) in ti,ab
#9 (coronary symptom* or coronary event*) in ti,ab
#10 chest pain* in ti,ab
#11 (acute near coronary near event*) in ti,ab
#12 (acute near coronary near episode*) in ti,ab
#13 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12
#14 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti, ab
#15 (time near (interval or elaps* or length)) in ti,ab
#16 #14 or #15
#17 "Emergency-Medical-Services"
#18 explode "Emergencies"
#19 "Hospitalization"
#20 "Admissions"
#21 explode "Patients"
#22 explode "Help-Seeking-Behavior"
#23 "Decision-Making"

#24 (hospital or hospitali?ation) in ti,ab
#25 (prehospital or pre hospital or pre-hospital) in ti,ab
#26 (gp* or general practitioner* or doctor*) in ti,ab
#27 emergency medical service* in ti,ab
#28 (emergency near service*) in ti,ab
#29 ambulance* in ti,ab
#30 (accident near emergency) in ti,ab
#31 emergency room in ti,ab
#32 (access* near service*) in ti,ab
#33 ((911 or 9-1-1) near (call* or dial*)) in ti,ab
#34 ((999 or 9-9-9) near (call* or dial*)) in ti,ab
#35 (arrival* or presentation* or admission*) in ti,ab
#36 #17 or #18 or #19 or #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35
#37 #16 and #36
#38 late action in ti,ab
#39 early action in ti, ab
#40 (time* near deci*) in ti,ab
#41 ((seek* or ask* or look*) near (treat* or help* or assist* or care or attention)) in ti,ab
#42 #38 or #39 or #40 or #41
#43 #37 or #42
#44 #13 and #43

Mental Health Abstracts: DIALOG. 1969-2000/06. 6th December 2000.

The DIALOG online host was used to search the following 4 databases with the same search strategy: Mental Health Abstracts, Social SciSearch, SciSearch and ERIC. The Mental Health Abstracts 'delay predictors' search covered the date range 1969 to June 2000 and identified 15 records.

s1 s myocardial(w)infarct?
s2 s ami or mi
s3 s acute(3w)mi
s4 s heart(w)attack? ?
s5 s heart(w)failure
s6 s cardiac(w)arrest? ? or cardiac(w)failure
s7 s cardiac(w)symptom? ? or cardiac(w)event? ?
s8 s coronary(w)symptom? ? or coronary(w)event? ?
s9 s chest(3w)pain? ?
s10 s acute(3w)coronary(3w)event? ?
s11 s acute(3w)coronary(3w)episode? ?
s12 s s1:s11
s13 s delay? or postpon? or wait? or hesitat? or defer? or put(w)off
s14 s time(3n)interval
s15 s time(3n)elaps?
s16 s time(3n)length
s17 s s13:s16
s18 s hospital or hospitali?ation
s19 s prehospital or pre(w)hospital or pre-hospital
s20 s gp? ? or general(w)practitioner? or doctor?
s21 s emergency(w)medical(w)service?
s22 s emergency(3w)service?
s23 s ambulance?
s24 s accident(2w)emergency
s25 s emergency(w)room
s26 s access?(3n)service?
s27 s 911(3n)call?
s28 s 911(3n)dial?
s29 s 999(3n)call?
s30 s 999(3n)dial?
s31 s arrival? ? or presentation? or admission?
s32 s s18:s31

s33 s s17 and s32
s34 s late(w)action
s35 s early(w)action
s36 s time?(3n)deci?
s37 s (seek? or ask? or look?)(5n)(treat? or help? or assist? or care or attention)
s38 s s34:s37
s39 s s33 or s38
s40 s s12 and s39

Social Science Citation Index (Social SciSearch): DIALOG. 1972-2000/12. 6th December 2000.

The above search strategy used for the Mental Health Abstracts database via the DIALOG online host was also used for the Social SciSearch database. The Social SciSearch 'delay predictors' search covered the date range 1972 to December 2000 and identified 122 records.

Science Citation Index (SciSearch): DIALOG. 1974-2000/12. 6th December 2000.

The above search strategy used for the Mental Health Abstracts database via the DIALOG online host was also used for the SciSearch database. The SciSearch 'delay predictors' search covered the date range 1974 to December 2000 and identified 1,257 records.

Educational Resources Information Center (ERIC): DIALOG. 1966-2000/12. 6th December 2000.

The above search strategy used for the Mental Health Abstracts database via the DIALOG online host was also used for the ERIC database. The ERIC 'delay predictors' search covered the date range 1966 to December 2000 and identified 48 records.

Applied Social Sciences Index and Abstracts (ASSIA): DATASTAR. 1987-2000. 6th December 2000.

The ASSIA 'delay predictors' search covered the date range 1987 to 2000 and identified 24 records.

#1 Myocardial adj infarct$
#2 ami or mi
#3 acute with mi
#4 heart adj attack$1
#5 heart adj failure
#6 (cardiac adj arrest$1) or (cardiac adj failure)
#7 (cardiac adj symptom$1) or (cardiac adj event$1)
#8 (coronary adj symptom$1) or (coronary adj event$1)
#9 chest with pain$1
#10 acute with (coronary adj event$1)
#11 acute with (coronary adj episode$1)
#12 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11
#13 delay$ or postpon$ or wait$ or hesitat$ or defer$ or (put adj off)
#14 time with interval
#15 time with elaps$
#16 time with length
#17 13 or 14 or 15 or 16
#18 (hospital or hospitalisation or hospitalization).ti,ab.
#19 prehospital or (pre adj hospital)
#20 gp$1 or doctor$ or (general adj practitioner$)
#21 emergency adj (medical adj service$)
#22 emergency with service$
#23 ambulance$
#24 accident with emergency
#25 emergency adj room
#26 access$ with service$
#27 '911' with call$

#28 '911' with dial$
#29 '999' with call$
#30 '999' with dial$
#31 arrival$1 or presentation$ or admission$
#32 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29 or 30 or 31
#33 17 and 32
#34 late adj action
#35 early adj action
#36 time$ with deci$
#37 (seek$ or ask$ or look$) with (treat$ or help$ or assist$ or care or attention)
#38 34 or 35 or 36 or 37
#39 33 or 38
#40 12 and 39

System for Information on Grey Literature in Europe (SIGLE): STN. 1976-2000. 12th December 2000.

The SIGLE 'delay predictors' search covered the date range 1976 to 2000 and identified 0 records.

L1 s myocardial(w)infarct?
L2 s ami or mi
L3 s acute(3w)mi
L4 s heart(w)attack#
L5 s heart(w)failure
L6 s (cardiac(w)arrest#) or (cardiac(w)failure)
L7 s (cardiac(w)symptom#) or (cardiac(w)event#)
L8 s (coronary(w)symptom#) or (coronary(w)event#)
L9 s chest(3w)pain#
L10 s acute(3w)(coronary(3w)event#)
L11 s acute(3w)(coronary(3w)episode#)
L12 s L1-L11
L13 s delay? or postpon? or wait? or hesitat? or defer? or (put(w)off)
L14 s time(3a)interval
L15 s time(3a)elaps?
L16 s time(3a)length
L17 s L13-L16
L18 s (hospital or hospitali!ation)/ti,ab
L19 s prehospital or (pre(w)hospital)
L20 s gp# or doctor? or (general(w)practitioner?)
L21 s emergency(w)(medical(w)service?)
L22 s emergency(3w)service?
L23 s ambulance?
L24 s accident(2w)emergency
L25 s emergency(w)room
L26 s access?(3a)service?
L27 s 911(3a)call?
L28 s 911(3a)dial?
L29 s 999(3a)call?
L30 s 999(3a)dial?
L31 s arrival# or presentation? or admission?
L32 s L18-L31
L33 s L17 and L32
L34 s late(w)action
L35 s early(w)action
L36 s time?(3a)deci?
L37 s (seek? or ask? or look?)(5a)(treat? or help? or assist? or care or attention)
L38 s L34-L37
L39 s L33 or L38
L40 s L12 and L39

Cochrane Controlled Trials Register (CCTR): Cochrane Library, 2000:4. CD-ROM. 21st November 2000.

The Cochrane Controlled Trials Register (CCTR) was searched to find completed trials. The search was carried out on 21st November 2000 and identified 225 records.

#1 MYOCARDIAL-INFARCTION*:ME
#2 (MYOCARDIAL next INFARCT*)
#3 HEART-ARREST*:ME
#4 (((HEART next ATTACK*) or (HEART next FAILURE)) OR (HEART NEXT ARREST*))
#5 ((CARDIAC next ARREST*) or (CARDIAC next FAILURE))
#6 ((CARDIAC next SYMPTOM*) or (CARDIAC next EVENT*))
#7 CHEST-PAIN*:ME
#8 (CHEST next PAIN)
#9 (((((((#1 or #2) or #3) or #4) or #5) or #6) or #7) or #8)
#10 (((((DELAY* or POSTPON*) or WAIT*) or HESITAT*) or DEFER*) OR (PUT next OFF))
#11 (TIME near ((INTERVAL or ELAPS*) or LENGTH))
#12 (#10 or #11)
#13 TIME-FACTORS*:ME
#14 TRANSPORTATION-OF-PATIENTS*:ME
#15 EMERGENCY-SERVICE-HOSPITAL*:ME
#16 EMERGENCIES*:ME
#17 PATIENT-ADMISSION*:ME
#18 ((HOSPITAL or HOSPITALIZATION) or HOSPITALISATION)
#19 ((PREHOSPITAL or (PRE next HOSPITAL)) OR PRE-HOSPITAL)
#20 ((GP* or (GENERAL next PRACTITIONER*)) OR DOCTOR*)
#21 ((EMERGENCY next MEDICAL) next SERVICE*)
#22 (EMERGENCY near SERVICE*)
#23 AMBULANCE*
#24 (ACCIDENT near EMERGENCY)
#25 (EMERGENCY next ROOM)
#26 (ACCESS* near SERVICE*)
#27 ((ARRIVAL* or PRESENTATION*) or ADMISSION*)
#28 ((seek* or ask* or look*) near (treat* or help* or assist* or care or attention))
#29 ((((((((((((((#13 or #14) or #15) or #16) or #17) or #18) or #19) or #20) or #21) or #22) or #23) or #24) or #25) or #26) or #27) or #28)
#30 (#12 and #29)
#31 (#9 and #30)

Database of Abstracts of Reviews of Effectiveness (DARE): Cochrane Library, 2000:4. CD-ROM. 21st November 2000.

DARE was searched at the same time as the CCTR on the Cochrane Library, using the same search strategy listed above. The database was searched on the 21st November 2000 and identified 5 records.

NHS Economic Evaluation Database (NHS EED): Cochrane Library, 2000:4. CD-ROM. 21st November 2000.

NHS EED was searched at the same time as the CCTR on the Cochrane Library, using the same search strategy listed above. The database was searched on the 21st November 2000 and identified 18 records.

National Research Register (NRR): CD-Rom, 2000:3. CD-ROM. 21st November 2000.

The National Research Register (NRR) was searched to find ongoing and completed studies. The search was carried out on 21st November 2000 and identified 17 ongoing and 10 complete trials.

#1 MYOCARDIAL-INFARCTION*:ME
#2 (MYOCARDIAL next INFARCT*)
#3 HEART-ARREST*:ME
#4 (((HEART next ATTACK*) or (HEART next FAILURE)) OR (HEART NEXT ARREST*))
#5 ((CARDIAC next ARREST*) or (CARDIAC next FAILURE))
#6 ((CARDIAC next SYMPTOM*) or (CARDIAC next EVENT*))
#7 CHEST-PAIN*:ME
#8 (CHEST next PAIN)
#9 (((((((#1 or #2) or #3) or #4) or #5) or #6) or #7) or #8)
#10 (((((DELAY* or POSTPON*) or WAIT*) or HESITAT*) or DEFER*) OR (PUT next OFF))
#11 (TIME near ((INTERVAL or ELAPS*) or LENGTH))
#12 (#10 or #11)
#13 TIME-FACTORS*:ME
#14 TRANSPORTATION-OF-PATIENTS*:ME
#15 EMERGENCY-SERVICE-HOSPITAL*:ME
#16 EMERGENCIES*:ME
#17 PATIENT-ADMISSION*:ME
#18 ((HOSPITAL or HOSPITALIZATION) or HOSPITALISATION)
#19 ((PREHOSPITAL or (PRE next HOSPITAL)) OR PRE-HOSPITAL)
#20 ((GP* or (GENERAL next PRACTITIONER*)) OR DOCTOR*)
#21 ((EMERGENCY next MEDICAL) next SERVICE*)
#22 (EMERGENCY near SERVICE*)
#23 AMBULANCE*
#24 (ACCIDENT near EMERGENCY)
#25 (EMERGENCY next ROOM)
#26 (ACCESS* near SERVICE*)
#27 ((ARRIVAL* or PRESENTATION*) or ADMISSION*)
#28 ((seek* or ask* or look*) near (treat* or help* or assist* or care or attention))
#29 ((((((((((((((#13 or #14) or #15) or #16) or #17) or #18) or #19) or #20) or #21) or #22) or #23) or #24) or #25) or #26) or #27) or #28)
#30 (#12 and #29)
#31 (#9 and #30)

Intervention Search Strategies

MEDLINE: Silverplatter. CD-ROM. 1966-2000/12. 10th January 2001.

The MEDLINE 'intervention' search covered the date range 1966 to December 2000. The search was carried out on 10th January 2001 and identified 871 records.

#1 explode "Heart-Diseases"/ all subheadings
#2 heart disease* in ti,ab
#3 coronary disease* in ti,ab
#4 (heart attack* or heart failure) in ti,ab
#5 heart arrest* in ti,ab
#6 (cardiac arrest* or cardiac failure) in ti,ab
#7 (cardiac symptom* or cardiac event*) in ti,ab
#8 (coronary symptom* or coronary event*) in ti,ab
#9 myocardial infarct* in ti,ab
#10 (myocardial near disease*) in ti,ab
#11 (myocardium near disease*) in ti,ab
#12 ami in ti,ab
#13 mi in ti,ab
#14 (acute near mi) in ti,ab
#15 explode "Myocardial-Ischemia"/ all subheadings
#16 (isch?emic* near heart near disease*) in ti,ab
#17 angina in ti,ab
#18 "Chest-Pain"/ all subheadings
#19 chest pain* in ti,ab
#20 (acute near coronary near event*) in ti,ab
#21 (acute near coronary near episode*) in ti,ab
#22 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21
#23 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti, ab
#24 (time near (interval or elaps* or length)) in ti,ab
#25 #23 or #24
#26 "Time-Factors"
#27 explode "Transportation-of-Patients"/ all subheadings
#28 explode "Emergency-Service-Hospital"/ all subheadings
#29 "Emergencies"/ all subheadings
#30 "Patient-Admission"/ all subheadings
#31 (hospital or hospitali?ation) in ti,ab
#32 (prehospital or pre hospital or pre-hospital) in ti,ab
#33 (gp* or general practitioner* or doctor*) in ti,ab
#34 emergency medical service* in ti,ab
#35 (emergency near service*) in ti,ab
#36 ambulance* in ti,ab
#37 (accident near emergency) in ti,ab
#38 emergency room in ti,ab
#39 (access* near service*) in ti,ab
#40 ((911 or 9-1-1) near (phone* or telephone* or call* or dial*)) in ti,ab
#41 ((999 or 9-9-9) near (phone* or telephone* or call* or dial*)) in ti,ab
#42 (arrival* or presentation* or admission*) in ti,ab
#43 #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42
#44 #25 and #43
#45 ((late or delay*) near (action or detection or identification or evaluation)) in ti,ab
#46 ((early or rapid) near (action or detection or identification or evaluation)) in ti,ab
#47 (time* near deci*) in ti,ab
#48 ((seek* or ask* or look* or call*) near (treat* or help* or assist* or care or attention)) in ti,ab
#49 #45 or #46 or #47 or #48
#50 #44 or #49
#51 explode "Social-Environment"/ all subheadings
#52 explode "Social-Behavior"/ all subheadings
#53 ((community or social) near (support or education* or organi?ation or awareness)) in ti,ab
#54 ((community or social) near intervention*) in ti,ab

#55 support system* in ti,ab
#56 support* patient* in ti,ab
#57 explode "Communications-Media"/ all subheadings
#58 (media or campaign*) in ti,ab
#59 (television or film*) in ti,ab
#60 (video near (tap* or record* or cassette)) in ti,ab
#61 (advertisement* or advertising) in ti,ab
#62 "Pamphlets"/ all subheadings
#63 (pamphlet* or leaflet* or booklet*) in ti,ab
#64 explode "Preventive-Health-Services"/ all subheadings
#65 "Health-Promotion"/ all subheadings
#66 (preventive near health near service*) in ti,ab
#67 health education* in ti,ab
#68 health promotion* in ti,ab
#69 public education* in ti,ab
#70 professional education* in ti,ab
#71 education* intervention in ti,ab
#72 "Education-Professional"/ all subheadings
#73 explode "Professional-Patient-Relations"/ all subheadings
#74 (nurse near (instruction* or intervention or counsel*)) in ti,ab
#75 "Patient-Acceptance-of-Health-Care"/ all subheadings
#76 (patient* near (participation or attitude* or choice* or decision* or education* or counsel*)) in ti,ab
#77 patient information in ti,ab
#78 explode "Interviews"/ all subheadings
#79 (one-to-one near interview*) in ti,ab
#80 (talking near patient*) in ti,ab
#81 early intervention in ti,ab
#82 brief intervention in ti,ab
#83 "Role-Playing"
#84 (rehearsal or role-play*) in ti,ab
#85 "Self-Help-Groups"/ all subheadings
#86 self help in ti,ab
#87 explode "Health-Behavior"/ all subheadings
#88 health behavio?r in ti,ab
#89 health seeking behavio?r in ti,ab
#90 explode "Decision-making"/ all subheadings
#91 (decision near (aids or tools or support*)) in ti,ab
#92 "Hotlines"/ all subheadings
#93 (helpline* or help line* or help-line*) in ti,ab
#94 nhs direct in ti,ab
#95 direct mail* in ti,ab
#96 national heart attack alert program* in ti,ab
#97 rapid early action for coronary treatment* in ti,ab
#98 Worcester heart attack study* in ti,ab
#99 #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 or #68 or #69 or #70 or #71 or #72 or #73 or #74 or #75 or #76 or #77 or #78 or #79
#100 #80 or #81 or #82 or #83 or #84 or #85 or #86 or #87 or #88 or #89 or #90 or #91 or #92 or #93 or #94 or #95 or #96 or #97 or #98
#101 #99 or #100
#102 #22 and #50
#103 #101 and #102

EMBASE: Silverplatter. CD-ROM. 1980-2000/12. 10th January 2001.

The MEDLINE search strategy was translated and adapted to run in the EMBASE database. The EMBASE 'intervention' search covered the date range 1980 to December 2000 and identified 624 records.

#1 explode "Heart-Disease"/ all subheadings

#2 heart disease* in ti,ab
#3 coronary disease* in ti,ab
#4 (heart attack* or heart failure) in ti,ab
#5 heart arrest* in ti,ab
#6 (cardiac arrest* or cardiac failure) in ti,ab
#7 (cardiac symptom* or cardiac event*) in ti,ab
#8 (coronary symptom* or coronary event*) in ti,ab
#9 myocardial infarct* in ti,ab
#10 (myocardial near disease*) in ti,ab
#11 (myocardium near disease*) in ti,ab
#12 ami in ti,ab
#13 mi in ti,ab
#14 (acute near mi) in ti,ab
#15 (isch?emic* near heart near disease*) in ti,ab
#16 angina in ti,ab
#17 "Thorax-Pain"/ all subheadings
#18 chest pain* in ti,ab
#19 (acute near coronary near event*) in ti,ab
#20 (acute near coronary near episode*) in ti,ab
#21 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20
#22 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti, ab
#23 (time near (interval or elaps* or length)) in ti,ab
#24 #22 or #23
#25 explode "Time"/ all subheadings
#26 "Patient-Transport"/ all subheadings
#27 "ambulance"/ all subheadings
#28 explode "Emergency-Treatment"/ all subheadings
#29 "Emergency-Health-Service"/ all subheadings
#30 "Emergency"/ all subheadings
#31 "Hospital-Admission"/ all subheadings
#32 (hospital or hospitali?ation) in ti,ab
#33 (prehospital or pre hospital or pre-hospital) in ti,ab
#34 (gp* or general practitioner* or doctor*) in ti,ab
#35 emergency medical service* in ti,ab
#36 (emergency near service*) in ti,ab
#37 ambulance* in ti,ab
#38 (accident near emergency) in ti,ab
#39 emergency room in ti,ab
#40 (access* near service*) in ti,ab
#41 ((911 or 9-1-1) near (phone* or telephone* or call* or dial*)) in ti,ab
#42 ((999 or 9-9-9) near (phone* or telephone* or call* or dial*)) in ti,ab
#43 (arrival* or presentation* or admission*) in ti,ab
#44 #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43
#45 #24 and #44
#46 ((late or delay*) near (action or detection or identification or evaluation)) in ti,ab
#47 ((early or rapid) near (action or detection or identification or evaluation)) in ti, ab
#48 (time* near deci*) in ti,ab
#49 ((seek* or ask* or look* or call*) near (treat* or help* or assist* or care or attention)) in ti,ab
#50 #46 or #47 or #48 or #49
#51 #45 or #50
#52 explode "Social-Environment"/ all subheadings
#53 explode "Social-Behavior"/ all subheadings
#54 ((community or social) near (support or education* or organi?ation or awareness)) in ti,ab
#55 ((community or social) near intervention*) in ti,ab
#56 support system* in ti,ab
#57 support* patient* in ti,ab
#58 explode "Mass-Communication"/ all subheadings
#59 (media or campaign*) in ti,ab
#60 (television or film*) in ti,ab
#61 (video near (tap* or record* or cassette)) in ti,ab
#62 (advertisement* or advertising) in ti,ab

#63 (pamphlet* or leaflet* or booklet*) in ti,ab
#64 "Preventive-Health-Service"/ all subheadings
#65 explode "Health-Education"/ all subheadings
#66 (preventive near health near service*) in ti,ab
#67 health education* in ti,ab
#68 health promotion* in ti,ab
#69 public education* in ti,ab
#70 professional education* in ti,ab
#71 education* intervention in ti,ab
#72 "Vocational-Education"/ all subheadings
#73 (nurse near (instruction* or intervention* or counsel*)) in ti,ab
#74 "Nurse-Patient-Relationship"/ all subheadings
#75 "Doctor-Patient-Relation"/ all subheadings
#76 explode "Patient-Attitude"/ all subheadings
#77 (patient* near (participation or attitude* or choice* or decision* or education* or counsel*)) in ti,ab
#78 "Patient-Information"/ all subheadings
#79 patient information in ti,ab
#80 "Interview"/ all subheadings
#81 (one-to-one near interview*) in ti,ab
#82 (talking near patient*) in ti,ab
#83 early intervention in ti,ab
#84 brief intervention in ti,ab
#85 "Role-Playing"/ all subheadings
#86 (rehearsal or role-play*) in ti,ab
#87 "Self-Help"/ all subheadings
#88 self help in ti,ab
#89 explode "Health-Behavior"/ all subheadings
#90 health behavio?r in ti,ab
#91 health seeking behavio?r in ti,ab
#92 (helpline* or help line* or help-line*) in ti,ab
#93 nhs direct in ti,ab
#94 direct mail* in ti,ab
#95 national heart attack alert program* in ti,ab
#96 rapid early action for coronary treatment* in ti,ab
#97 Worcester heart attack study* in ti,ab
#98 #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 or #68 or #69 or #70 or #71 or #72 or #73 or #74 or #75 or #76 or #77 or #78 or #79
#99 #80 or #81 or #82 or #83 or #84 or #85 or #86 or #87 or #88 or #89 or #90 or #91 or #92 or #93 or #94 or #95 or #96 or #97
#100 #98 or #99
#101 #21 and #51
#102 #100 and #101

Cumulative Index to Nursing and Allied Health Literature (CINAHL): Silverplatter. CD-ROM. 1982-2000/11. 11th January 2001.

The CINAHL ‘intervention’ search covered the date range 1982 to January 2001 and identified 187 records.

#1 explode "Heart-Diseases"/ all subheadings
#2 heart disease* in ti,ab
#3 coronary disease* in ti,ab
#4 (heart attack* or heart failure) in ti,ab
#5 heart arrest* in ti,ab
#6 (cardiac arrest* or cardiac failure) in ti,ab
#7 (cardiac symptom* or cardiac event*) in ti,ab
#8 (coronary symptom* or coronary event*) in ti,ab
#9 myocardial infarct* in ti,ab
#10 (myocardial near disease*) in ti,ab

#11 (myocardium near disease*) in ti,ab
#12 ami in ti,ab
#13 mi in ti,ab
#14 (acute near mi) in ti,ab
#15 explode "Myocardial-Ischemia"/ all subheadings
#16 (isch?emic* near heart near disease*) in ti,ab
#17 angina in ti,ab
#18 "Chest-Pain"/ all subheadings
#19 chest pain* in ti,ab
#20 (acute near coronary near event*) in ti,ab
#21 (acute near coronary near episode*) in ti,ab
#22 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17 or #18 or #19 or #20 or #21
#23 "Treatment-Delay"/ all subheadings
#24 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti,ab,rf
#25 (time near (interval or elaps* or length)) in ti,ab,rf
#26 #23 or #24 or #25
#27 "Time-Factors"
#28 explode "Transportation-of-Patients"/ all subheadings
#29 explode "Emergency-Medical-Services"/ all subheadings
#30 explode "Emergencies"/ all subheadings
#31 "Patient-Admission"/ all subheadings
#32 (hospital or hospitali?ation) in ti,ab
#33 (prehospital or pre hospital or pre-hospital) in ti,ab
#34 (gp* or general practitioner* or doctor*) in ti,ab
#35 emergency medical service* in ti,ab
#36 (emergency near service*) in ti,ab
#37 ambulance* in ti,ab
#38 (accident near emergency) in ti,ab
#39 emergency room in ti,ab
#40 (access* near service*) in ti,ab
#41 ((911 or 9-1-1) near (phone* or telephone* or call* or dial*)) in ti,ab
#42 ((999 or 9-9-9) near (phone* or telephone* or call* or dial*)) in ti,ab
#43 (arrival* or presentation* or admission*) in ti,ab,rf
#44 #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36 or #37 or #38 or #39 or #40 or #41 or #42 or #43
#45 #26 and #44
#46 ((late or delay*) near (action or detection or identification or evaluation)) in ti,ab
#47 ((early or rapid) near (action or detection or identification or evaluation)) in ti,ab
#48 (time* near deci*) in ti,ab
#49 ((seek* or ask* or look* or call*) near (treat* or help* or assist* or care or attention)) in ti,ab
#50 #46 or #47 or #48 or #49
#51 #45 or #50
#52 explode "Social-Environment"/ all subheadings
#53 explode "Social-Behavior"/ all subheadings
#54 explode "Support-Psychosocial"/ all subheadings
#55 ((community or social) near (support or education* or organi?ation or awareness)) in ti,ab
#56 ((community or social) near intervention*) in ti,ab
#57 support system* in ti,ab
#58 support* patient* in ti,ab
#59 explode "Communications-Media"/ all subheadings
#60 (media or campaign*) in ti,ab
#61 (television or film*) in ti,ab
#62 (video near (tap* or record* or cassette)) in ti,ab
#63 (advertisement* or advertising) in ti,ab
#64 "Pamphlets"/ all subheadings
#65 (pamphlet* or leaflet* or booklet*) in ti,ab
#66 explode "Preventive-Health-Care"/ all subheadings
#67 "Health-Promotion"/ all subheadings
#68 (preventive near health near service*) in ti,ab
#69 health education* in ti,ab
#70 health promotion* in ti,ab
#71 public education* in ti,ab

#72 professional education* in ti,ab
#73 education* intervention in ti,ab
#74 (nurse near (instruction* or intervention or counsel*)) in ti,ab
#75 "Professional-Patient Relations"/ all subheadings
#76 "Patient-Attitudes"/ all subheadings
#77 (patient* near (participation or attitude* or choice* or decision* or education* or counsel*)) in ti,ab
#78 patient information in ti,ab
#79 explode "Interviews"/ all subheadings
#80 (one-to-one near interview*) in ti,ab
#81 (talking near patient*) in ti,ab
#82 early intervention in ti,ab
#83 brief intervention in ti,ab
#84 "Role-Playing"
#85 (rehearsal or role-play*) in ti,ab
#86 "Support-Groups"/ all subheadings
#87 support group* in ti,ab
#88 self help in ti,ab
#89 explode "Health-Behavior"/ all subheadings
#90 health behavio?r in ti,ab
#91 health seeking behavio?r in ti,ab
#92 "Help-Seeking-Behavior"/ all subheadings
#93 "Telephone-Information-Services"/ all subheadings
#94 (helpline* or help line* or help-line*) in ti,ab
#95 nhs direct in ti,ab
#96 direct mail* in ti,ab
#97 national heart attack alert program* in ti,ab
#98 rapid early action for coronary treatment* in ti,ab
#99 Worcester heart attack study* in ti,ab
#100 #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 or #68 or #69 or #70 or #71 or #72 or #73 or #74 or #75 or #76 or #77 or #78 or #79
#101 #80 or #81 or #82 or #83 or #84 or #85 or #86 or #87 or #88 or #89 or #90 or #91 or #92 or #93 or #94 or #95 or #96 or #97 or #98 or #99
#102 #100 or #101
#103 #22 and #51
#104 #102 and #103

PsycLIT: Silverplatter. CD-ROM. 1887-2001/01. 15th January 2001.

The PsycLIT ‘intervention’ search covered the date range 1887 to January 2001 and identified 85 records.

#1 explode "Heart-Disorders"
#2 heart disease* in ti,ab
#3 coronary disease* in ti,ab
#4 (heart attack* or heart failure) in ti,ab
#5 heart arrest* in ti,ab
#6 (cardiac arrest* or cardiac failure) in ti,ab
#7 (cardiac symptom* or cardiac event*) in ti,ab
#8 (coronary symptom* or coronary event*) in ti,ab
#9 myocardial infarct* in ti,ab
#10 (myocardial near disease*) in ti,ab
#11 ami in ti,ab
#12 mi in ti,ab
#13 (acute near mi) in ti,ab
#14 "Thorax"
#15 chest pain* in ti,ab
#16 (acute near coronary near event*) in ti,ab
#17 (acute near coronary near episode*) in ti,ab

#18 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15 or #16 or #17
#19 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti, ab
#20 (time near (interval or elaps* or length)) in ti,ab
#21 #19 or #20
#22 "Emergency-Services"
#23 explode "Hospital-Admission"
#24 (hospital or hospitali?ation) in ti,ab
#25 (prehospital or pre hospital or pre-hospital) in ti,ab
#26 (gp* or general practitioner* or doctor*) in ti,ab
#27 emergency medical service* in ti,ab
#28 (emergency near service*) in ti,ab
#29 ambulance* in ti,ab
#30 (accident near emergency) in ti,ab
#31 emergency room in ti,ab
#32 (access* near service*) in ti,ab
#33 ((911 or 9-1-1) near (phone* or telephone* or call* or dial*)) in ti,ab
#34 ((999 or 9-9-9) near (phone* or telephone* or call* or dial*)) in ti,ab
#35 (arrival* or presentation* or admission*) in ti,ab
#36 #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35
#37 #21 and #36
#38 ((late or delay*) near (action or detection or identification or evaluation)) in ti,ab
#39 ((early or rapid) near (action or detection or identification or evaluation)) in ti,ab
#40 (time* near deci*) in ti,ab
#41 ((seek* or ask* or look* or call*) near (treat* or help* or assist* or care or attention)) in ti,ab
#42 #38 or #39 or #40 or #41
#43 #37 or #42
#44 explode "Social-Environments"
#45 explode "Social-Behavior"
#46 ((community or social) near (support or education* or organi?ation or awareness)) in ti,ab
#47 ((community or social) near intervention*) in ti,ab
#48 support system* in ti,ab
#49 support* patient* in ti,ab
#50 explode "Communications-Media"
#51 (media or campaign*) in ti,ab
#52 (television or film*) in ti,ab
#53 (video near (tap* or record* or cassette)) in ti,ab
#54 (advertisement* or advertising) in ti,ab
#55 (pamphlet* or leaflet* or booklet*) in ti,ab
#56 "Health-Promotion"
#57 (preventive near health near service*) in ti,ab
#58 health education* in ti,ab
#59 health promotion* in ti,ab
#60 public education* in ti,ab
#61 professional education* in ti,ab
#62 education* intervention in ti,ab
#63 (nurse near (instruction* or intervention* or counsel*)) in ti,ab
#64 explode "Client-Attitudes"
#65 (patient* near (participation or attitude* or choice* or decision* or education* or counsel*)) in ti,ab
#66 "Client-Education"
#67 patient information in ti,ab
#68 explode "Interviews"
#69 (one-to-one near interview*) in ti,ab
#70 (talking near patient*) in ti,ab
#71 early intervention in ti,ab
#72 brief intervention in ti,ab
#73 "Role-Playing"
#74 (rehearsal or role-play*) in ti,ab
#75 explode "Self-Help-Techniques"
#76 self help in ti,ab
#77 "Health-Behavior"

#78 health behavio?r in ti,ab
#79 health seeking behavio?r in ti,ab
#80 explode "Help-Seeking-Behavior"
#81 "Decision-Making"
#82 (decision near (aids or tools or support*)) in ti,ab
#83 "Hot-Line-Services"
#84 (helpline* or help line* or help-line*) in ti,ab
#85 nhs direct in ti,ab
#86 direct mail* in ti,ab
#87 national heart attack alert program* in ti,ab
#88 rapid early action for coronary treatment* in ti,ab
#89 Worcester heart attack study* in ti,ab
#90 #44 or #45 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66
#91 #67 or #68 or #69 or #70 or #71 or #72 or #73 or #74 or #75 or #76 or #77 or #78 or #79 or #80 or #81 or #82 or #83 or #84 or #85 or #86 or #87 or #88 or #89
#92 #90 or #91
#93 #18 and #43
#94 #92 and #93

Sociological Abstracts: Silverplatter. CD-ROM. 1963-2000/12. 11th January 2001.

The Sociological Abstracts 'intervention' search covered the date range 1963 to December 2000 and identified 15 records.

#1 "Heart-Diseases"
#2 heart disease* in ti,ab
#3 coronary disease* in ti,ab
#4 (heart attack* or heart failure) in ti,ab
#5 heart arrest* in ti,ab
#6 (cardiac arrest* or cardiac failure) in ti,ab
#7 (cardiac symptom* or cardiac event*) in ti,ab
#8 (coronary symptom* or coronary event*) in ti,ab
#9 myocardial infarct* in ti,ab
#10 (myocardial near disease*) in ti,ab
#11 ami in ti,ab
#12 (acute near mi) in ti,ab
#13 chest pain* in ti,ab
#14 (acute near coronary near event*) in ti,ab
#15 (acute near coronary near episode*) in ti,ab
#16 #1 or #2 or #3 or #4 or #5 or #6 or #7 or #8 or #9 or #10 or #11 or #12 or #13 or #14 or #15
#17 (delay* or postpon* or wait* or hesitat* or defer* or put off) in ti, ab
#18 (time near (interval or elaps* or length)) in ti,ab
#19 #17 or #18
#20 "Emergency-Medical-Services"
#21 explode "Emergencies"
#22 "Hospitalization"
#23 "Admissions"
#24 explode "Patients"
#25 (hospital or hospitali?ation) in ti,ab
#26 (prehospital or pre hospital or pre-hospital) in ti,ab
#27 (gp* or general practitioner* or doctor*) in ti,ab
#28 emergency medical service* in ti,ab
#29 (emergency near service*) in ti,ab
#30 ambulance* in ti,ab
#31 (accident near emergency) in ti,ab
#32 emergency room in ti,ab
#33 (access* near service*) in ti,ab
#34 ((911 or 9-1-1) near (phone* or telephone* or call* or dial*)) in ti,ab
#35 ((999 or 9-9-9) near (phone* or telephone* or call* or dial*)) in ti,ab
#36 (arrival* or presentation* or admission*) in ti,ab

#37 #20 or #21 or #22 or #23 or #24 or #25 or #26 or #27 or #28 or #29 or #30 or #31 or #32 or #33 or #34 or #35 or #36
#38 #19 and #37
#39 ((late or delay*) near (action or detection or identification or evaluation)) in ti,ab
#40 ((early or rapid) near (action or detection or identification or evaluation)) in ti,ab
#41 (time* near deci*) in ti,ab
#42 ((seek* or ask* or look* or call*) near (treat* or help* or assist* or care or attention)) in ti,ab
#43 #39 or #40 or #41 or #42
#44 #38 or #43
#45 explode "Social-Environment"
#46 explode "Social-Behavior"
#47 ((community or social) near (support or education* or organi?ation or awareness)) in ti,ab
#48 ((community or social) near intervention*) in ti,ab
#49 support system* in ti,ab
#50 support* patient* in ti,ab
#51 explode "Mass-Media"
#52 "Telecommunications-Policy"
#53 "Mass-Media-Effects"
#54 (media or campaign*) in ti,ab
#55 (television or film*) in ti,ab
#56 (video near (tap* or record* or cassette)) in ti,ab
#57 (advertisement* or advertising) in ti,ab
#58 (pamphlet* or leaflet* or booklet*) in ti,ab
#59 "Information-Sources"
#60 patient information in ti,ab
#61 "Health-Education"
#62 (preventive near health near service*) in ti,ab
#63 health education* in ti,ab
#64 health promotion* in ti,ab
#65 public education* in ti,ab
#66 professional education* in ti,ab
#67 education* intervention in ti,ab
#68 "Practitioner-Patient-Relationship"
#69 (nurse near (instruction* or intervention or counsel*)) in ti,ab
#70 (patient* near (participation or attitude* or choice* or decision* or education* or counsel*)) in ti,ab
#71 (one-to-one near interview*) in ti,ab
#72 (talking near patient*) in ti,ab
#73 explode "Intervention"
#74 early intervention in ti,ab
#75 brief intervention in ti,ab
#76 "Role-Playing"
#77 (rehearsal or role-play*) in ti,ab
#78 "Self-Help-Groups"
#79 "Self-Help"
#80 self help in ti,ab
#81 explode "Health-Behavior"
#82 health behavio?r in ti,ab
#83 health seeking behavio?r in ti,ab
#84 "Help-Seeking-Behavior"
#85 "Decision-Making"
#86 (decision near (aids or tools or support*)) in ti,ab
#87 "Telephone-Communications"
#88 (helpline* or help line* or help-line*) in ti,ab
#89 nhs direct in ti,ab
#90 direct mail* in ti,ab
#91 national heart attack alert program* in ti,ab
#92 rapid early action for coronary treatment* in ti,ab
#93 esheart attack study* in ti,ab
#94 or #46 or #47 or #48 or #49 or #50 or #51 or #52 or #53 or #54 or #55 or #56 or #57 or #58 or #59 or #60 or #61 or #62 or #63 or #64 or #65 or #66 or #67 or #68 or #69 or #70
#95 #71 or #72 or #73 or #74 or #75 or #76 or #77 or #78 or #79 or #80 or #81 or #82 or #83 or #84 or #85 or #86 or #87 or #88 or #89 or #90 or #91 or #92 or #93

#96 #94 or #95
#97 #16 and #44
#98 #96 and #97

Mental Health Abstracts: DIALOG. 1969-2001/01. 16th January 2001.

The DIALOG online host was used to search the following 4 databases with the same search strategy: Mental Health Abstracts, Social SciSearch, SciSearch and ERIC. The Mental Health Abstracts 'intervention' search covered the date range 1969 to January 2001 and identified 1 record.

s1 s heart(w)disease? ? or coronary(w)disease? ?
s2 s myocardial(w)infarct? or myocardial(w)disease? ?
s3 s heart(w)attack? ? or heart(w)failure
s4 s cardiac(w)arrest? ? or cardiac(w)failure
s5 s cardiac(w)symptom? ? or cardiac(w)event? ?
s6 s coronary(w)symptom? ? or coronary(w)event? ?
s7 s chest(3w)pain? ?
s8 s acute(3w)coronary(3w)event? ?
s9 s acute(3w)coronary(3w)episode? ?
s10 s s1:s9
s11 s delay? or postpon? or wait? or hesitat? or defer? or put(w)off
s12 s time(3n)interval
s13 s time(3n)elaps?
s14 s time(3n)length
s15 s s11:s14
s16 s hospital or hospitali?ation
s17 s prehospital or pre(w)hospital or pre-hospital
s18 s gp? ? or general(w)practitioner? or doctor?
s19 s emergency(w)medical(w)service?
s20 s emergency(3w)service?
s21 s ambulance?
s22 s accident(2w)emergency
s23 s emergency(w)room
s24 s access?(3n)service?
s25 s 911(3n)call?
s26 s 911(3n)dial?
s27 s 999(3n)call?
s28 s 999(3n)dial?
s29 s arrival? ? or presentation? or admission?
s30 s s16:s29
s31 s s15 and s30
s32 s late(w)action
s33 s early(w)action
s34 s time?(3n)deci?
s35 s (seek? or ask? or look?)(5n)(treat? or help? or assist? or care or attention)
s36 ss s32:s35
s37 s s31 or s36
s38 s (community or social)(3n)(support or education? or organi?ation or intervention?)
s39 s patient?(3n)(participation or attitude? or choice? or decision? or support or information)
s40 s health(3w)(education? or promotion? or behavio?r)
s41 s education?(3n)(professional or public or patient? or intervention?)
s42 s nurse(3n)(instruction? or intervention? or counsel?)
s43 s (nurse or doctor or professional)(w)patient(w)relation?
s44 s (early or brief)(w)intervention?
s45 s self(w)help
s46 s hotline? or helpline? or help(w)line? or help-line?
s47 s media(3n)(communication? or campaign? or mass)
s48 s television or film?
s49 s video(n)(tap? or cassette or record?)
s50 s pamphlet? or leaflet? or booklet?
s51 s advertisement? or advertising

s52 s s38:s51
s53 s s10 and s37 and s52

Social Science Citation Index (Social SciSearch): DIALOG. 1972-2001/01. 16th January 2001.

The above search strategy used for the Mental Health Abstracts database via the DIALOG online host was also used for the Social SciSearch database. The Social SciSearch 'intervention' search covered the date range 1972 to January 2001 and identified 45 records.

Science Citation Index (SciSearch): DIALOG. 1974-2001/01. 16th January 2001.

The above search strategy used for the Mental Health Abstracts database via the DIALOG online host was also used for the SciSearch database. The SciSearch 'intervention' search covered the date range 1974 to January 2001 and identified 173 records.

Educational Resources Information Center (ERIC): DIALOG. 1966-2001/01. 16th January 2001.

The above search strategy used for the Mental Health Abstracts database via the DIALOG online host was also used for the ERIC database. The ERIC 'intervention' search covered the date range 1966 to January 2001 and identified 3 records.

Applied Social Sciences Index and Abstracts (ASSIA): DATASTAR. 1987-2001. 16th January 2001.

The ASSIA 'intervention' search covered the date range 1987 to 2001 and identified 8 records.

#1 (heart adj disease$1) or (coronary adj disease$1)
#2 (myocardial adj infarct$) or (myocardial adj disease$1)
#3 (heart adj attack$1) or (heart adj failure)
#4 (cardiac adj arrest$1) or (cardiac adj failure)
#5 (cardiac adj symptom$1) or (cardiac adj event$1)
#6 (coronary adj symptom$1) or (coronary adj event$1)
#7 chest with pain$1
#8 acute with (coronary adj event$1)
#9 acute with (coronary adj episode$1)
#10 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9
#11 delay$ or postpon$ or wait$ or hesitat$ or defer$ or (put adj off)
#12 time with interval
#13 time with elaps$
#14 time with length
#15 11 or 12 or 13 or 14
#16 (hospital or hospitalisation or hospitalization).ti,ab.
#17 prehospital or (pre adj hospital)
#18 gp$1 or doctor$ or (general adj practitioner$)
#19 emergency adj (medical adj service$)
#20 emergency with service$
#21 ambulance$
#22 accident with emergency
#23 emergency adj room
#24 access$ with service$
#25 '911' with call$
#26 '911' with dial$
#27 '999' with call$
#28 '999' with dial$
#29 arrival$1 or presentation$ or admission$
#30 16 or 17 or 18 or 19 or 20 or 21 or 22 or 23 or 24 or 25 or 26 or 27 or 28 or 29
#31 15 and 30
#32 late adj action
#33 early adj action
#34 time$ with deci$
#35 (seek$ or ask$ or look$) with (treat$ or help$ or assist$ or care or attention)
#36 32 or 33 or 34 or 35
#37 31 or 36
#38 (community or social) with (support or education$ or organisation or organization or intervention$)
#39 patient$ with (participation or attitude$ or choice$ or decision$ or support or information)
#40 health adj (education$ or promotion$ or behavior or behaviour)
#41 education$ with (professional or public or patient$ or intervention$)
#42 nurse with (instruction$ or intervention$ or counsel$)
#43 (nurse or doctor or professional) adj (patient adj relation$)
#44 (early or brief) adj intervention$
#45 self adj help
#46 hotline$ or helpline$ or (help adj line$)
#47 media with (communication$ or campaign$ or mass)
#48 television or film$

#49 video adj (tap$ or cassette or record$)
#50 pamphlet$ or leaflet$ or booklet$
#51 advertisement$ or advertising
#52 38 or 39 or 40 or 41 or 42 or 43 or 44 or 45 or 46 or 47 or 48 or 49 or 50 or 51
#53 10 and 37 and 52

System for Information on Grey Literature in Europe (SIGLE): STN. 1976-2001. 16th January 2001.

The SIGLE 'intervention' search covered the date range 1976 to 2001 and identified 0 records.

L1 s (heart(w)disease#) or (coronary(w)disease#)
L2 s (myocardial(w)infarct?) or (myocardial(w)disease#)
L3 s (heart(w)attack#) or (heart(w)failure)
L4 s (cardiac(w)arrest#) or (cardiac(w)failure)
L5 s (cardiac(w)symptom#) or (cardiac(w)event#)
L6 s (coronary(w)symptom#) or (coronary(w)event#)
L7 s chest(3w)pain#
L8 s acute(3w)(coronary(3w)event#)
L9 s acute(3w)(coronary(3w)episode#)
L10 s L1-L9
L11 s delay? or postpon? or wait? or hesitat? or defer? or (put(w)off)
L12 s time(3a)interval
L13 s time(3a)elaps?
L14 s time(3a)length
L15 s L11-L14
L16 s (hospital or hospitali!ation)/ti,ab
L17 s prehospital or (pre(w)hospital)
L18 s gp# or doctor? or (general(w)practitioner?)
L19 s emergency(w)(medical(w)service?)
L20 s emergency(3w)service?
L21 s ambulance?
L22 s accident(2w)emergency
L23 s emergency(w)room
L24 s access?(3a)service?
L25 s 911(3a)call?
L26 s 911(3a)dial?
L27 s 999(3a)call?
L28 s 999(3a)dial?
L29 s arrival# or presentation? or admission?
L30 s L16-L29
L31 s L15 and L30
L32 s late(w)action
L33 s early(w)action
L34 s time?(3a)deci?
L35 s (seek? or ask? or look?)(5a)(treat? or help? or assist? or care or attention)
L36 s L32-L35
L37 s L31 or L36
L38 s (community or social)(3a)(support or education? or organi!ation or intervention?)
L39 s patient?(3a)(participation or attitude? or choice? or decision? or support or information)
L40 s health(3w)(education? or promotion? or behavio!r)
L41 s education?(3a)(professional or public or patient? or intervention?)
L42 s nurse(3a)(instruction? or intervention? or counsel?)
L43 s (nurse or doctor or professional)(w)patient(w)relation?
L44 s (early or brief)(w)intervention?
L45 s self(w)help
L46 s hotline? or helpline? or help(w)line? or help-line?
L47 s media(3a)(communication? or campaign? or mass)
L48 s television or film?
L49 s video(w)(tap? or cassette or record?)
L50 s pamphlet? or leaflet? or booklet?

L51 s advertisement? or advertising
L52 s L38:L51
L53 s L10 and L37 and L52

Cochrane Controlled Trials Register (CCTR): Cochrane Library, 2000:4. CD-ROM. 11th January 2001.

The Cochrane Controlled Trials Register (CCTR) was searched to find completed trials. The search was carried out on 11th January 2001 and identified 41 records.

#1 HEART-DISEASES*:ME
#2 (HEART next DISEASE*)
#3 (MYOCARDIAL next INFARCT*)
#4 (((HEART next ATTACK*) or (HEART next FAILURE)) OR (HEART NEXT ARREST*))
#5 ((CARDIAC next ARREST*) or (CARDIAC next FAILURE))
#6 ((CARDIAC next SYMPTOM*) or (CARDIAC next EVENT*))
#7 (((CORONARY next DISEASE*) or (CORONARY next SYMPTOM*)) OR (CORONARY NEXT EVENT*))
#8 CHEST-PAIN*:ME
#9 (CHEST next PAIN)
#10 (((((((#1 or #2) or #3) or #4) or #5) or #6) or #7) or #8) or #9)
#11 (((((DELAY* or POSTPON*) or WAIT*) or HESITAT*) or DEFER*) OR (PUT next OFF))
#12 (TIME near ((INTERVAL or ELAPS*) or LENGTH))
#13 (#11 or #12)
#14 TIME-FACTORS*:ME
#15 TRANSPORTATION-OF-PATIENTS*:ME
#16 EMERGENCY-SERVICE-HOSPITAL*:ME
#17 EMERGENCIES*:ME
#18 PATIENT-ADMISSION*:ME
#19 ((HOSPITAL or HOSPITALIZATION) or HOSPITALISATION)
#20 ((PREHOSPITAL or (PRE next HOSPITAL)) OR PRE-HOSPITAL)
#21 ((GP* or (GENERAL next PRACTITIONER*)) OR DOCTOR*)
#22 ((EMERGENCY next MEDICAL) next SERVICE*)
#23 (EMERGENCY near SERVICE*)
#24 AMBULANCE*
#25 (ACCIDENT near EMERGENCY)
#26 (EMERGENCY next ROOM)
#27 (ACCESS* near SERVICE*)
#28 ((ARRIVAL* or PRESENTATION*) or ADMISSION*)
#29 ((((SEEK* or ASK*) or LOOK*) or CALL*) near ((((TREAT* or HELP*) or ASSIST*) or CARE) or ATTENTION))
#30 ((((((((((((((#14 or #15) or #16) or #17) or #18) or #19) or #20) or #21) or #22) or #23) or #24) or #25) or #26) or #27) or #28) or #29)
#31 (#13 and #30)
#32 SOCIAL-ENVIRONMENT*:ME
#33 SOCIAL-BEHAVIOR*:ME
#34 ((COMMUNITY or SOCIAL) near ((((SUPPORT or EDUCATION*) or ORGANISATION) or ORGANIZATION) or AWARENESS))
#35 ((COMMUNITY or SOCIAL) near INTERVENTION*)
#36 (SUPPORT next SYSTEM*)
#37 (SUPPORT* next PATIENT*)
#38 COMMUNICATIONS-MEDIA*:ME
#39 (MEDIA or CAMPAIGN*)
#40 (TELEVISION or FILM*)
#41 (VIDEO near ((TAP* or RECORD*) or CASSETTE))
#42 (ADVERTISEMENT* or ADVERTISING)
#43 PAMPHLETS*:ME
#44 ((PAMPHLET* or LEAFLET*) or BOOKLET*)
#45 PREVENTIVE-HEALTH-SERVICES*:ME
#46 HEALTH-PROMOTION*:ME
#47 ((PREVENTIVE near HEALTH) near SERVICE*)
#48 (HEALTH next EDUCATION*)

#49 (HEALTH next PROMOTION*)
#50 (PUBLIC next EDUCATION*)
#51 (PROFESSIONAL next EDUCATION*)
#52 (EDUCATION* next INTERVENTION)
#53 EDUCATION-PROFESSIONAL*:ME
#54 PROFESSIONAL-PATIENT-RELATIONS*:ME
#55 (NURSE near ((INSTRUCTION* or INTERVENTION) or COUNSEL*))
#56 PATIENT-ACCEPTANCE-OF-HEALTH-CARE*:ME
#57 (PATIENT* near (((((PARTICIPATION or ATTITUDE*) or CHOICE*) or DECISION*) or EDUCATION*) or COUNSEL*))
#58 (PATIENT next INFORMATION)
#59 (EARLY next INTERVENTION)
#60 (BRIEF next INTERVENTION)
#61 ROLE-PLAYING*:ME
#62 (REHEARSAL or ROLE-PLAY*)
#63 SELF-HELP-GROUPS*:ME
#64 (SELF next HELP)
#65 HEALTH-BEHAVIOR*:ME
#66 (HEALTH next (BEHAVIOR or BEHAVIOUR))
#67 DECISION-MAKING*:ME
#68 (DECISION near ((AIDS or TOOLS) or SUPPORT*))
#69 HOTLINES*:ME
#70 ((HELPLINE* or (HELP next LINE*)) OR HELP-LINE*)
#71 (DIRECT next MAIL*)
#72 ((((((((((((((((#32 or #33) or #34) or #35) or #36) or #37) or #38) or #39) or #40) or #41) or #42) or #43) or #44) or #45) or #46) or #47) or #48) or #49) or #50)
#73 ((((((((((((((((((#51 or #52) or #53) or #54) or #55) or #56) or #57) or #58) or #59) or #60) or #61) or #62) or #63) or #64) or #65) or #66) or #67) or #68) or #69) or #70) or #71)
#74 (#72 or #73)
#75 (#10 and #31)
#76 (#74 and #75)

Database of Abstracts of Reviews of Effects (DARE): Cochrane Library, 2000:4. CD-ROM. 11th January 2001.

DARE was searched at the same time as the CCTR on the Cochrane Library, using the same search strategy listed above. The database was searched on the 11th January 2001 and identified 1 record.

NHS Economic Evaluation Database (NHS EED): Cochrane Library, 2000:4. CD-ROM. 11th January 2001.

NHS EED was searched at the same time as the CCTR on the Cochrane Library, using the same search strategy listed above. The database was searched on the 11th January 2001 and identified 3 records.

National Research Register (NRR): CD-Rom, 2000:4. CD-ROM. 11th January 2001.

The National Research Register (NRR) was searched to find ongoing and completed studies. The search was carried out on 11th January 2001 and identified 0 ongoing trials and 7 complete trials.

#1 HEART-DISEASES*:ME
#2 (HEART next DISEASE*)
#3 (MYOCARDIAL next INFARCT*)
#4 (((HEART next ATTACK*) or (HEART next FAILURE)) OR (HEART NEXT ARREST*))
#5 ((CARDIAC next ARREST*) or (CARDIAC next FAILURE))
#6 ((CARDIAC next SYMPTOM*) or (CARDIAC next EVENT*))
#7 (((CORONARY next DISEASE*) or (CORONARY next SYMPTOM*)) OR

(CORONARY NEXT EVENT*))
#8 CHEST-PAIN*:ME
#9 (CHEST next PAIN)
#10 (((((((#1 or #2) or #3) or #4) or #5) or #6) or #7) or #8) or #9)
#11 (((((DELAY* or POSTPON*) or WAIT*) or HESITAT*) or DEFER*) OR (PUT next OFF))
#12 (TIME near ((INTERVAL or ELAPS*) or LENGTH))
#13 (#11 or #12)
#14 TIME-FACTORS*:ME
#15 TRANSPORTATION-OF-PATIENTS*:ME
#16 EMERGENCY-SERVICE-HOSPITAL*:ME
#17 EMERGENCIES*:ME
#18 PATIENT-ADMISSION*:ME
#19 ((HOSPITAL or HOSPITALIZATION) or HOSPITALISATION)
#20 ((PREHOSPITAL or (PRE next HOSPITAL)) OR PRE-HOSPITAL)
#21 ((GP* or (GENERAL next PRACTITIONER*)) OR DOCTOR*)
#22 ((EMERGENCY next MEDICAL) next SERVICE*)
#23 (EMERGENCY near SERVICE*)
#24 AMBULANCE*
#25 (ACCIDENT near EMERGENCY)
#26 (EMERGENCY next ROOM)
#27 (ACCESS* near SERVICE*)
#28 ((ARRIVAL* or PRESENTATION*) or ADMISSION*)
#29 ((((SEEK* or ASK*) or LOOK*) or CALL*) near ((((TREAT* or HELP*) or ASSIST*) or CARE) or ATTENTION))
#30 ((((((((((((((#14 or #15) or #16) or #17) or #18) or #19) or #20) or #21) or #22) or #23) or #24) or #25) or #26) or #27) or #28) or #29)
#31 (#13 and #30)
#32 SOCIAL-ENVIRONMENT*:ME
#33 SOCIAL-BEHAVIOR*:ME
#34 ((COMMUNITY or SOCIAL) near ((((SUPPORT or EDUCATION*) or ORGANISATION) or ORGANIZATION) or AWARENESS))
#35 ((COMMUNITY or SOCIAL) near INTERVENTION*)
#36 (SUPPORT next SYSTEM*)
#37 (SUPPORT* next PATIENT*)
#38 COMMUNICATIONS-MEDIA*:ME
#39 (MEDIA or CAMPAIGN*)
#40 (TELEVISION or FILM*)
#41 (VIDEO near ((TAP* or RECORD*) or CASSETTE))
#42 (ADVERTISEMENT* or ADVERTISING)
#43 PAMPHLETS*:ME
#44 ((PAMPHLET* or LEAFLET*) or BOOKLET*)
#45 PREVENTIVE-HEALTH-SERVICES*:ME
#46 HEALTH-PROMOTION*:ME
#47 ((PREVENTIVE near HEALTH) near SERVICE*)
#48 (HEALTH next EDUCATION*)
#49 (HEALTH next PROMOTION*)
#50 (PUBLIC next EDUCATION*)
#51 (PROFESSIONAL next EDUCATION*)
#52 (EDUCATION* next INTERVENTION)
#53 EDUCATION-PROFESSIONAL*:ME
#54 PROFESSIONAL-PATIENT-RELATIONS*:ME
#55 (NURSE near ((INSTRUCTION* or INTERVENTION) or COUNSEL*))
#56 PATIENT-ACCEPTANCE-OF-HEALTH-CARE*:ME
#57 (PATIENT* near (((((PARTICIPATION or ATTITUDE*) or CHOICE*) or DECISION*) or EDUCATION*) or COUNSEL*))
#58 (PATIENT next INFORMATION)
#59 (EARLY next INTERVENTION)
#60 (BRIEF next INTERVENTION)
#61 ROLE-PLAYING*:ME
#62 (REHEARSAL or ROLE-PLAY*)
#63 SELF-HELP-GROUPS*:ME
#64 (SELF next HELP)

#65 HEALTH-BEHAVIOR*:ME
#66 (HEALTH next (BEHAVIOR or BEHAVIOUR))
#67 DECISION-MAKING*:ME
#68 (DECISION near ((AIDS or TOOLS) or SUPPORT*))
#69 HOTLINES*:ME
#70 ((HELPLINE* or (HELP next LINE*)) OR HELP-LINE*)
#71 (DIRECT next MAIL*)
#72 ((((((((((((((((((#32 or #33) or #34) or #35) or #36) or #37) or #38) or #39) or #40) or #41) or #42) or #43) or #44) or #45) or #46) or #47) or #48) or #49) or #50)
#73 ((((((((((((((((((((#51 or #52) or #53) or #54) or #55) or #56) or #57) or #58) or #59) or #60) or #61) or #62) or #63) or #64) or #65) or #66) or #67) or #68) or #69) or #70) or #71)
#74 (#72 or #73)
#75 (#10 and #31)
#76 (#74 and #75)

Internet Resources

A number of internet sites were searched for further information about predictors of decision time in seeking help for the signs and symptoms of an AMI and interventions to reduce this decision time.

Searches were carried out on the Internet using the medical search engines OMNI (http://omni.ac.uk/), Medscape (http://medscape.com/) and the Health Development Agency (HDA) HealthPromis database (http://healthpromis.hea.org.uk), the meta-search engine Copernic (http://www.copernic.com/) and the general search engines Alta Vista (http://www.altavista.com/) and Google (http://www.google.com/). Specialist Heart related sites such as the American Heart Association (http://americanheart.org/) and the American College of Cardiology (http://www.acc.org) were searched. Three major heart delay sites were also searched; National Heart Attack Alert Program (http://www.nhlbi.nih.gov/about/nhaap/index.htm), Early Heart Attack Care (http://jumpstart.chestpaincenters.org/ehac/blue_new.cfm) and Rapid Early Action for Coronary Treatment (http://www.epi.umn.edu/react/welcome.html).

A selection of simple search terms were used alone and in combination; 'heart attack', 'myocardial infarction', 'mi','delay' and 'heart'. The results were then browsed to find relevant references. These were then saved as html files.

The three heart delay sites were referred to in their entirety as all pages were deemed to be of potential interest.

Copernic
http://www.copernic.com
This site was searched on the 31st of January 2001 and had 204 hits.

Medscape
http://medscape.com/
This site was searched on the 31st of January 2001 and had 187 hits.

Google
http://www.google.com/
This site was searched on the 12th of February 2001 and all relevant hits had already been retrieved.

Alta Vista
http://www.altavista.com/
This site was searched on the 12th of February 2001 and all relevant hits had already been retrieved.

OMNI
http://omni.ac.uk/)
This site was searched on the 12th of February 2001 and there were no relevant hits.

HDA HealthPromis
http://healthpromis.hea.org.uk
This site was searched on the 13th of February 2001 and there was 1 hit.

American Heart Association
http://americanheart.org/
This site was searched on the 13th of February 2001 and had 3 relevant hits.

American College of Cardiology
http://www.acc.org)
This site was searched on the 13th of February 2001 and had 100 hits.

REACT (Rapid Early Action for Coronary Treatment)
http://www.epi.umn.edu/react/welcome.html
The reviewers were referred to the site and any relevant pages or papers were saved as html files.

EHAC (Early Heart Attack Care)
http://jumpstart.chestpaincenters.org/ehac/blue_new.cfm
The reviewers were referred to the site and any relevant pages or papers were saved as html files.

NHAAP (National Heart Attack Alert Program)
http://www.nhlbi.nih.gov/about/nhaap/index.htm)
The reviewers were referred to the site and any relevant pages or papers were saved as html files.

The search results from MEDLINE, EMBASE, CINAHL, PsycLIT, Sociological Abstracts, Mental Health Abstracts, Social SciSearch, SciSearch, ASSIA, ERIC and the Cochrane Controlled Trails Register were downloaded and imported into Endnote (ISI ReSearchSoft, USA) reference management software and duplicate records were deleted.

The search results from the National Research Register, DARE and NHS EED were downloaded in full into a text file. The search results from the Internet were saved as HTML files.

Appendix B: Quality assessment criteria

RCTs only

1. Were the intervention and control groups randomly selected?

Yes
No
Not reported/ insufficient information

2. Was allocation concealed?

Yes *(i.e. it is clear that allocation could not have been predicted)*
No
Not reported insufficient information

RCTs and controlled trial only

1. Were the groups comparable at baseline?

Yes *(i.e. there were no baseline differences between control and intervention groups that could have influenced the outcome of delay time)*
No *(i.e. there were baseline differences between control and intervention groups that could influenced the outcome of delay time)*
Not reported/insufficient information *(i.e. it was not possible to determine from the information provided whether there were baseline differences between control and intervention groups)*

2. Were the groups treated identically other than the named interventions?

Yes
No
Not reported/insufficient information

3. Were the outcome assessors blind to allocation?

Yes *(i.e. individuals assessing delay time were unaware as to whether patients were from the intervention or control group)*
No
Not reported/insufficient information

4. Was the method of measuring delay time reported?

Yes *(i.e. both the method of measuring time of onset of symptoms and the method of measuring time of call for help/arrival at hospital were reported)*
No *(i.e. neither the method of measuring time of onset of symptoms nor the method of measuring time of call for help/arrival at hospital was reported)*
Partial *(i.e. only the method of measuring time of onset of symptoms or only the method of measuring time of call for help/arrival at hospital was reported)*

5. What (if any) was the percentage of missing data?

6. Were appropriate statistical analyses used?

Yes *(i.e. statistical analyses used were appropriate for the type of data being analysed)*
No *(i.e. statistical analyses used were inappropriate for the type of data being analysed)*
Not reported/insufficient information *(i.e. no information was provided on the type of statistical analyses carried out, but there was evidence that statistical analyses were carried out)*
Not applicable *(i.e. no statistical analyses were carried out)*

7. Was a sample size/power calculation performed?

Yes
Not reported/insufficient information

Before-and-after studies only

1. Was the method of measuring delay time reported?

Yes *(i.e. both the method of measuring time of onset of symptoms and the method of measuring time of call for help/arrival at hospital were reported)*
No *(i.e. neither the method of measuring time of onset of symptoms nor the method of measuring time of call for help/arrival at hospital was reported)*

Partial *(i.e. only the method of measuring time of onset of symptoms or only the method of measuring time of call for help/arrival at hospital was reported)*

2. Was there adjustment for the effect of any confounding factors?

Yes *(i.e. some adjustment was made)*
No/not reported/insufficient information *(i.e. no adjustment was made, or little or no information on adjustment was provided)*
Not applicable *(i.e. no confounding factors were reported)*

3. Was a sample size/power calculation performed?

Yes
No/not reported/insufficient information

4. Were appropriate statistical analyses used?

Yes *(i.e. statistical analyses used were appropriate for the type of data being analysed)*
No *(i.e. statistical analyses used were inappropriate for the type of data being analysed)*
Not reported/insufficient information *(i.e. no information was provided on the type of statistical analyses carried out, but there was evidence that statistical analyses were carried out)*
Not applicable *(i.e. no statistical analyses were carried out)*

Appendix C: Excluded studies

Study details	General		Predictor studies			Intervention studies	
	Primary study[a]	Delay time and AMI[b]	Factors influencing delay time[c]	Multi-variate analysis[d]	Outcome of patient delay[e]	Appropriate intervention[f]	Appropriate study design[g]
Aguayo de Hoyas (1999)[1]	Yes	Yes	No			No	
Ahmad (1992)[2]	Yes	Yes	No			No	
Aleksandrow (1979)[3]	Yes	Yes	Yes	No		No	
Alonzo (1977)[4]	Yes	No					
Alonzo (1986)[5]	Yes	Yes	Yes	Yes	No	No	
Alonzo (1973)[6]	Yes	Yes	Yes	No		No	
Anand (1997)[7]	Yes	Yes	No			No	
Anonymous (1997)[8]	No						
Anonymous (1987)[9]	Yes	Yes	Yes	No		No	
Anonymous (1995)[10]	Yes	Yes	No			No	
Arboleda Sanchez (1999)[11]	Yes	Yes	Yes	No		No	
Balagtas (1990)[12]	Yes	Yes	No			No	
Barber (1973)[13]	Yes	Yes	Yes	No		No	
Barrillon (1978)[14]	Yes	Yes	Yes	No		No	
Baumann (1976)[15]	Yes	Yes	No			No	
Bellam (1989)[16]	Yes	Yes	Yes	No		No	
Berglin Blohm (1998)[17]	Yes	Yes	Yes	Yes	No	No	
Bernard (1988)[18]	Yes	Yes	Yes	No		No	
Bett (1993)[19]	Yes	Yes	No			No	
Beunderman (1976)[20]	No						
Birkhead (1992)[21]	Yes	Yes	No			No	
Blank (1998)[22]	Yes	Yes	No			No	
Bleeker (1993)[23]	Yes	Yes	Yes	No		No	
Bleeker (1993)[24]	Yes	Yes	Yes	No		No	
Bleeker (1995)[25]	Yes	Yes	Yes	No		No	
Bouma (1999)[26]	Yes	Yes	Yes	No		No	
Bouvrain (1971)[27]	Yes	Yes	Yes	No		No	
Bradley (1995)[28]	No						
Brieger (1998)[29]	Yes	Yes	No			No	
Broer (1998)[30]	Yes	Yes	Yes	No		No	
Brophy (1998)[31]	Yes	Yes	Yes	No		No	
Brown (2000)[32]	Yes	No					
Brown (1998)[33]	Yes	Yes	Yes	No		No	
Brown (1995)[34]	Yes	Yes	Yes	No		No	
Bullen (1997)[35]	Yes	Yes	No			No	
Bundy (1996)[36]	Yes	Yes	No			No	
Cabades (1999)[37]	Yes	No					
Cabades (1997)[38]	Yes	No					
Cagan (1999)[39]	Yes	Yes	Yes	No		No	
Caldwell (2000)[40]	Yes	Yes	Yes	No		No	
Cambou (1990)[41]	No						
Canto (2000)[42]	Yes	Yes	No			No	
Castiella (1997)[43]	Yes	Yes	Yes	No		No	
Castillo-Fenoy (1987)[44]	Yes	Yes	Yes	No		No	
Chavez (1993)[45]	No						
Clark (1992)[46]	Yes	Yes	Yes	Yes	No	No	
Cooper (1986)[47]	Yes	Yes	No			No	
Coutaz (1990)[48]	Yes	Yes	Yes	No		No	
Cox (1997)[49]	Yes	Yes	Yes	No		No	
Crumlish (2000)[50]	No						
Davidson (1976)[51]	Yes	Yes	Yes	No		No	
De Backer (1994)[52]	No						
Dellborg (1988)[53]	Yes	Yes	Yes	No		No	
Dellborg (1993)[54]	Yes	Yes	No			No	
Dempsey (1995)[55]*	Yes	Yes	Yes	No		No	
Dewar (1991)[56]	Yes	Yes	No			Yes	No
Dickerson (1998)[57]*	Yes	Yes	Yes	No		No	

Study details	General		Predictor studies			Intervention studies	
	Primary study[a]	Delay time and AMI[b]	Factors influencing delay time[c]	Multi-variate analysis[d]	Outcome of patient delay[e]	Appropriate intervention[f]	Appropriate study design[g]
Dickson (1992)[58]	Yes	Yes	Yes	No		No	
Dracup (1997)[59]	Yes	Yes	Yes	Yes	No	No	
Dracup (1997)[60]	Yes	Yes	Yes	Yes	No	No	
Echanove (1999)[61]	Yes	No					
Ecochard (2000)[62]	Yes	Yes	Yes	Yes	No	No	
Eppler (1994)[63]	Yes	Yes	No			No	
Erhardt (1974)[64]	Yes	Yes	Yes	No		No	
Evans (1990)[65]	Yes	No					
Flototto (1975)[66]	Yes	Yes	Yes	No		No	
Foster (1998)[67]*	Yes	Yes	Yes	No		No	
Fraser (2000)[68]	Yes	Yes	No			No	
Frohner (1989)[69]	Yes	Yes	Yes	No		No	
Gaspov (1993)[70]	Yes	Yes	Yes	No		No	
Genoni (1996)[71]	Yes	Yes	Yes	No		No	
Ghali (1993)[72]	Yes	Yes	Yes	No		No	
Ghanima (2000)[73]	Yes	Yes	No			No	
Giebel (1992)[74]	Yes	Yes	Yes	No		No	
Giebel (1992)[75]	Yes	Yes	Yes	No		No	
Gilchrist (1973)[76]	Yes	Yes	Yes	No		No	
Gillum (1976)[77]	Yes	Yes	Yes	No		No	
Goff (1999)[78]	Yes	Yes	Yes	Yes	No	No	
Goldberg (1999)[79]	Yes	Yes	Yes	Yes	No	No	
Goldberg (2000)[80]	Yes	Yes	Yes	Yes	No	No	
Goldberg (1992)[81]	Yes	Yes	Yes	No		No	
Goldstein (1972)[82]	Yes	Yes	Yes	No		No	
Grasshoff (1995)[83]	Yes	Yes	No			No	
Gudmundsson (1980)[84]	Yes	Yes	Yes	No		No	
Gurwitz (1997)[85]	Yes	Yes	Yes	Yes	No	No	
Hackett (1972)[86]	Yes	Yes	No			No	
Hackett (1969)[87]	Yes	Yes	Yes	Yes	No	No	
Haghfelt (1980)[88]	Yes	Yes	Yes	No		No	
Haigh (1991)[89]	Yes	Yes	No			No	
Hartford (1993)[90]	Yes	Yes	Yes	No		No	
Hartford (1990)[91]	Yes	Yes	Yes	No		No	
Hartnett (1996)[92]	Yes	Yes	No			No	
Hayasaki (1984)[93]	Yes	Yes	No			No	
Haywood (1993)[94]	Yes	No					
Hedges (1998)[95]	Yes	Yes	Yes	No		No	
Hejl (1976)[96]	Yes	Yes	Yes	No		No	
Heriot (1993)[97]	Yes	Yes	Yes	No		No	
Herlitz (1988)[98]	No						
Hirvonen (1998)[99]	Yes	Yes	Yes	No		No	
Hoegholm (1989)[100]	Yes	Yes	Yes	No		No	
Hofgren (1988)[101]	Yes	Yes	Yes	No		No	
Holt (1999)[102]	No						
Horne (2000)[103]	Yes	Yes	Yes	No		No	
Hu (1991)[104]	Yes	Yes	No			No	
Huddleston (1996)[105]*	Yes	Yes	Yes	No		No	
Hurlimann (1998)[106]	Yes	Yes	Yes	No		No	
Jasinski (1979)[107]	Yes	Yes	Yes	No		No	
Jensen (1993)[108]	Yes	Yes	Yes	No		No	
Johnson (1995)[109]	Yes	Yes	No			No	
Karlson (1990)[110]	Yes	Yes	Yes	Yes	No	No	
Karlson (1994)[111]	Yes	Yes	No			No	
Kennerly (1996)[112]	Yes	Yes	No			No	
Kenyon (1991)[113]	Yes	Yes	Yes	Yes	No	No	
Killinger (1993)[114]	Yes	Yes	No			No	
Kolitz (1988)[115]	Yes	Yes	Yes	No		No	
Kruszewska (1997)[116]	Yes	Yes	Yes	No		No	
Ladwig (1991)[117]	Yes	Yes	Yes	No		No	
Landa Goni (1990)[118]	Yes	Yes	Yes	No		No	
Latour Perez (1996)[119]	Yes	Yes	Yes	Yes	No	No	
Lee (1998)[120]	Yes	Yes	Yes	No		No	

Study details	General		Predictor studies			Intervention studies	
	Primary study[a]	Delay time and AMI[b]	Factors influencing delay time[c]	Multi-variate analysis[d]	Outcome of patient delay[e]	Appropriate intervention[f]	Appropriate study design[g]
Lee (2000)[121]	Yes	Yes	Yes	No		No	
Leitch (1989)[122]	Yes	Yes	Yes	No		No	
Leslie (2000)[123]	Yes	Yes	Yes	No		No	
Levy (1981)[124]	Yes	No					
Logue (1991)[125]	Yes	Yes	Yes	No		No	
MacGowan (1991)[126]	Yes	Yes	No			No	
Maclean (1975)[127]	No						
Macneill (1995)[128]	Yes	No					
Madsen (1981)[129]	Yes	Yes	No			No	
Maggioni (1990)[130]	Yes	Yes	No			No	
Magid (1997)[131]	Yes	Yes	Yes	Yes	No	No	
Maroni (1988)[132]	Yes	Yes	Yes	No		No	
Matthews (1983)[133]	Yes	Yes	Yes	No		No	
Maynard (1995)[134]	Yes	Yes	Yes	No		No	
McIlwaine (1986)[135]	Yes	Yes	No			No	
McKinley (2000)[136]	Yes	Yes	Yes	No		No	
Meischke (1995)[137]	Yes	Yes	Yes	No		No	
Meischke (1994)[138]	Yes	Yes	No			No	
Meischke (1998)[139]	Yes	Yes	Yes	Yes	No	No	
Meischke (2000)[140]	Yes	No					
Meischke (1993)[141]	Yes	Yes	Yes	Yes	No	No	
Meischke (2000)[142]	Yes	Yes	No	No		No	
Meischke (1995)[143]	Yes	No					
Miller (1997)[144]	Yes	No					
Miracle (2000)[145]	Yes	Yes	Yes	No		No	
Miric (1990)[146]	Yes	No					
Mogensen (1975)[147]	Yes	No					
More (1995)[148]	Yes	Yes	No			Yes	No
Moser (1993)[149]	No						
Moss (1969)[150]	Yes	Yes	Yes	No		No	
Moss (1970)[151]	Yes	Yes	Yes	No		No	
Mumford (1999)[152]	Yes	Yes	Yes	No		No	
Murphy (1996)[153]	Yes	Yes	Yes	No		No	
Newby (1996)[154]	Yes	Yes	Yes	No		No	
Nitzkin (2000)[155]	No						
Nolan (1991)[156]	Yes	Yes	Yes	No		No	
Norris (1973)[157]	Yes	Yes	Yes	No		No	
O'Callaghan (1995)[158]	Yes	Yes	Yes	No		No	
O'Hare (1993)[159]	Yes	Yes	Yes	No		No	
Oka (1996)[160]	Yes	Yes	No			No	
Olin (1964)[161]	Yes	Yes	No			No	
Ong (2000)[162]	Yes	Yes	Yes	No		No	
Oscherwitz (1975)[163]	Yes	Yes	Yes	No		No	
Ottesen (1998)[164]	Yes	Yes	Yes	Yes	No	No	
Ottesen (1996)[165]	Yes	Yes	Yes	Yes	No	No	
Pell (2001)[166]	Yes	No					
Peter (2000)[167]	Yes	Yes	No			No	
Picken (1998)[168]	Yes	Yes	Yes	Yes	No	No	
Podczeck (1996)[169]	Yes	Yes	No			No	
Podell (1980)[170]	Yes	Yes	No			No	
Pozen (1978)[171]	Yes	Yes	No			No	
Puska (1975)[172]	Yes	Yes	Yes	No		No	
Raczynski (1993)[173]	Yes	No					
Rapold (1990)[174]	Yes	Yes	Yes	No		No	
Rawles (1988)[175]	Yes	Yes	Yes	No		No	
Reilly (1994)[176]	Yes	Yes	Yes	No		No	
Richards (2000)[177]	Yes	Yes	Yes	No		No	
Ridker (1992)[178]	Yes	Yes	No			No	
Ritzmann (2000)[179]	Yes	Yes	Yes	No		No	
Roberts (1994)[180]	Yes	Yes	Yes	Yes	No	No	
Roth (1997)[181]	Yes	Yes	No			No	
Rowley (1992)[182]	Yes	Yes	Yes	No		No	
Rukholm (1989)[183]	Yes	Yes	Yes	No		No	
Rustige (1990)[184]	Yes	Yes	No			Yes	No

Study details	General		Predictor studies			Intervention studies	
	Primary study[a]	Delay time and AMI[b]	Factors influencing delay time[c]	Multi-variate analysis[d]	Outcome of patient delay[e]	Appropriate intervention[f]	Appropriate study design[g]
Rustige (1997)[185]	Yes	Yes	Yes	Yes	No	No	
Ruston (1998)[186]*	Yes	Yes	Yes	No		No	
Sainsous (1989)[187]	Yes	Yes	Yes	No		No	
Sanchez (1993)[188]	Yes	Yes	Yes	Yes	No	No	
Saner (1994)[189]	Yes	Yes	No			No	
Sarantidis (1997)[190]	Yes	Yes	No			No	
Scherck (1997)[191]	Yes	Yes	No			No	
Scherer (1989)[192]	Yes	Yes	No			No	
Schmidt (1990)[193]	Yes	Yes	Yes	Yes	No	No	
Schmidt (1996)[194]	Yes	Yes	Yes	No		No	
Schmidt (1991)[195]	Yes	Yes	No			No	
Schroeder (1978)[196]	Yes	Yes	Yes	No		No	
Schwarz (1994)[197]	Yes	Yes	Yes	No		No	
Schwarz (1993)[198]	Yes	Yes	Yes	No		No	
Segers (1977)[199]	Yes	No					
Sheifer (2000)[200]	Yes	Yes	Yes	Yes	No	No	
Siltanen (1979)[201]	Yes	Yes	No			No	
Simon (1972)[202]	Yes	Yes	Yes	No		No	
Sire (1981)[203]	Yes	Yes	Yes	No		No	
Smyllie (1972)[204]	Yes	Yes	No			No	
Swor (2000)[205]	Yes	Yes	No			No	
Syed (2000)[206]	Yes	Yes	Yes	Yes	No	No	
Szczepanski (1973)[207]	Yes	Yes	Yes	No		No	
Takagi (1981)[208]*	Yes	Yes	Yes	No		No	
Takano (1987)[209]	Yes	Yes	No			No	
Taylor (1998)[210]	Yes	Yes	No			No	
Teng (1994)[211]	Yes	No					
Theisen (1994)[212]	Yes	Yes	Yes	No		No	
Theorell (1975)[213]	Yes	Yes	Yes	No		No	
Tilli (1997)[214]	Yes	Yes	No			No	
Tjoe (1972)[215]	Yes	Yes	Yes	No		No	
Trent (1995)[216]	Yes	Yes	No			No	
Tresch (1996)[217]	Yes	Yes	No			No	
Tunstall-Pedoe (1996)[218]	Yes	Yes	No			No	
Uretsky (1977)[219]	Yes	Yes	No			No	
Vincelj (1998)[220]	Yes	Yes	No			No	
Vroom (1973)[221]	Yes	Yes	Yes	No		Yes	No
Wagner (1998)[222]	Yes	Yes	No			No	
Wallbridge (1992)[223]	Yes	Yes	Yes	No		No	
Walsh (1974)[224]	Yes	Yes	Yes	No		No	
Weaver (1996)[225]	Yes	No					
White (2000)[226]*	Yes	Yes	No			No	
Wielgosz (1988)[227]	Yes	Yes	Yes	Yes	No	No	
Yarzebski (2000)[228]	Yes	Yes	Yes	No		No	
Yarzebski (1994)[229]	Yes	Yes	Yes	Yes	No	No	
Zammit Maempel (1978)[230]	Yes	Yes	Yes	No		No	
Zdichynec (1978)[231]	Yes	Yes	No			No	

The inclusion criteria were only assessed up to and including the first inclusion criterion that was not met
[a] Is it a primary study?; [b] Is the study concerned with the time to seeking medical help/arrival at hospital in people with suspected AMI?; [c] Does the study relate to factors that may influence time to seeking medical help in patients with suspected AMI?; [d] Does the study involve multivariate analysis?; [e] Does the study look at patient delay as an outcome?; [f] Does the study evaluate an intervention to reduce time to seeking medical help/arrival at hospital in people with suspected AMI whereby patient or pre-hospital delay is an outcome?; [g] Does it use one of the following study designs: randomised controlled trial, controlled trial or before-and-after study?; *Indicates qualitative studies

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Appendix D: Details of analyses used in predictor studies

In the reporting of the results we have adopted the statistical terms used by the authors of the primary studies. We have attempted to classify the type of statistical analyses used according to the information presented in the original studies.

This section describes the details relating to univariate and multivariate analyses used in each predictor study. Information such as how the authors decided which variables to enter into multivariate analyses and the percentage of explained variance (for regression analysis), are provided where available. The studies used a variety of statistical analyses including different types of regression (stepwise multiple regression, multiple regression, multivariate linear regression, and polytomous logistic regression) and other types of analysis (automatic interaction detector, multiple non-linear analysis, and multivariate analysis of variance). For ease of presentation, and readability, author names have been used to describe the analyses of predictor studies.

Three studies investigated predictors of delay time in stepwise multiple regression.[35, 37, 41] Burnett et al.[35] entered a number of variables into univariate analyses, conducted using the chi-squared test and analysis of variance, but demographic variables such as age and sex were not entered. Stepwise multiple regression was performed on a subset of the original population (n=361) in order to ensure that there were no missing data points for any of the variables entered into the regression model. The logarithm of delay was used as the dependent variable because the distribution of the untransformed decision time was skewed. The criterion for variables to enter and remain in the multivariate model was 0.10, thus variables with $p<0.10$ in the univariate analysis were entered into the multivariate analysis. Some variables (e.g. marital status, ethnicity) that were not entered into univariate analyses were entered into the regression. It is unclear if any other variables that were not examined in the univariate analysis were entered into the multivariate analyses, as only statistically significant variables were reported. The final regression model accounted for approximately 30% of the variance in patient delay.

Martiny et al.[37] conducted univariate analyses before multivariate analyses using chi-squared and ANOVA (for continuous variables). Age and sex were not entered into the univariate analyses but they were entered into stepwise multiple regression. Geographical location was put into the regression analyses, even though it was not statistically significant in the univariate analyses. In the stepwise regression, the coefficients of statistically significant variables were reported, but p values were not. The 'coefficient of multiple correlation' (equivalent to R) relative to the complete model was 0.22, thus the percentage of explained variance, R^2 was 4.8%. The authors state that this indicates that although some variables made a significant contribution to the model, these variables do not have a high predictive value.

Ell et al.[41] conducted preliminary analysis using two-way analysis of variance. The stepwise multiple regression involved forward inclusion and backward elimination processes on log-transformed data. It was unclear which variables were put into the preliminary or multivariate analyses. For both types of analyses, only statistically significant findings were reported, thus it is possible that other factors were also investigated. In the multiple regression, the percentage of variance explained was 0.17. The authors also performed stepwise multiple regression analysis of decision-path duration on the following subgroups: White, African American, Latino, Public Hospital and Private health maintenance organisation. As race and hospital type were entered into the total group analysis, sub-group analyses involving these variables have not been reported here. Another publication by Ell[44] reported the results of a stepwise multiple regression analysis on the African American participants from the previously mentioned study.[41] The results of this analysis have not been reported here as the analysis of the whole sample in the main paper involved race.

Rawles et al.[39] conducted univariate analysis using Kendall's rank correlation to relate patient delay to symptom scores and cardiac enzyme concentrations, and linear regression to relate transformed data. The Wilcoxon test was used for comparison of means. The distribution of patient delays was extremely skewed, but was normalised using log-log transformation. Multiple regression analysis on transformed data was used for relating patient delay to symptom scores and cardiac enzyme concentrations. Age was statistically significant in the univariate analysis, but did not appear to be entered into the multivariate analysis. Breathlessness and anxiety were not statistically significant in the univariate analysis, but appeared to be entered into the multivariate analyses. The percentage of explained variance in this analysis was 5.76% ($R=0.24$, $F(2, 247)=7.70$, $p<0.001$).

Fowler[34] conducted univariate analysis before multivariate analysis. Univariate analysis involved simple bivariate analysis using t-test correlations, one way analysis of variance and chi-squared tests to determine the amount of delay attributable to each dependent variable. Multivariate analysis, using the log of delay time as the dependent variable, appeared to be performed on the same variables that were entered into univariate analysis. However, this was not entirely clear as the author used a code to represent each variable in the multivariate analysis, and it was not obvious what all the variable codes represented. The interaction effects of the revised Health Fears Inventory total scores on the other independent variables (determined by multiplying the Health Fear Inventory scores by each of the other independent variables) were also entered into the analysis. The multiple regression (n=184) yielded the following data: multiple R=0.281, R square=0.079, and the adjusted R square=0.026, which were not statistically significant.

Ashton[9] carried out univariate analyses using a chi-squared test on the predictor variable gender only. Multivariate analyses was conducted using polytomous logistic regression and variables examined were those that yielded sufficient data for investigating relationships and 'those variables of most interest in the study'. As it was not stated which variables these were, it was unclear what variables went into this analysis. The author did not report which variables were statistically significant, and only mentioned which variables 'appeared to be the most highly related to delay'. The percentage of explained variance in the polytomous logistic regression was not reported.

Crawford et al.[42] did not perform a univariate analysis before conducting a multivariate linear regression for participants who sought care for chest pain (logistic regression was used to examine predictors of delay time for participants seeking help for shortness of breath, but these results have not been reported here). Stepwise and backward elimination procedures (with $p<0.05$) were employed to eliminate redundant or unrelated covariates from the multivariate models in order to better estimate the effects of the remaining predictors. Model fit was assessed with residual diagnostics. Statistics were not reported for some variables entered into the analysis and it was therefore assumed that they were eliminated at an early stage in stepwise and backward elimination procedures and hence were not statistically significant. Results reported here are adjusted for racial differences. The percentage of explained variance was not reported.

Leizorovicz et al.[36] conducted univariate analysis using the Wilcoxon rank test. Multivariate linear regression, using a generalised linear model was used to identify which 'baseline characteristics correlated with a longer or shorter delay'. Thus it is likely that those variables entered into the linear regression were those baseline characteristics entered into univariate analysis, although this was unclear as another table also reported baseline characteristics, and only statistically significant results were reported. The percentage of explained variance was not reported.

Sjögren et al.[43] conducted univariate and multivariate analysis simultaneously using multiple non-linear analysis on the same predictor variables. In the multivariate analysis a squared beta coefficient indicates a strong association of the non-dependent variable with the dependent variable when all other variables have been taken into account. The dependent variable was a delay time of greater than six hours (delay time of less than 2 hours was also used as a dependent variable, but these findings have not been reported here). The authors reported variables with a squared beta value greater than or equal to 0.01, but do not state which are statistically significant.

Bleeker et al.[38] conducted univariate analysis using Mann Whitney U and chi-squared tests while multivariate analysis was conducted using Multivariate Analysis of Variance (MANOVA). Univariate analysis was performed on knowledge, acute coping, and sociodemographic variables, while MANOVA was conducted on general coping and denial scales. Thus univariate and multivariate analysis were conducted on completely different sets of variables.

Alonzo[40] conducted univariate analysis using Kruskal-Wallis one way analysis of variance. Multivariate analysis was conducted using a procedure known as Automatic Interaction Detector (AID), which according to the author is designed primarily to handle dichotomous or continuous dependent variables. Delay times were transformed into their log values for the AID computations. It is unclear whether the sociodemographic and clinical factors investigated in the univariate analysis were entered into the multivariate analysis. The authors merely reported that the AID analysis included 'all factors thus far considered'. None of the univariate variables emerged as part of the AID multivariate model. The statistical significance of individual variables was not reported. Instead, the variables that were involved in the longest and shortest pathways to making a medical care decision were reported. Using AID, seven factors explained 43.2% of the variance in the medical care decision duration ($F=21.64$ (7, 940), $p<0.001$, $R2=64.1\%$).

Appendix E: Details of predictor studies

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
Author (year), country Alonzo (1980),[40] USA **Setting** Six Columbus hospitals, Ohio. **Authors' objectives** To study the initial medical care decision of patients who experienced acute cardiac symptomatology in order to determine factors contributing to expedient care-seeking and the decision to use EMS, direct emergency room services, or physician consultation. **Duration** 12 months.	**Inclusion criteria** Patients with acute cardiac symptomatology admitted to the hospital or emergency room of any one of six Columbus hospitals, Ohio. Inclusion for sub-group transported by one of the 4 mobile MCCUs: patients defined by the communication logs of the Columbus Division of EMS as suspected cardiovascular emergency cases. Inclusion for sub-group transported by non-MCCU means: patients defined by hospital admission records as suspected acute coronary artery disease (CAD). **Sample size** 1102 (551 MCCU patients, 551 non-MCCU patients). The total sample was regrouped as follows: 497 calling EMS or other emergency medical transport, 154 travelling to hospital emergency room by private automobile or taxi, 451 calling a physician or other medical person. **Participant details** **Age** 0-44yr.: 8.2% 45-54yr.: 20.5% 55-64 yr.: 29.8% 65+yr.: 41.6% **Gender** Men: 63.9% **Race** White: 86.0%, Black: 13.9%, Asian: 0.1% **History** History of CAD (n): EMS: 353, hospital emergency room: 86, physician consultation: 299 **Symptoms**	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors of longer delay, p<0.01 using Kruskal-Wallis 1-way ANOVA): Sex: EMS: male, female*; hospital emergency room: male, female; physician consultation: male, female*. Age: EMS 0-44yr., 45-54yr., 55-64yr., 65+yr.; hospital emergency room- 0-44yr., 45-54yr., 55-64yr., 65+yr.; physician consultation: 0-44yr., 45-54yr., 55-64yr., 65+yr. History of CAD: EMS: No CAD, CAD; hospital emergency room: No CAD, CAD*; physician consultation: No CAD, CAD. Final diagnosis: EMS: MI, non-MI diagnosis, non-coronary diagnosis; hospital emergency room: MI, non-MI diagnosis, non-coronary diagnosis; physician consultation: MI, non-MI diagnosis, non-coronary diagnosis. **Method of assessment of predictors** Patients were interviewed while hospitalised and again 6 months later. Interviews covered social and demographic background, medical and health care history, and experiences and circumstances surrounding hospitalisation. In cases where the patient died before he could be interviewed, family and other persons familiar with the circumstances surrounding hospitalisation were interviewed. **Method of assessment of delay time** Not stated **Delay time measured** Patient delay is defined as the medical	**Multivariate analyses** The type of multivariate analysis used was Automatic Interaction Detector (AID) procedure (designed primarily to handle dichotomous or continuous dependent variables). Times were transformed into their log values for the AID computations. Antilog values were reported. None of the variables entered into the univariate analysis were entered into the multivariate analysis. Variables entered into the multivariate analysis were: patients intentions when informing lay others (inform others and seek advice, other vs. turn over the situation to lay others*), symptom course (>30 min. vs. <30 min.), level of incapacitation (none, curtailed activities, stopped activities vs. collapsed or unconscious), usurpation of control by lay others (yes vs. no), number present at ASO (none, 1-3 vs. 4+), lay advice 1 (hospital emergency room, EMS vs. physician consultation; hospital emergency room, physician consultation vs. EMS), and setting at ASO (home vs. work, office, public). *includes unknown, not applicable, or other categories. **Power calculation** Not stated **Refusals** Not stated **Missing** data 1 participant was missing from the multivariate analysis.	**Results** R square=43.2%, p<0.001, F=83.18, df (910, 1101). Shortest MCD duration=5.5min. (n=72): this was when the patient's intention was to turn the situation over to lay others and when they became unconscious or collapsed. Longest MCD duration=481.0 min. (n=29): this was when the patient intended to ask for advice about symptoms, symptoms began within 30 minutes, lay others did not usurp control of the situation, and lay secondary advice was to seek physician consultation. Several factors contributed to a short medical care decision phase: they were a combination of the patient's intention to turn the situation over to lay others, patient collapse or incapacitation, symptom course of less than 30 minutes, usurpation of the situation by lay others, and numerous lay others present.

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	Acute symptom incidence by medical care decision types: EMS: chest pain: 78% arm, shoulder or jaw pain: 52% dyspnea: 61% dizziness: 31% syncope: 24% sudden fatigue: 48% diaphoresis: 60% abdominal pain: 6% nausea or vomiting: 52% diarrhoea: 8% palpitations: 17% other symptoms: 35% Hospital emergency room: chest pain: 92% arm, shoulder or jaw pain: 66% dyspnea: 52% dizziness: 31% syncope: 2% sudden fatigue: 42% diaphoresis: 60% abdominal pain: 8% nausea or vomiting: 44% diarrhoea: 5% palpitations: 19% other symptoms: 32 % Physician consultation: chest pain: 89% arm, shoulder or jaw pain: 63% dyspnea: 52% dizziness: 30% syncope: 7 % sudden fatigue: 53% diaphoresis: 54% abdominal pain: 9% nausea or vomiting: 47% diarrhoea: 6% palpitations: 18% other symptoms: 43% **Incapacitation by medical care decision types**: EMS: chest pain: 56% arm, shoulder or jaw pain: 56%	care decision (MCD) phase consisting of two phases: Self-evaluation phase (the period between acute symptom onset and the seeking of advice from lay or medical others) and Lay-evaluation phase (the period between seeking lay advice and the decision to seek medical evaluation). **Delay time** Median: total sample 75 min., EMS 41 min., hospital emergency room 105 min., physician consultation 150min.		

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	dyspnea: 63% dizziness: 57% syncope: 98% sudden fatigue: 64% diaphoresis: 38% abdominal: 47% nausea or vomiting: 40% diarrhoea: 36% palpitations: 38% other symptoms: 4%. Hospital emergency room: chest pain: 39% arm, shoulder or jaw pain: 39% dyspnea: 40% dizziness: 46% syncope: 100% sudden fatigue: 38% diaphoresis: 20% abdominal pain:17% nausea or vomiting: 28% diarrhoea: 0% palpitations: 17% other symptoms: 39% Physician consultation: chest pain: 58% arm, shoulder or jaw pain: 37% dyspnea: 45% dizziness: 46% syncope: 100% sudden fatigue: 41% diaphoresis; 25% abdominal pain: 46% nausea or vomiting: 36% diarrhoea: 23% palpitations: 27% other symptoms: 39% **Onset time** Not stated **Other participant details** Total sample: MI: 50.8% Non-MI diagnosis: 30.5% Non-coronary diagnosis: 18.7% MCCU sample: discharge diagnosis of AMI: 290			

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	other types of cardiac emergencies: 119 possible cardiac aetiologies: 41 non-cardiac aetiologies: 101 Non-MCCU sample: discharge diagnosis of AMI: 270 other types of cardiac emergencies: 95 possible cardiac aetiologies: 81 non-cardiac aetiologies: 105			
Author (year), country Ashton (1999),[9] USA **Setting** A 532-bed urban teaching hospital in Southern New Jersey. **Authors' objectives** To examine the experiences of men and women with symptoms of CHD who seek medical care. **Duration** No stated	**Inclusion criteria** Clients admitted to one of two cardiac units in an urban teaching hospital in southern New Jersey who were hospitalised for the first time with problems involving the heart and had admission or medical diagnosis of unstable angina, MI, or rule out MI. Clients hospitalised for diagnostic testing associated with annual physical exam or undergoing psychiatric therapy were excluded. **Sample size** 121 **Participant details** **Age** Mean 57.5 yr. men, 64.3 yr. women (t=3.02, p<0.003) **Gender** Men: 44.6% **Race** Men: African-American 18%, White 80%, Hispanic 2%. Women: African-American 16%, White 81%, Hispanic 3%. **History** Angina: 33% men, 49% women MI: 53% men, 33% women Uncertain diagnosis of 'rule out MI': 9.5% men, 11% women When analysed separately by	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors): gender. **Method of assessment of predictors** The principal investigator approached eligible participants during their stay on the progressive care unit. Interviews were conducted one day each week for 28 weeks and all eligible clients were approached on these days. Information was obtained using retrospective, self-reports. An instrument was developed by the author to gain an understanding of the subject's experience with heart disease that resulted in seeking care. The 30-item questionnaire contained 19 items, some of which were identified as important factors related to delay, and 11 demographic items. The questionnaire was reviewed for content validity by a panel of cardiovascular experts that included two cardiovascular clinical nurse specialists and a cardiologist. The questionnaire took about 10 minutes to complete and was administered by the author verbally. **Method of assessment of delay time** Not stated	**Multivariate analyses** Polytomous logistic regression was used to simultaneously consider multiple predictor variables in determining the relative risk of delay for men and women. The following variables were entered into the polytomous regression: gender, age, previously experienced symptoms, number of symptoms, smoking, diabetes, marital status, income source, and diagnosis. **Power calculation** Not stated **Refusals** It was reported that refusals were rare. **Missing data** 3 missing cases on delay time (1 women, 2 men)	**Results** It was not reported which variables were statistically significant. Only variables the author believed appeared to be most highly related to delay were reported. These were: smoking (states of having previously smoked or currently smoking were associated with less delay for both men and women); number of symptoms (the more symptoms experienced was associated with less delay for both men and women). No statistics were reported.

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	diagnosis, these diagnostic groups were not appreciably different from each other (p=0.93). Smoking: never: men 33%, women 52% quit >1 month: men 37%, women 19% smoker: men 30%, women 28% Diabetes: men 22%, women 31% Hypertension: men 41%, women 58% Birth control pills: women 5% Hormone replacement: women 12% **Symptoms** Men: chest pain/discomfort: 72% difficulty breathing: 44% nausea/vomiting: 15% loss of bowel/bladder: 7% sweating: 56% dizziness: 20% Previously experienced symptoms: 33% Women: chest pain/discomfort: 79% difficulty breathing: 55% nausea/vomiting: 31% loss of bowel/bladder: 6% sweating: 52% dizziness: 30% Previously experienced symptoms: 51% **Onset time** Men: 8am-4pm: 44% 4pm-midnight: 33% midnight-8am: 20% Women: 8am-4pm: 37% 4pm-midnight:25% midnight-8am: 34% **Other participant details** Education: Men: high school: 39%; <high school	**Delay time measured** Patient delay - defined as the time from onset of symptoms to the patient deciding to seek medical help. Delay was divided into three levels as follows: 0=none or delay <1 hr., 1=delay of 1-4 hr., and 2=delay >4 hr. **Delay time** Men: <1 hr.: 57% 1-4 hr.: 25% >4 hr.: 19% Women: <1 hr.: 48% 1-4 hr.: 42% >4 hr.: 11%		

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	graduate: 30%; some college: 15% college graduate or +: 17% Women: high school: 45%; <high school graduate: 37%; some college: 12%; college graduate or +: 6% Religion: Men: catholic: 46%; protestant: 39%; other or none: 15% Women: catholic: 48%; protestant: 42%; other or none: 10% Occupation: Men: retired: 37%; homemaker: 0%; labourer: 31%; clerical: 6%; managerial/professional: 24%; unemployed: 2% Women: retired: 33%; homemaker33%; labourer: 7%; clerical: 19%; managerial/professional: 7%; unemployed: 0% Marital status: Men: married or cohabiting: 67%; single: 13%; divorced, separated, widowed: 20% Women: married or cohabiting: 45%; single 6%; divorced, separated, widowed: 49% Children at home: Men: none: 69%; 1-2: 24%; >2: 7% Women: none: 54%; 1-2: 43%; >2: 3% Source of income: Men: salary: 50%; pension: 39%; government assistance: 6%; self employed: 4%; other: 2% Women: salary: 33%; pension: 55%; government assistance 9%; self; employed: 0%; other: 3%.			

Author (year), country	**Inclusion criteria**	**Predictors**	**Multivariate analyses**	**Results**
Bleeker (1995),[38] The Netherlands	People with a documented definite AMI who were admitted to the CCU of three hospitals in Rotterdam. Only	Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors using	MANOVA was used. Separate test values as well as 90% Bonferroni simultaneous confidence intervals	Reported 90% confidence intervals are Bonferroni.

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
Setting The CCUs of 3 hospitals in Rotterdam. **Authors' objectives** To assess the effects on patient delay of knowledge about an AMI (so-called cardiovascular knowledge) and psychological factors, such as coping and defence mechanisms. **Duration** 2 years.	those were included who were younger than 75 years, lived in the Netherlands, spoke Dutch adequately and were able to remember the events during the acute onset of the AMI until their arrival at the hospital and to reflect about their own behaviour. The AMI had to be developed outside the hospital and an AMI had to be the only diagnosis. **Sample size** 300 **Participant details** **Age** Mean 58 (SD 10) yr. men 60 (SD 11) yr. women. **Gender** Men: 79% **Race** Not stated **History** Not stated **Symptoms** No stated **Onset** time No stated **Other participant details** No stated	Mann-Whitney U and chi-square test): Knowledge of: symptoms*, actions*, and risk factors* was greater for short delayers; Coping during the acute phase of AMI: avoiding mental and physical effort, worrying, distracting* (short delayers used distraction of AMI symptoms to a lesser degree), seeking social support* (short delayers sought more social support); Defence mechanisms: displacement* was more likely in long delayers; Sociodemographic variables: sex, age, SES, past history of cardiac events. **Method of assessment of predictors** Patients were interviewed approximately five days after hospital admission. The first author interviewed all patients. All assessment tools were validated in The Netherlands, except for the cardiovascular and displacement interviews, which were developed within the project, because no other alternatives were available. Patients were interviewed about events during the acute phase of AMI by means of a revised version of the Patient Delay Questionnaire. The Patient Delay Questionnaire examines events during the acute phase of an AMI and in the preceding four weeks. Accuracy was cross-checked with a spouse, partner, family member, or close friend, as well as the municipal ambulance service. Significant others were approached by means of a written version of the Patient Delay Questionnaire, which they returned by mail. Other structured interviews concerned the defence mechanism of displacement, SES and cardiovascular knowledge. Patients also completed questionnaires about coping in the acute phase of an AMI and the defence mechanism of denial. These questionnaires were completed during	were calculated. None of the variables included in the univariate analysis were included in the multivariate analysis. Multivariate analysis was performed on coping in general and the denial scales. 'Coping in general' variables were active managing of the problems, palliative reaction, avoiding, seeking social support, expressing emotions, depressive reaction and easing thoughts. 'Denial' variables were resentment, dependency, anxiety and vital exhaustion. **Power calculation** Not stated **Refusals** Questionnaires were returned by 89% of significant others. **Missing data** Not stated	The coping scales showed a statistically significant multivariate effect (F=2.53, p=0.016). The following 'coping in general' variables were associated with shorter delay: active managing of problems (t=2.2, (90% CI: -0.07, 1.10, p=0.031)); seeking social support (t=2.0, (90% CI: -0.08, 0.76, p=0.047)); easing thoughts (t=2.8, (90% CI: 0.04, 0.76, p=0.006)) After Bonferroni adjustment, only easing thoughts remained statistically significant. No overall effect was found with the denial scales. The following 'denial' variables were associated with shorter delay: resentment (t=-2.3, (90% CI: -1.00, -0.03, p=0.024)); vital exhaustion (t=-1.99, (90% CI: -1.5, 0.09, p=0.048)) After Bonferroni adjustment, only resentment remained statistically significant.

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
		the interview. The Denial Questionnaire was completed independently by the patient and a significant other. Previous cardiac events were recorded at the cardiology department of each hospital. **Method of assessment of delay time** No stated **Delay time measured** Patient delay - defined as the time between the start of the complaints and the moment the patient or a significant other called for medical help. The population under study was subdivided into two parts by median delay (<or=30 min., >30min.). **Delay time** Median 30 min.		
Author (year), country Burnett (1995),[35] USA **Setting** Multiple regional cardiac referral centres in the USA **Authors' objectives** To identify factors that distinguish early responders from late responders. **Duration** Not stated. Patient follow-up was for 6 months after study entry (enrolment took place between 4/88 and 5/90).	**Inclusion criteria** Patients with well documented AMI. Inclusion for first sub-group: symptoms compatible with AMI of 6 hours duration or less accompanied by an electrocardiogram with more than 1 mm (0.1 mV) ST segment elevation in two or more contiguous leads; age of less than 76 years; no contraindication to thrombolytic intervention, including prior stroke or other known intracranial disease, recent trauma or surgery, refractory hypertension, active bleeding, or prolonged (more than 10 minutes) cardiopulmonary resuscitation; no prior coronary artery bypass graft surgery; no prior Q wave infarction in the same distribution as the current infarction; and absence of cardiogenic shock as defined by systolic blood pressure of less than 80 mm Hg with vasopressor	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors, p<0.05 using chi-square test): six domains: 1. Context: day of week (weekend, weekday); time of day (% am); where patient was when symptoms began (home, work, other); whom patient was with (alone, family, friends/co-workers). 2. Antecedents: what the patient was doing (passive, active, other); how expected the symptoms were; the level of emotional stress the patient was under. 3. Behavioural responses to the symptoms: what the patient did when symptoms were noticed (emotion-focused, problem-focused, other); ease in reaching the doctor; difficulty getting transportation to the hospital. 4. Affective responses to the symptoms: how anxious/upset the	**Multivariate analyses** In multiple regression analysis, decision time was coded as a continuous variable. Due to the skewed nature of decision time, the logarithm of decision time was used as the dependent variable. Stepwise multiple regression and a non-stepwise multiple regression were performed. The logarithm of delay time was used as the dependent variable because the distribution of the untransformed decision delay time was skewed. Variables with many missing observations and those considered less theoretically interesting were excluded from the analyses (not stated what these variables are.) For categorical variables with >2 response categories, dummy variables were created to allow these variables to be included in	**Results** Stepwise multiple regression: The final multiple regression model accounted for approximately 30% of the variance in delay time. Shorter delay times were most strongly associated with: greater patient perceptions of the seriousness of their symptoms (beta=-0.21, p<0.0001); more comfort in seeking medical assistance (beta=-0.24, p<0.0001); symptom onset outside of the home but not at work (beta=-0.76, p<0.0001); attributing symptoms to the heart (beta=-0.58, p<0.0005); being married (beta=-0.29, p<0.003); perceived inability to control the symptoms (beta=-0.11, p<0.037). The two most statistically significant predictors were perceived seriousness of symptoms and

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	requirement. Inclusion for second sub-group: AMI more than 6 but less than 24 hours after the onset of symptoms; an ECG ST-segment elevation of 1mm or more in two or more contiguous leads. The following were excluded: age above 75 years, chest pain relieved by nitroglycerin, a history of stroke or recent surgery or trauma, a predisposition to bleeding, previous Q-wave infarction in the distribution of the infarct-related artery, or blood pressure greater than 180/110 mm Hg by two separate measures. **Sample size** 501 **Participant details** **Age** Mean for total 57.6 yr., for early responders 57.6 yr., for late responders 57.7 yr. **Gender** Men: for total 75.7%, for early responders 76.0%, for late responders 75.5%. **Race** For total: White 89.2%, Black 7.7%, Other 3.1%; for early responders: White 87.8%, Black 9.8%, Other 2.5%; for late responders: White 90.4%, 6.0%, Other 3.6% **History** Not stated **Symptoms** Symptoms attributed to: heart: for early responders 47%, for late responders 18% indigestion: for early responders 26%, for late responders 52% other: for early responders 25%, for late responders 29% **Onset time** A.M.: for early responders 53.2%, for late responders 53.3%	patient felt*; comfort in seeking medical assistance*; severity of pain. 5. Cognitive responses to the symptoms: symptom attribution (heart, indigestion, other)*; perceived seriousness of symptoms*; perceptions of ability to control symptoms*. 6. Other's responses to symptoms: instrumental; palliative. **Method of assessment of predictors** Predictors were assessed by means of a questionnaire administered at a subset of study sites. Study nurses approached subjects on the first day of their hospitalisation. The 'Response to Symptoms' questionnaire consisted of 18 items that examined the six domains. **Method of assessment of delay time** Not stated **Delay time measured** Patient delay - defined as the length of the interval between the onset of symptoms and the request for medical assistance. Patients were assigned to either early (<60 minutes after the onset of AMI symptoms) or late (>or=60 minutes after symptom onset) responder groups based on a median split of decision time. **Delay time** Mean 3.05 (SD 4.97) hr.	the multiple regression analysis. The criterion for variables to enter and remain in the model was set at p<0.10. As only statistically significant variables were reported, it is not clear which variables were entered into the multivariate analyses. Marital status and ethnicity, which were not included in the univariate analysis, were entered in the stepwise multiple regression. Ejection fraction, AMI location and number of diseased vessels, which were not included in the univariate analysis, were entered in the non-stepwise regression model but not in the stepwise regression model. **Power calculation** Not stated **Refusals** No stated **Missing data** In univariate analysis delay time data were unavailable for 48 participants. The stepwise multiple regression was performed on 361 of the participants in order to ensure that there were no missing data points for any of the variables. The non-stepwise multiple regression was performed on 173 participants for whom there were complete disease severity data available.	perceived comfort level, which reduced delay time on a 1 to 5 scale by 76 and 55 minutes respectively. Attributing symptoms to the heart rather than to another organ system reduced delay by 26 minutes. Non-stepwise multiple regression: disease severity did not statistically significantly contribute to the model.

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	Weekend: for early responders 32%, for late responders 26% Weekday: for early responders 67%, for late responders 74% **Other participant details** Education (yr.): for total 11.4, for early responders 11.4, for late responders 11.4 Married: for total 77.5%, for early responders 79.3%, for late responders 75.9% Mean ejection fraction: for total 51.6%, for early responders 51.2%, for late responders 51.8% Anterior AMI location by ECG: for total 44.6%, for early responders 42.9%, for late responders 46.0% Inferior AMI location by ECG: for total 55.4%, for early responders 57.1%, for late responders 54.0% Number of coronary arteries narrowed >50% in diameter by angiogram: 0: for total 7.1%, for early responders 6.2%, for late responders 7.7% 1: for total 47.8%, for early responders 49.6%, for late responders 46.7% 2: for total 27.8%, for early responders 27.9%, for late responders 27.7% 3: for total 16.4%, for early responders 15.5%, for late responders 16.9%.			
Author (year), country Crawford (1994),[42] USA **Setting** Three inner city Boston neighbourhoods (Dorchester, Roxbury and Mattapan).	**Inclusion criteria** Black and white adults born in USA aged 44 to 75 years at time of interview. Participants had to have reported experiencing one or more of the following CHD symptoms: chest pain, discomfort, pressure, or	**Predictors** No univariate analysis was performed. Multivariate analysis was carried out on following variables: interaction between race and sex (black race: men only, women only; female sex: whites only, blacks only); SES:	**Multivariate analyses** For subjects who sought care for chest pain, a multivariate linear regression model was estimated. A similar model was estimated for shortness of breath. Because hours of delay was skewed for both symptoms, a log	**Results** Values reported are adjusted racial differences. For patients seeking care for chest pain, the following variables had shorter delay time: serious chest pain

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
Authors' objectives To identify the role of race in seeking and receipt of care for symptoms of CHD in a community based random sample of black and white adults with similar levels of SES and geographic access to care. **Duration** Not stated. Interviews were conducted between 9/88 and 12/89.	heaviness. **Sample** size 1007 **Participant details** **Age** Mean 56.0 (SD 8.1) yr. Blacks, 58.8 (SD 8.7) yr. Whites (p< 0.001) **Gender** Women: 66.2% Black, 54.7% White (p<0.001) **Race** 627 Blacks, 380 Whites **History** Blacks: Current smoking: 36.1% Diabetes: 19.4% Family history: 42.2% Mean BMI: 28.7 (SD=6.7) Hypertension: 64.1% Elevated cholesterol: 30.9% Whites: Current smoking: 38.45 Diabetes: 14.2% (p<0.05) Family history: 52.8% (p<0.001) Mean BMI: 26.8 (SD=5.6) (p<0.001) Hypertension: 48.2% (p<0.001) Elevated cholesterol: 34.4% **Symptoms** Blacks: no chest pain: 22.1% somewhat/ very serious chest pain: 43.4% no shortness of breath: 40.5% somewhat/very serious shortness of breath: 29.8% Whites: no chest pain: 24.0% somewhat/ very serious chest pain: 40.9% no shortness of breath: 37.9, % somewhat/very serious shortness of breath: 30.8% **Onset time** Not stated **Other participant details** Not stated	currently employed, very difficult paying for basics; insurance coverage: uninsured; risk factors: current smoking, hypertension, elevated cholesterol; symptoms: serious chest pain, serious shortness of breath; access: very difficult to reach care, very satisfied with care; propensity/knowledge: would seek care for six symptoms, MI knowledge **Method of assessment of predictors** A telephone interview was conducted asking if respondents had ever experienced chest pain, and if yes, had they seen a physician in response to the symptom. **Method of assessment of delay time** Patients were asked in a telephone interview, the time between first noticing the symptom and contacting health care professional. **Delay time measured** Patient delay - defined as time in hours between symptom onset and contact with medical person. **Delay time** Median 49.0 hr. Blacks, 73.0 hr. Whites. Median delay in seeking care for shortness of breath: 96.0 hr. Blacks, 336.0 hr. Whites (p<0.05)	transformation was applied. Unadjusted racial differences for each of the outcomes were assessed by including only race as a predictor. Corresponding adjusted racial differences were obtained by adding the remaining predictors. The interaction between race and sex was included as a predictor. Stepwise and backward elimination procedures (p<0.05) were employed to eliminate redundant or unrelated covariates from the multivariate models in order to better estimate the effects of the remaining predictors. Model fit was assessed with residual diagnostics for the linear regressions. **Power calculation** Not stated **Refusals** 232 refused to participate and 48 could not be recontacted after initial screening. Response rate was 87.9% among the 2310 known eligible persons. Because the composition of the respondent sample of 2030 persons (39.8% white, 37.8% male) differed very little from that of the full potential sample of 2310 persons (41.2% white, 39.2% male), no adjustments were made for non-response. **Missing data** In the multivariate **analysis**, the sample size was 468 for the chest pain group, and 303 for the shortness of breath group.	(cofficient=-1.72, (95% CI: -2.39, -1.05)); general propensity was to seek care for six symptoms (coefficient=-0.95, (95% CI: -1.60, -0.30)) For patients seeking care for chest pain, the following variables had longer delay time: currently employed (coefficient=0.97, (95% CI: 0.35, 1.59)); elevated cholesterol levels (coefficient=0.86, (95% CI: 0.21, 1.50)) For patients seeking care for shortness of breath, the following variables had shorter delay time: black women (coefficient=-1.62, (95% CI: -2.74, -0.50)); serious chest pain (coefficient=-0.90, (95% CI: -1.78, -0.02)); serious shortness of breath (coefficient=-1.92, (95% CI: -2.82, -1.02)); very difficult access to reach care (coefficient=-1.95, (95% CI: -3.71, -0.19)); general propensity was to seek care for six symptoms (coefficient=-1.00, (95% CI: -1.88, -0.12))

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
Author (year), country Ell (1995),[41] USA **Setting** Two Los Angeles medical centers: a large urban public hospital (Los Angeles County- University of Southern California Medical Centre) and a large urban private HMO hospital (Kaiser Hospital, Los Angeles). **Authors' objectives** To systematically examine the length of time spent in deciding to seek emergency medical care for acute chest pain, identify factors that influence decision time, and ascertain behaviours engaged in during the decision-making process, as influenced by racial/ethnic group and SES. **Duration** 8/88 to 7/90.	**Inclusion criteria** Racial/ethnic group status had to be African-American, Latino or White and patients had to be hospitalised for acute chest pain. The following were excluded: unwilling to give consent, inability to cooperate due to severity of illness or mental status, alternative clinical diagnosis, discharge prior to being interviewed and care-seeking decision duration time exceeding 1 week. **Sample size** 1441 **Participant details** **Age** <or=44 yr.: 15.7% 45-64 yr.: 53.3% >or=65 yr.: 31.0% **Gender** Men: 59.1% **Race** White: 34.8%, African-American: 31.2%, Latino: 34.0%. **History** History AMI: 459 History Angina: 785 Other heart disease: 470 **Symptoms** Not stated **Onset time** Not stated **Other participant details** Public hospital patients: 49.8% Private hospital patients: 50.2%	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors of longer delay, p<0.05 using 2-way ANOVA): Race: White, African-American*, Latino; African-American: public hospital*, private hospital; Latino: <65yrs*, >65yrs; Female: White, African-American*, Latino. As only statistically significant variables appear to have been reported, it is unclear if any other variables went into the univariate analysis. **Method of assessment of predictors** Interviews were conducted by bilingual bicultural researchers assigned to each hospital, using a structured questionnaire incorporating instruments from previous surveys of health care behaviour and access to care. The data collection utilised questions from an instrument used in a previous study of the impact of a MCCU on acute care-seeking behaviour. **Method of assessment of delay time** To record the duration of the decision-making period (i.e. decision-path duration), interviewers verified times by using a benchmark technique whereby the patient was asked to verify the time reported with an event occurrence, daily routine, or break in routine. **Delay time measured** Patient delay – defined as length of time between onset of acute symptoms and decision to seek emergency care (referred to as decision-path duration).	**Multivariate analyses** Multiple regression modelling (including stepwise forward inclusion and backward elimination) was used to compare results among and within racial/ethnic groups, and determine the predictors of decision time. The decision time was log transformed prior to multivariate analyses. Variables entered into the multivariate analysis that were not entered into the 2-way ANOVA were insurance type, symptom pattern, symptom intensity, consulted medical professional, and transportation. Race and age were entered into the 2-way ANOVA but it is unclear whether they entered into multivariate analysis as only statistically significant variables were reported. For the same reason, it is unclear if any other variables were entered into the multivariate analysis. Stepwise multiple regression analysis of decision-path duration was also performed on the following subgroups: White, African-American, Latino, Public Hospital and Private HMO. **Power calculation** Not stated **Refusals** Not stated **Missing data** 7 participants were excluded because delay was more than 1 week, giving a sample of 1434.	**Results** R square=0.17 Hospital (1=public, 2=HMO): coefficient=-0.83, SE=0.32, p=0.01. (Public hospital locus extended the decision duration) Insurance (no, yes): coefficient=-0.80, SE=0.34, p=0.02. (Having no insurance extended the decision duration) Symptom pattern (continuous, intermittent): coefficient=1.00, SE=0.19, p=0.001. (Perceived symptom severity reduced the decision duration.) Symptom intensity (increasing, decreasing): coefficient=0.57, SE=0.18, p=0.002. (Perceived symptom intensity reduced the decision duration.) Consulted medical professional (no, yes): coefficient=1.02, SE=0.20, p=0.001. (Consultation with a medical professional extended the decision duration) Transportation (paramedic, other): coefficient=1.62, SE=0.24, p=0.001. (Use of paramedic transport reduced the decision duration.) Gender (male, female): coefficient=0.40, SE=0.18, p=0.03. (Being female extended the decision duration)

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
		Delay time Mean 9 hr., median 1.75 (range 0-123) hr.		
Author (year), country Fowler (1997),[34] USA **Setting** St. Agnes Chest Pain Emergency Room at St. Agnes Hospital (a non-profit 452 bed Catholic secondary hospital) in Southwest Baltimore city. **Authors' objectives** To investigate the relationship between patient delay and medical fears and phobias in acute chest pain patients. **Duration** 6 weeks.	**Inclusion criteria** Patients had to present to the St. Agnes chest pain emergency room with chest pain and discomfort and survive long enough to complete the interviews and questionnaires. Pregnant women and individuals less than 18 years of age were excluded. **Sample size** 211 **Participant details** **Age** Mean 56.005 yr., median 57 yr., mode 67 yr., min. 20 yr., max. 96 yr., SD=17.997 yr., SE=1.242 yr. **Gender** Men: 39.5% **Race** White 69.5%, Non-white 30.5%. **History** History of ischemic heart disease: 40.5% **Symptoms** Not stated **Onset time** Not stated **Other participant details** Confirmed coronary artery disease: 35% Education (yr.): mean 11.952, median 12, mode 12, min. 4, max. 24, SD=3.176, SE=0.219 Chronic disease: 58.3% Cardiac illness belief status for current admission: 61.1% Self-treatment: 49.3%	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors, $p<0.05$ using t-test, 1-way ANOVA and chi-square test): fear, trait anxiety, age, pain, education, race, gender, chronic disease status (non-infarct angina, diabetes and hypertension) vs. non chronic, patient belief in cardiac origin of symptoms* (non believers delayed longer), pre-hospitalisation self-treatment, history of ischemic heart disease, subsequent confirmation of ischemic myocardial disease for this admission, fear levels in patients with no subsequent confirmation of heart disease, fear levels in patients with subsequent confirmation of heart disease. Univariate post-hoc analyses were also used to investigate the relationship between pre-hospitalisation activity level and delay, marital status and delay, and insurance status and delay. None of these variables were statistically significant. **Method of assessment of predictors** Each patient coming into the chest pain emergency room with signs and symptoms of chest pain was solicited for interviewing using the revised Health Fear Inventory (specific for cardiovascular problems), the Spielberger Trait Anxiety Inventory and the Chest Pain Questionnaire. The questionnaires were administered by only the author, in order to	**Multivariate analyses** In the multivariate analysis the dependent variable of delay was log transformed to decrease the effects of the wide range of values and insure greater adherence to the assumptions underlying multiple regression analysis. Multiple regression analysis was performed. The dependent variable of delay was log transformed to decrease the effects of the wide range of values and insure greater adherence to the assumptions underlying multiple regression analysis. The variables entered into the multivariate analysis were those entered into the univariate analysis although it was unclear if the following four variables were entered: patient belief in cardiac origin of symptoms, subsequent confirmation of ischemic myocardial disease for this admission, fear levels in patients with no subsequent confirmation of heart disease, fear levels in patients with subsequent confirmation of heart disease. Except for one variable in the univariate analysis (patient belief in cardiac origin of symptoms) variables entered into multivariate analysis were not statistically significant in univariate analysis. Each independent variable was also multiplied by the fear factor and these products were allowed to enter as new variables in the multiple regression equation if they met the default stepwise variable entry criteria. The	**Results** n=184, multiple R=0.281, R square=0.079, adjusted R square=0.026, F=1.478 (NS). This does not permit the right to view the t-values of variables in the equation, but given this caveat 2 interaction variables are statistically significant: belief in cardiac origin of symptoms and total scores of the revised health fear inventory (t=2.232, p=0.027, B=0.010288, SE=0.004609, Beta=0.170547); revised health fear inventory scores and gender (t=-2.065, p=0.0405, B=-0.013426, SE=0.006503, Beta=-0.231833). The predictive power of the second multiple regression did not increase appreciably: multiple R=0.266, R square=0.071, adjusted R square=0.022, F=1.467, p=0.164. The interaction variable of confirmation and total scores on the trait anxiety inventory stepped in with: t=-2.550, p=0.012. The logistic regression model did not attain statistical significance.

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	Confirmed cardiac diagnosis for the current admission: 35.2% Pain level prior to the decision to seek medical care (measured on the Chest pain Emergency Room questionnaire): Level 1: 1.9% Level 2: 12.4% Level 3: 24.4% Level 4: 25.8% Level 5: 35.4% mean 3.804, median 4, mode 5, min. 1, max. 5, SD=1.111, SE=0.077.	eliminate inter-rater reliability bias. Data was collected after the suspected AMI. **Method of assessment of delay time** Patients were asked directly at what time they first felt the pain and at what time they decided to come in. **Delay time measured** Patient delay – defined as time from when pain was first felt by the patient to when action was initiated to seek treatment. **Delay time** Mean 9.063 hr., median 2.5 hr., mode 0.5 hr., min. 0.0 hr., max 144 hr., SD=18.685 hr., SE=1.286 hr.	biomedical and demographic variables were forced into the equation. The psychological variables of revised Health Fear Inventory total scores and the interaction variables were allowed to enter, if they could, using a stepwise variable entry method. A second multiple regression model was created that used the independent variable of 'subsequent confirmation of CHD for this admission' as an interaction variable. The same variable entry procedure used with the previous multiple regression was re-employed, this time employing confirmation of heart disease as an interactional variable. This began with forced entry of demographic and biomedical factors and then stepwise entry for the psychological variables. A logistic regression model was also devised that divided the log-transformed dependent variable of delay into 2 categorical variables. One variable included all subjects with delay time <6 hr., while the other included those patients with delay time >6 hr. **Power calculation** An alpha test error level of 0.05 (the probability of a type I error) and a beta score of 0.20 (the probability of making a type II error was used. This yielded a test power of 0.80 (1 minus beta). The smallest discernible effect size of the independent variables on delay was 0.086 given the eventual sample of more than 200 patients. These boundaries permit the retention of the 95% confidence level (accepting the null hypothesis when it's true) and acceptable power of the test (rejecting the null hypothesis when it's false) of the test. **Refusals**	

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
			12 (4 men, 8 women) **Missing data** 17 (8 men, 9 women) patients were considered lost to the study because interviewing was impossible. Data was missing for 1 person on gender, 1 on race, 6 on history of ischemic heart disease, 7 on chronic disease, 12 on cardiac diagnosis of current admission, 3 on cardiac illness belief for current admission, and 2 on pain level prior to decision to seek care.	
Author (year), country Leizorovicz (1997),[36] France **Setting** 198 mobile emergency units in 15 European countries and Canada. **Authors' objectives** To examine the various components of delay from onset of symptoms to treatment and to identify the characteristics of patients who sought treatment early in patients presenting with suspected AMI. **Duration** Not stated. Enrolment took place between 10/88 and 1/92.	**Inclusion criteria** Patients with chest pain characteristic of MI and lasting for at least 30 minutes, or pain lasting for less than 30 minutes but still present and non responsive to nitrates, who were seen within 6 hours of the onset of symptoms and who underwent 12-lead electrocardiography. The following were excluded: patients receiving oral anticoagulant treatment (but aspirin, dipyridamole, or any other anitiplatelet drug was allowed); patients known to have a haemorrhage diathesis or a recently active peptic ulcer; patients who had had a stroke, surgery, or major trauma in the previous 6 months; patients who had undergone external cardiac massage for the present symptoms; patients with systolic blood pressure above 200 mm Hg or a diastolic blood pressure above 120 mm Hg; patients known or suspected to be pregnant; patients with percutaneous transluminal coronary angioplasty in the previous two weeks; or patients declining to give their consent to participate. Patients could also be	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors of longer delay time using Wilcoxon rank sum test): acute pulmonary oedema (yes*/no), age<65 years old (yes/no*), cardioversion after inclusion (yes/no*), male (yes/no*), pain in the 24 h prior to inclusion (yes*/no), pain still present (yes/no*), previous angina (yes/no), previous MI (yes/no*), shock (yes/no*), ventricular fibrillation (yes/no*). **Method of assessment of predictors** Baseline variables were noted on a pre-hospital study form completed in the ambulance, and a hospital study form was completed by the ED and ward staff during the hospitalisation period. The study forms were sent to a co-ordinating centre at regular intervals for quality control and archival purposes. Confirmation and/or corrections were requested when erroneous or questionable data were found. **Method of assessment of delay time** Time of onset of symptoms and time of	**Multivariate analyses** Linear regression (using a generalised linear model) was used. As only statistically significant variables were reported, it was not clear which variables were entered into the linear regression. **Power calculation** Not stated **Refusals** Not stated **Missing data** Not stated	**Results** The following variables were associated with longer delay: age>65 yr. (p=0.0001); pain within the previous 24 hr. (p=0.0001); women (p=0.003); previous pulmonary oedema (p=0.02). The following variables were associated with shorter delay: ventricular fibrillation (p=0.02); previous MI (p=0.03); shock (p=0.0001).

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	excluded for any other reason at the discretion of the investigator. **Sample size** 5469 **Participant details** **Age** mean 61.2 (SD 12.2) yr. **Gender** Men: 76.8% **Race** Not stated **History** Prior MI: 19.1% Prior angina pectoris: 44.6% Prior atherosclerotic diseases: 15.7% **Symptoms** Not stated **Onset time** Not stated **Other participant details** ventricular fibrillation: 1.4% shock: 7.7% mean systolic blood pressure: 131.4 (SD 28.8) (mmHg) mean diastolic blood pressure: 79.1 (SD 18.4) mmHg mean heart rate: 76.8 (SD 20.2) beats.min.to the power of -1 elevated ST: 87.2% Final diagnosis: MI: 87.85 probable MI: 1.6% acute coronary symptom: 7.1% pericarditis: 0.4% aortic dissection: 0.2% other cardiac disease: 1.0% non-cardiac disease: 1.8%	call for ambulance were noted on study forms completed by the ED and ward staff during the hospitalisation period. **Delay time measured** Patient delay - defined as delay between onset of symptoms and call for ambulance. Median delay time was measured as a continuous variable. **Delay time** Median 75 min., (95% CI: 70, 76)		

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
Author (year), country Martiny (1992),[37] Italy **Setting** All accident and emergency services in the Piedmonte region (North of Italy). **Authors' objectives** To assess factors associated with time to hospitalisation in patients receiving emergency cardiological treatment and emergency services. **Duration** 10/87 to 6/89. The hospitals were assessed for 5 months each during this time period.	**Inclusion criteria** Patients hospitalised with a cardiological emergency within 12 hours of symptom onset. **Sample size** 1705 **Participant details** **Age** Not stated **Gender** Not stated **Race** Not stated **History** Not stated **Symptoms** Not stated **Onset time** Not stated **Other participant details** Called the doctor at home: 49.3% AMI: 57% Pulmonary Oedema: 22% Arrhythmia: 17% Pulmonary embolism, aortic dissection, detached valvular prosthesis or cardiac arrest: 4%	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors using chi-square test for nominal and ordinal variables, and ANOVA for continuous variables): who was called (Dr vs. A & E), diagnosis* (delay for acute pulmonary embolism was less than cardiac arrhythmia which was less than AMI), time of onset* (delay was less for day-time than night-time), geographical area. **Method of assessment of predictors** The Division of Cardiology carried out a survey of the regions Division of Emergency Services and first aid centres based on the compilation of a questionnaire for each patient who passed through these structures over a five-month period. Semi-structured questionnaires were filled in by a medical 'active guard' in A & E (with the collaboration of doctors working in the hospital cardiology services) for every patient presenting with a cardiological emergency. The questionnaire aimed to assess: the time the patient took to reach a decision, the eventual call for a home visit, the type of doctor called, the time spent by the doctor, the use of either a private vehicle or of an ambulance for transport to hospital, and the overall time taken to admit the patient to the emergency cardiology ward. **Method of assessment of delay time** Semi-structured questionnaires were filled in by a medical 'active guard' in A & E (with the collaboration of doctors working in the hospital cardiology services) for every patient presenting with a cardiological emergency. Amongst other items, the questionnaire assessed the time the	**Multivariate analyses** Stepwise regression was carried out on the variables of sex, age, time of symptom onset, geographical location, and diagnosis. The variables of age and sex were entered into the multivariate analysis although they were not entered in the univariate analysis. Geographical location was put into the multivariate analysis, even though it was statistically non-significant in the univariate analysis. **Power calculation** Not stated **Refusals** Not stated **Missing data** Not stated	**Results** Multiple correlation coefficient relative to the complete model=0.22, R square=4.8%. Statistically significant variables were: diagnosis (those with AMI delayed longer (regression coefficient=32, mean delay time=143 (+/-174) min., median delay time=60 min.), those with pulmonary oedema delayed less (regression coefficient=-38, mean delay time=85 (+/-97) min., median=45 min.)); time of symptom onset (symptom onset during the night was associated with longer delay than onset during 6am to 6pm (regression coefficient=-48))

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
		patient took to reach a decision. **Delay time measured** Patient delay - defined as time from onset of symptoms to contacting the health services or going directly to A & E. Delay was measured as a continuous variable. **Delay time** 125 +/- 158 min.		
Author (year), country Rawles (1990),[39] Scotland **Setting** CCU at Aberdeen Royal Infirmary. **Authors' objectives** To test whether patient delay is related to the severity of infarction and whether patients who delay for more than four hours have a different symptomatology from those who present earlier. **Duration** Not stated. Patient follow-up for 1 month.	**Inclusion criteria** Patients admitted consecutively to the CCU at Aberdeen Royal Infirmary with AMI, the diagnosis being confirmed by ECG and measurement of cardiac enzymes. None of the patients had suffered a cardiac arrest out of hospital. **Sample size** 250 **Participant details** **Age** Mean 57 (range 32-75) yr. **Gender** Not stated **Race** Not stated **History** Not stated **Symptoms** At onset: predominant pain: 90%=predominant breathlessness: 1% predominant anxiety: 0% At time of call: predominant pain: 94% predominant breathlessness: 0% predominant anxiety: 0% **Onset time** Not stated	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors, $p<0.05$. Kendall's rank correlation was used to relate patient data to symptom scores and cardiac enzyme concentrations. The Wilcoxon test was used for comparison of means): serum aspartate aminotransferase* (patient delay was negatively correlated with this), age*, pain* (patient delay was negatively correlated with pain at the time of calling), breathlessness, anxiety, anterior or inferior infarction. **Method of assessment of predictors** As soon as practicable after admission, and after initiation of therapy, patients were asked the nature of the presenting symptoms, when they had begun, which symptom predominated, and at what time medical help had been sought. Patients were then asked to mark six 15 cm visual analogue scales to indicate the severity of pain, breathlessness, and anxiety, when symptoms first started and when help was sought; the scales ranged from zero to the maximum severity the patient could imagine, and were later converted to scores of 0-100. All	**Multivariate analyses** Multiple regression analysis was conducted on transformed data and used to relate patient delay to symptom scores and cardiac enzyme concentrations. The skewed distribution of patient delays was normalised by log-log transformation. Log-transformation of maximum serum aspartate aminotransferase resulted in a normal distribution. Variables entered into the multiple regression were pain, anxiety, breathlessness, aspartate aminotransferase. The variables of age (which was statistically significant in the univariate analysis) and anterior or inferior infarction were entered into the univariate analysis but not into the regression. Breathlessness and anxiety were not statistically significant in the univariate analysis, but were entered into the multivariate analysis. **Power calculation** Not stated **Refusals** Not stated **Missing data**	**Results** $R=0.24$, $F(2,247)=7.70$, $p<0.001$. Log-log patient delay was associated with: log aspartate aminotranferase ($p<0.05$); pain score at the time of calling ($p<0.05$) The relationship between pain score and delay in calling was weak, and pain score only accounted for approximately 4% of the variance of delay.

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
		patients had blood taken daily for 3 days for measurement of serum asparate aminotransferase (AAT) and the highest measurement was recorded. **Method of assessment of delay time** As soon as practicable after admission, and after initiation of therapy, patients were asked when the presenting symptoms had begun and at what time medical help had been sought. **Delay time measured** Patient delay - defined as time from when presenting symptoms began to time medical help was sought. Delay time was log log transformed. **Delay time** Median 90 min., mean 11 hr. 1 min.	Not stated	
Author (year), country Sjogren (1979),[43] Sweden **Setting** CCU, Stockholm, Sweden. **Authors' objectives** To clarify the importance of some psychological and social factors in relation to patient delay, with special reference to a subjective grading of pain and anxiety. **Duration** No stated	**Inclusion criteria** Patients admitted to a CCU (Stockholm, Sweden) for acute and well defined onset of central chest pain. **Sample size** 100 **Participant details** **Age** Mean 64 (range 35-80) yr. **Gender** Men: 63% **Race** Not stated **History** Not stated **Symptoms** Not stated **Onset time** Not stated	**Predictors** Predictors entered into univariate analysis of delay time (*indicates statistically significant predictors using multiple non-linear analysis, which allows both univariate (squared eta values) and multi-variate (squared beta values) analysis of categorised non-linear non-dependent and dependent variables, with correlation coefficients calculated according to Goodman and Kruskal): age; sex; psychological and physical activity at onset of pain; who took the initiative in calling for help; who actually called for help; was help resisted by the patient; to whom was the call for help directed; was action taken to relieve pain; was medicine taken to relieve pain; what was the effect of medicine on the pain; degree of pain, anxiety, psychological impatience and medical	**Multivariate analyses** Analyses were performed on short and long delay. Multiple non-linear analysis was performed, which allows for analysis of categorised non-linear non-dependent and dependent variables. Correlation coefficients were calculated according to Goodman and Kruskal. All variables entered into the univariate analysis were entered into the multivariate analysis. **Power calculation** Not stated **Refusals** Not stated **Missing data** With regard to analyses using delay as	**Results** Only variables with a squared beta coefficient >or=0.01 in the long delay category were reported. It is not stated which values are considered to be statistically significant. All that is stated is that a great square beta coefficient indicates a strong association of the non-dependent variable with the dependent variable when all other variables have been taken into account For long delay (variables with a negative direction): patient's own diagnosis was MI (squared beta=0.15, squared eta=0.13); psychological activity before onset (squared beta=0.07, squared eta=0.08) high professional group (squared beta=0.04, squared eta=0.01); not consulted physician

Study details	Participant details	Predictor details	Statistical analyses/ missing data	Results for multivariate analyses
	Other participant details Verified AMI: 81% Acute chest pain due to angina pectoris or of other origin: 19%	knowledge; occupation; whereabouts at onset of pain; was someone else present; previous diseases; call to a doctor in the last year; diagnosis (AMI/non-AMI). Only the results with a squared beta coefficient >or=0.01 in the long delay category were reported. It is not stated which values are considered to be statistically significant. All that is stated is that the squared eta corresponds to the amount of variance explained by the variable when the other non-dependent variables have not been taken into account. **Method of assessment of predictors** Interviews were performed within 48 hours of admission by two nurses who checked one another for consistency of judgement during the first ten interviews. **Method of assessment of delay time** Not stated **Delay time measured** Patient delay - defined as the time it takes to decide to seek medical help. Delay was split into short delay (<2 hr.), medium delay (2-6 hr.), long delay (>6 hr.). **Delay time** Not stated	the dependent variable, long (n=37) and short (n=52) delay were examined. There was no data on medium delay. Only data on 89 of the 100 person sample was reported.	recently (squared beta=0.03, squared eta=0.04); patient called for help (squared beta=0.03, squared eta=0.00); high degree of pain (squared beta=0.03, squared eta=0.02); ingested heart medication for relief (squared beta=0.03, squared eta=0.00); presence of another person (squared beta=0.02, squared eta=0.04); high degree of anxiety (squared beta=0.02, squared eta=0.04); initiative by patient himself (squared beta=0.02, squared eta=0.00); male sex (squared beta=0.01, squared eta=0.03); previous history of CCU care (squared beta=0.01, squared eta=0.08) For long delay (variables with a positive direction): high age (squared beta=0.02, squared eta=0.08); high degree of impatience (squared beta=0.02, squared eta=0.00); called correct agency (squared beta=0.01, squared eta=0.01); attempts to relieve pain by resting (squared beta=0.01, squared eta=0.00) It is reported that patients most likely to have a long delay were those who did not initially believe that they had suffered a MI, had not been psychologically active prior to onset of pain, belonged to the lower socio-economic strata, had consulted a physician recently, did not call for help themselves, and reported a low degree of pain.

Appendix F: Details of intervention studies

RCTs

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
Author (year), country Meischke (1997),[18] USA **Language** English **Authors' objectives** To increase use of emergency medical services via 911 calls, and to reduce pre-hospital delay for individuals experiencing AMI.	**Content and setting** A mass media 'sensitisation' campaign entitled 'Call fast, Call 911' which consisted of public service announcements (PSA's) was followed by a direct mailing campaign. PSA's: the PSA's consisted of television and radio advertisements. The advertisement messages outlined the symptoms of AMI, listed reasons why patients should quickly call 911 after the initiation of AMI symptoms, and countered excuses patients commonly use to postpone seeking professional treatment. The basis and general content of the campaign were derived from a theoretic model of delay in health care behaviour. The PSA's provided information and included emotional messages designed to decrease delay by attenuating fear and/or denial about AMI and by bolstering belief in the success of current therapies. Mailing campaign: there were three intervention groups receiving brochures with informational, emotional or social messages. The mail campaign drew upon the theoretical model of Safer and colleagues. The informational and emotional brochures were targeted at the potential AMI victim him or	**Inclusion criteria: total sample** The direct mail campaign was targeted at households in King County in which the head of household was 50 years of age or older. A list of 65% such households was obtained from a commercial direct mail address firm. The list contained 130,000 names. **Inclusion criteria: suspected AMI** Events (one per household) referred to patients in the coronary care unit admissions registry whose addresses linked to an address on the mailing registry. The case definition of an event was admission to the coronary care unit with a diagnosis on the unit log of "rule out myocardial infarction" (including acute myocardial infarction, angina, chest pain, cardiac arrest before arrival at hospital, and congestive heart failure). Patients who were admitted for scheduled procedures or who developed acute myocardial infarction symptoms after hospital admission were excluded. **Sample size** **Control**	**Statistical analyses** The transformation ln (ln[delay time]), which was approximately normally distributed, was used to test mean differences between groups. Z-tests were used to test for differences between proportions, t-tests for differences between means, and chi-squared tests to compare distributions. To maintain statistical significance at an alpha level of 0.05 for each outcome measure, the difference between each intervention group and the control group was tested at $p<0.017$. Monthly totals of 911 calls, ED visits and hospital admissions were compared using student's t-test. A value of 0.05 was chosen as an arbitrary measure of statistical significance. Data were plotted against 95% confidence intervals based on Student's t-test to compare them with the 95% confidence intervals for additional observations	**Delay time measured** Pre-hospital delay - defined as time from acute symptom onset to emergency department arrival. **Method of outcome evaluation** The registry contained patient data abstracted from hospital records. Two outcome measures were abstracted from the medical chart: method of transport (emergency vehicle vs. self-transport) and delay time from acute symptom onset to emergency department arrival. Media campaign only: ED records and EMS incident reports provided data to determine the effects of the media campaign. Medical record abstractors made monthly visits to all 17 hospitals in the study community, compiling data on ED visits for chest pain and whether these patients were admitted to the hospital's CCU or sent home. All patients admitted to CCU's with an admitting diagnosis of "rule-out MI" had their charts abstracted to determine whether an AMI had occurred. The EMS system in Seattle and King County supplied information on the number of 911 responses for AMI symptoms for the entire population and for individuals 50 years of age or older. The following sources provided monthly data from January 1990 on: Seattle and King County hospital ED visits and hospital admission records, Seattle and King County 911 call logs, and Seattle and King County hospital and CCU and ICU admission logs. Process Outcomes: Individuals in the study were interviewed via telephone to determine process outcomes. Six trained interviewers conducted the interviews. If the person on the list was deceased, very ill, or otherwise permanently unavailable, interviewers interviewed another available household member over the age of 50. Interviewers were blind to the research hypothesis as well

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
	herself. The informational described the signs and symptoms of AMI and the role of the paramedics in rapid treatment. The emotional strategy focused on the psychological barriers to calling 911 for chest pain. The social brochures were targeted at the "bystander" (mostly the spouse) of an AMI patient. The setting was King County. **Duration and frequency** The mass-media campaign lasted 7 weeks (10/91 to 11/91). The television PSA's ran for 4 weeks, and the radio PSA's ran for 6 weeks. Both the television and the radio PSA's were scheduled to air during programmes most likely to reach the target audience. The PSA's were aired on six radio stations for a total of 567 spots and on three network television stations for a total of 98 times. The mailing intervention lasted 10 months (12/91 to 10/92). Brochures were mailed once every two months. **Duration of outcome measurement** Outcome data were collected for a period of 2 years (17/12/91 to 31/12/93). There was 2 months of data collection after each mailing and a year of follow up. Method of randomisation or control group selection The mailing list was used to randomise individuals. This list was linked to a registry accumulating coronary care unit admissions from	1343 **Intervention** 4101 **Total** 5444 **Participant details** **Control** Age: 20-49 yr.: 3.3% 50-59 yr.: 9.9% 60-69 yr.: 28.4% 70-79 yr.: 36.7% 80+ yr.: 21.8% Gender: 55.4% men Race: 91.6% White, 5.2% African-American, 2.9% Asian/Pacific Islander, 0.2 % Hispanic. Marital status: 65.3% married, 8.1% single, 26.5% divorced/widowed/separated. Income: <20 000$: 31.0% 20 000-39 999$: 22.9% 40 000-49 999$: 19.2% >or=50 000$: 26.9% Medical insurance: 22.8% private/group/HMO, 73.6% medicare, 2.1% medicaid, 1.4% none AMI: 25.8% Prior history of AMI: 28.9% New onset/unstable angina: 21.7% Prior history of angina: 39.4% **Intervention** Age: 20-49 yr.: 3.0% 50-59 yr.: 9.0% 60-69 yr.: 28.4% 70-79 yr.: 36.9% 80+ yr.: 22.7% Gender: 54.9% men	in a regression. Analyses were restricted to the relatively homogeneous group of patients (90% of events) who were white and who reported having private medical insurance or medicare or being a member of a HMO. **Power calculation** The authors considered an increase of 10 percentage points in the rate of 911 calls and a decrease of 30 minutes in delay to be meaningful intervention effects. Percentage of patients calling 911: With approximately 1150 cases per group, the power to detect a change of 10 percentage points in 911 calls between each intervention group and the control group was more than 99% (two-sided z-test, alpha=0.05/3). Delay time from acute symptom onset to emergency department arrival: With approximately 800 cases per group of quantifiable delay time data, the power to detect a 30-minute change between each intervention group and the control group was 70% (two-sided	as to the randomly assigned group designation of each interviewee. To get an indication of how many people remembered receiving printed materials on the topic, respondents were asked (a) if they remembered receiving a mailing or brochure in the past year on how to respond to a heart attack, and if so (b) if they had read one or more of these brochures. For those individuals who reported they remembered and had read such a brochure, respondents were asked what they remembered best about the brochure and what they thought the main message was. **Delay time** Baseline delay time: control Not stated **Baseline delay time: intervention** Not stated Trial end delay time: control Total n (control + intervention groups)=4704 Pre-hospital delay time: median 146 min., mean 173 min. ln(ln [delay time]): mean 1.6391 (SD=0.2559), n=790. **Trial end delay time intervention** Pre-hospital delay time: Informational intervention: median 160 min., mean 183 min., ln(ln [delay time]): mean 1.6509 (SD=0.2626), n=894. (NS, p<0.4). Emotional intervention: median 150 min., mean 167 min., ln(ln [delay time]): mean 1.6331 (SD=0.2766), n=795. (NS, p<0.7) Social intervention: median 140 min., mean 173 min., ln(ln [delay time]): mean 1.6401 (SD=0.2738), n=780. (NS, p>0.9) **Medical services** **Baseline use of medical services: control** Outcomes on number of 911 calls, number of ED visits, and CCU admissions with admitting diagnosis of rule-out MI are reported for control and intervention groups together **Baseline use of medical services: intervention** The following outcomes on number of 911 calls, number

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
	all 16 King County hospitals having such units. The authors randomised households on the mailing list, pre-sorted for zip code for equal representation across King County, into four groups; three intervention, one control.	Race: 92.3% White, 4.1% African-American, 3.2% Asian/Pacific Islander, 0.1% Native American/Alaskan, 0.4% Hispanic. Marital status: 65.0% married, 8.7% single, 26.3% divorced/widowed/separated. Income: <20 000$: 35.4% 20 000-39 999$: 21.9% 40 000-49 999$: 20.2% >or=50 000$: 22.6% Medical insurance: 23.2% private/group/HMO, 73.8% medicare, 1.8% medicaid, 1.1% none. AMI: 26.2% Prior history of AMI: 29.1% New onset/unstable angina: 20.8% Prior history of angina: 41.0% **Total** Not stated	t-test, alpha=0.05/3). **Missing data** Three people were excluded because their medical charts could not be located. Percentages of missing data for covariates were as follows: marital status, 2%; medical insurance, 1%; other variables <1%. Concerning analysis of percentage of patients calling 911, 3% of events had missing data for the outcome variable and 3 events had missing data for prior history of AMI. Concerning delay time from symptom onset to emergency department arrival, quantifiable delay time was present in 69% of events	of ED visits, and CCU admissions with admitting diagnosis of rule-out MI are reported for control and intervention groups together: Number of 911 calls: an average of 450 calls per month for AMI symptoms during the pre-campaign period. Number of ED visits for chest pain: an average of 1375 patients per month for chest pain during the pre-campaign period.. CCU admissions with admitting diagnosis of rule-out MI: an average of 660 per month during the pre-campaign period. Number of AMIs: an average of 155 confirmed AMIs per month in persons over 50 years of age during the pre-campaign period. **Trial end use of medical services: control** % (number) of patients calling 911: Total control group: 60.4 % (1112). No prior history of AMI and No AMI discharge diagnosis: 56.5% (554) No prior history of AMI with AMI discharge diagnosis: 64.8% (227) No prior history of AMI with No AMI discharge diagnosis: 64.6% (257) No prior history of AMI and No AMI discharge diagnosis: 61.6% (73) **Trial end use of medical services: intervention** The following outcomes on number of 911 calls, number of ED visits, and CCU admissions with admitting diagnosis of rule-out MI are reported for control and intervention groups together: The number of 911 calls: this statistically significantly rose during the campaign and remained high for 3 months after the campaign. Number of ED visits for chest pain: statistically significant increases occurred throughout the campaign period of October through December 1991. ED visits decreased below the upper 95% confidence interval (while remaining above the mean) 1-month after the media campaign and remained below this level. CCU admissions with admitting diagnosis of rule-out MI: This statistically significantly increased during the campaign month of November 1991. Although not

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
				statistically significantly higher, the number remained above the mean for 2 months after the campaign. Number of AMIs: For the 3 months overlapping the media campaign, there was an average of 153 AMIs per month (NS). % (number) of patients calling 911: Information: 63.3% (1190), NS, p<0.2. Emotional: 64.2% (1166), NS, p<0.06. Social: 61.8% (1099), NS, p<0.6. No prior history of AMI and No AMI discharge diagnosis: Informational: 58.6% (616), NS Emotional: 58.3% (592), NS Social: 55.8% (545), NS No prior history of AMI with AMI discharge diagnosis: Informational: 66.9% (236), NS Emotional: 66.1% (218), NS Social: 67.4% (227), NS Prior history of AMI with no AMI discharge diagnosis: Informational: 68.4% (266), NS Emotional: 70.7% (273), NS Social: 64.7% (258), NS Prior history of AMI with AMI discharge diagnosis: Informational: 72.2% (72), NS Emotional: 80.5% (82), p<0.01 Social: 79.4% (68), p<0.03 (tests of significance compare each intervention group with the control.) **Other outcomes** **Baseline for other outcomes: control** Not stated **Baseline for other outcomes: intervention** Not stated **Trial end for other outcomes: control** Not stated **Trial end for other outcomes: intervention** Not stated **Process outcomes** There were no statistically significant differences between intervention groups in the number of people who

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
				remembered or who had read at least one of the brochures. Overall, 67 people (22%) in the intervention group remembered receiving a brochure and 55 (18%) had read one of them. Ten individuals in the control group (10%) reported remembering a brochure dealing with how to respond to chest pain. However, only half of those people (n=5) said they had read the brochure and/or could remember anything about the brochure. Only two people who reported having read the brochure remembered aspects of the brochure that did not seem to fit the brochure content of the intervention brochures (i.e. diet and smoking). **Cost information** Total cost of the campaign: $245 250.
Author (year), country Luepker (2000),[19] USA **Language** English **Authors' objectives** To evaluate a community intervention to reduce patient delay from symptom onset to hospital presentation and increase emergency medical services use.	**Content and setting** The study was known as the rapid Early action for Coronary Treatment (REACT) trial. The intervention was a multi-component strategy based on social cognitive theory, self-regulatory theory, diffusion theory, social marketing, and community organisation principles. There were two central themes; symptom recognition, and the need to act fast by calling 911. Public messages emphasised chest pain or discomfort along with other AMI symptoms including shortness of breath, radiating pain, sweating, nausea, or weakness. The advice given instructed patients to call 911 for ambulance transport to hospital if any of these symptoms persisted for 15 minutes or longer. Intervention strategies were developed incorporating both interpersonal channels, such as mass media, and	**Inclusion criteria: total sample** Criteria for selecting communities included: proximity within 250 miles of a study field centre; clear geographic boundaries; population of more than 50 000; 911 emergency telephone service; willingness of the medical community and hospitals to participate; non-overlapping media and hospital use with other study communities; and similarity in demographics, medical services, and media characteristics within each community pair. The five field centres were: Universities of Alabama (Birmingham), Massachusetts (Worcester), Minnesota (Minneapolis - St Paul) and Texas (Houston) and a combined unit at the University of Washington (Seattle) and Oregon Health Services University (Portland). To capture the majority	**Statistical analyses used** Baseline data were analysed to determine comparability of delay times between intervention and comparison communities using a paired t-test on the observed delay times (log-transformed to reduce skew) as well as using a 2-stage analysis where the first stage adjusted log-transformed delay time for age, race, and history of MI by regression analysis and the second stage compared the adjusted community medians by a paired t-test. Geometric mean was used as the estimate of the median. Delay times were log-transformed to make the	**Delay time measured** Pre-hospital delay - defined as the time from self-reported acute symptom onset to arrival at the ED. **Method of outcome evaluation** Delay time was obtained from medical charts. A two-stage process was used to assess patient eligibility and collect delay time data. First, ED staff in study hospitals were trained in standardised questioning of patients regarding the nature and time of onset of acute symptoms. Follow-up training reinforced these practices. Study staff monitored ED logs to ensure that all presenting patients were considered and identified those that satisfied the inclusion criteria. Second, trained abstractors reviewed the hospital records of patients who were admitted with suspected acute CHD and collected demographic data, mode of transportation, procedures, clinical outcomes, and discharge diagnoses. Data collection protocols were reviewed and approved by the institutional review boards of each academic institution and hospital. measurement staff abstracted the symptoms and onset time, as well as the time of arrival at the ED, from hospital medical records using standardised medical record abstraction forms. The primary source of data on time of onset of symptoms was

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
	interpersonal methods, such as one-on-one interactions. The core symptom message used in interpersonal strategies emphasised chest pain as the primary symptom of AMI along with shortness of breath as another common symptom but stressed that other symptoms might also be present. The 4 intervention strategies included: (1) community organisation, in which health professionals and leaders of other relevant organisations in each community constituted a local advisory group; (2) public education, which targeted all residents of the intervention communities, with an 18-month programme that included the 6 themes of general awareness of AMI symptoms and appropriate action; MI survival plan, women and MI; MI symptom recognition; bystander response to MI; and importance of contacting emergency medical services (EMS); (3) professional education, which included physicians, nurses, rehabilitation staff, emergency department (ED) staff, and ambulance staff who were involved in continuing education meetings, special seminars, and academic detailing; and (4) patient education for those with a history of CHD or CHD risk factors who were taught at clinics by physicians **Duration and frequency** The intervention lasted for 18 months (4/96 to 8/97). Mass media: 1459 TV and newspaper stories about heart	of acute CHD patients, all hospitals that provided emergency care to patients with acute CHD from the study communities were included. Hospitals treating small numbers of community CHD patients were excluded if minority representation would not be adversely affected and if the expected number of cases at the hospital was so low (<10%) that it would make data collection and quality control difficult. One hospital near a study community was included because the hospital saw a large percentage of AMI patients from the study community. **Inclusion criteria: suspected AMI** All adults who presented to a hospital ED with a chief complaint of chest pain were included. Characteristics of the primary population for the study included age of 30 years and older, admission for evaluation of suspected acute CHD, and discharge with a CHD-related diagnosis. Institutionalised individuals, those transferred from hospitals outside of the study areas, and those presenting with other causes of chest pain were not included. **Sample size** **Control** 5051 baseline, 24347 at 18 months **Intervention**	distribution more nearly gausian. The analysis was conducted in 2 stages. First the trend in delay time was calculated for each community by linear regression of log delay against calendar time. All baseline data were attributed to time zero. Regression modelling was adjusted for 3 individual patient level covariates: age, sex, and history of AMI or CHD. Second, trends (slopes) in the 10 intervention communities were compared pair-wise with trends in the 10 matched control communities using the paired t test with 9 df. Trends in EMS use were analysed by a similar 2-stage procedure using logistic regression in the first stage. **Power calculation** A 30-minute net reduction in median delay time was considered to be a clinically relevant intervention effect. In the 10 community pairs, 15000 primary cases were estimated to occur over the 22 months of data collection. A sample size of 10 community pairs and 15000 cases provides 80% power for detecting a	the ED nurse notes. Secondary sources, in priority order, were the ED physician notes, the inpatient nurse notes, and the inpatient physician notes. The difference between symptom onset time and ED arrival time is the primary outcome of delay time. Time of taking action (i.e. calling 911 or getting into the car to drive to the ED) and time of contact with the emergency personnel (either EMS or ED) were obtained from patient telephone interviews on a random subset of cases. Time of receipt of reperfusion treatment in patients receiving such treatment was obtained from the medical record. Measures of other secondary clinical outcomes and utilisation of medical services was obtained from EMS data, hospital ED logs, and medical record abstraction of key data elements. Data on knowledge, attitudes, intentions, and other impact measures were obtained from telephone interviews: 1) 4 cross-sectional random-digit dialling community surveys, 2) post hospital discharge telephone interviews of a sample of patients with diagnosed acute cardiac ischemia, and 3) post-ED telephone interviews of a sample of chest pain patients released from the ED. **Delay time** **Baseline delay time: control** Mean pre-hospital delay time: 140.3 min. **Baseline delay time: intervention** Mean pre-hospital delay time: 140.0 min. **Trial end delay time: control** During: Mean pre-hospital delay time: 126.2 min. Mean delay trend in control communities: 6.8% per year (95% CI: -14.5% to 1.6%). Six control areas had decreasing delay times. **Trial end delay time intervention** During**:** Mean pre-hospital delay time: 130.3 min. Mean delay time trend in intervention communities statistically significantly declined at 4.7% per year (95% CI: -8.6% to -0.6%) but this did not statistically significantly differ from the trend in control communities. Eight intervention groups had negative slopes indicating decreasing delay times.

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
	disease; 235 TV and newspaper stories about the project or its message; a circulation of 1220650 for special newspaper inserts; 4657 public service announcements and paid advertisements played on commercial TV broadcast outlets in 10, 20, 30 and 60 second formats; 2932 public service announcements and paid advertisements played on cable TV channels; 385 public service announcements and paid advertisements played on commercial radio broadcast outlets. Small Media: 1175676 pieces of direct mail targeted at general public and Medicare-eligible persons; 607 displays with brochures for use mainly at pharmacy prescription and check-out counters; 210 billboards appeared for at least 30 days at a time in high-traffic public areas; 3094 posters were distributed in clinics, work sites, and other public areas; 1340704 brochures and newsletters for general public or target distribution audiences; presentation of messages on slides preceding movies in 6 communities. Community and patient groups: presentations to a combined total of 361 cardiac rehabilitation groups, risk factor patient management classes, and other in-person presentations or brief counselling sessions of high-risk patients; distribution of 468 printed and video materials to high-risk patients and their families; presentations to a combined total of 915 senior and civic organisations, work sites, and social service agencies; 145 visible	4582 baseline, 27063 at 18 months Total Not stated **Participant details** **Control** Numbers in brackets are average numbers per month. <u>Baseline</u>: Total presenting to ED: 5051 (1684) Released from ED: 3520 (1173) Hospitalised with non-cardiac diagnosis: 183 (46) Hospitalised with cardiac diagnosis (primary population): 2175 (544) Diagnoses of those hospitalised with cardiac diagnoses: Acute MI: 502 (126) Ischemic heart disease: 502 (126) Prior MI, angina pectoris, and other forms of chronic ischemic heart disease: 505 (126) Cardiac dysrhythmias, heart failure, ill defined descriptions, and complications of heart disease and atheroschlerosis: 194 (49) Chest pain: 479 (11) Age: mean 65 yr., SD 14. Gender: 52.7% men. <u>18 months</u>: Total presenting to ED: 24347 (1353) Released from ED: 13749 (764) Hospitalised with non-cardiac diagnosis: 797 (44) Hospitalised with cardiac diagnosis (primary population): 9801 (545)	30-minute net reduction in median delay time between intervention and comparison communities. **Missing data** Delay time information at baseline was available on 71.7% to 72.8% and did not differ by community assignment. Absence of delay times was primarily the result of a vague patient symptom history or inadequate recording by hospital staff.	**Medical services** **Baseline use of medical services: control** Average rate of EMS use: 33% Average ED presentations per month: 1684 **Baseline use of medical services: intervention** Average rate of EMS use: 33%. Average ED presentations per month: 1527 **Trial end use of medical services: control** <u>During</u>: EMS use in the control communities did not change (3% per year, 95% CI: -13% , 7%). Average ED presentations per month: 1353 **Trial end use of medical services: intervention** <u>During</u>: The odds of EMS use increased steadily and statistically significantly in intervention communities (16% per year, 95% CI: 2%, 32%). The net effect was a 20% increase in EMS use in intervention communities compared with control communities (odds ratio, 1.20; 95% CI: 1.07, 1.34, p<0.005). Average ED presentations per month:1504 **Other outcomes** **Baseline for other outcomes: control** Case fatality rates: 2.66%. The odds of reperfusion therapy use during the first six hours of symptom onset declined slightly during the follow-up period in the intervention community group (OR=0.92), but not in the control group (OR=1.11). Thus the net change favoured the control group (OR=0.83). As a function of time period, the odds ratio for receiving reperfusion therapy within 6 hours of symptom onset was most favourable during the first six months of the intervention. Reperfusion <or= 1 hr. from ED arrival (n=3013): Baseline control: 19.3% Reperfusion <or= 6 hr. from ED arrival (n=3013): Baseline control: 27.5 Angioplasty, those reperfused (n=1207): Baseline control: 19.3% Survival (n=3013): Baseline control: 95.0%

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
	public events, such as health fairs or brief presentations of the message as part of some other public event. **Duration of outcome measurement** Baseline measurements were taken for 4 months (12/95 to 3/96) and then measurements were taken for 18 months while the intervention was ongoing. **Method of randomisation or control group selection** One city in each matched pair was assigned to the intervention and the other city in each pair was randomly assigned to status. The matched pairs were comparable in age distribution, education level, ethnic distribution, household income, and median delay time. All communities accepted their randomised assignments and participated until the end of the intervention programme. Randomisation of communities was conducted by the co-ordinating centre at the beginning of baseline data collection and revealed to those printing the intervention materials. Randomisation status was revealed to investigators to hire and train intervention staff 2 months after baseline data collection began, and was made public at the beginning of the intervention (4/96).	Diagnoses of those hospitalised with cardiac diagnoses: Acute MI: 1892 (105) Ischemic heart disease: 2214 (123) Prior MI, angina pectoris, and other forms of chronic ischemic heart disease: 2755 (153) Cardiac dysrhythmias, heart failure, ill defined descriptions, and complications of heart disease and atheroschlerosis: 902 (50) Chest pain: 2038 (113) Age: mean 65 yr., SD 14 Gender: 54.0% men **Intervention** Numbers in brackets are average numbers per month. <u>Baseline</u>: Total presenting to ED: 4582 (1527) Released from ED: 2809 (936) Hospitalised with non-cardiac diagnosis: 269 (67) Hospitalised with cardiac diagnosis (primary population): 2876 (719) Diagnoses of those hospitalised with cardiac diagnoses: Acute MI: 700 (175) Ischemic heart disease: 704 (176) Prior MI, angina pectoris, and other forms of chronic ischemic heart disease: 683 (171) Cardiac dysrhythmias, heart failure, ill defined descriptions, and complications of heart disease and atheroschlerosis: 256 (64) Chest pain: 533 (133) Age: mean 65yr., SD 14		Reperfusion, no exclusions (n=4483): Baseline control: 45.5% (baseline rates adjusted for age, sex, ethnicity, cohabitation status, coronary heart disease history, insurance status, presenting blood pressure, and transfer status). **Baseline for other outcomes: intervention** Case fatality rates: 3.23% Reperfusion <or= 1 hr. from ED arrival (n=3013): Baseline intervention: 13.8% The odds of reperfusion therapy use during the first 6 hours of symptom onset declined in the intervention group (OR=0.92) Reperfusion <or= 6 hr. from ED arrival (n=3013): Baseline intervention: 28.3% Angioplasty, those reperfused (n=1207): Baseline intervention: 53.1% Survival (n=3013): Baseline intervention: 94.9% Reperfusion, no exclusions (n=4483): Baseline intervention: 49.6% (baseline rates adjusted for age, sex, ethnicity, cohabitation status, coronary heart disease history, insurance status, presenting blood pressure, and transfer status). **Trial end for other outcomes: control** <u>During</u>: Case fatality rates 1.78% (NS) The proportion of patients who were hospitalised and subsequently discharged with a non-cardiac diagnosis did not statistically significant differ between control and intervention communities during the intervention (p=0.61). The proportion of patients admitted with suspected CHD increased in both intervention and control communities from baseline to intervention, but the differences were not statistically significant (p=0.13). Reperfusion <or= 1 hr. from ED arrival (n=3013): odds ratio at 1.5 years for control group: 0.78 (95% CI: 0.47, 1.30). Reperfusion <or= 6 hr. from ED arrival (n=3013): odds

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
		Gender: 56.0% men <u>18 months:</u> Total presenting to ED: 27063 (1504) Released from ED: 15688 (872) Hospitalised with non-cardiac diagnosis: 813 (45) Hospitalised with cardiac diagnosis (primary population): 10563 (587) Diagnoses of those hospitalised with cardiac diagnoses: Acute MI: 2200 (122) Ischemic heart disease: 2512 (140) Prior MI, angina pectoris, and other forms of chronic ischemic heart disease: 2587 (144) Cardiac dysrhythmias, heart failure, ill defined descriptions, and complications of heart disease and atheroschlerosis: 984 (55) Chest pain: 2280 (127) Age: mean 66 yr., SD 14 Gender: 52.5% men **Total** Not stated		ratio at 1.5 years for control group: 1.11 (95% CI: 0.70, 1.76). Angioplasty, those reperfused (n=1207): odds ratio at 1.5 years for control group: 1.86 (95% CI: 0.81, 4.30). Survival (n=3013): odds ratio at 1.5 years for control group: 1.06 (95% CI: 0.49, 2.29). Reperfusion (n=4483): odds ratio at 1.5 years for control group: 0.83 (95% CI: 0.57, 1.21). **Trial end for other outcomes: intervention** <u>During</u>: Case fatality rates: 2.43% (NS) The proportion of patients who were hospitalised and subsequently discharged with a non-cardiac diagnosis did not statistically significantly differ between control and intervention communities during the intervention (p=0.61). The proportion of patients admitted with suspected CHD increased in both intervention and control communities from baseline to intervention, but the differences were not statistically significant (p=0.13), Reperfusion <or= 1 hr. from ED arrival (n=3013): odds ratio at 1.5 years for intervention group: 0.90 (95% CI: 0.55, 1.47). OR trend ratio (I:C): 1.15 (95% CI: 0.57, 3.33, p=0.69). Reperfusion <or= 6 hr. from ED arrival (n=3013): odds ratio at 1.5 years for intervention group: 0.92 (95% CI: 0.61, 1.40). OR trend ratio (I:C): 0.83 (95% CI: 0.45, 1.55, p =1.55). Angioplasty, those reperfused (n=1207): odds ratio at 1.5 years for control group: 3.09 (95% CI: 1.45, 6.57). OR trend ratio (I:C): 1.66 (95% CI: 0.54, 5.09, p =0.36). Survival (n=3013): odds ratio at 1.5 years for control group: 1.06 (95% CI: 0.54, 2.08). OR trend ratio (I:C): 1.00 (95% CI: 0.36, 2.76, p =0.99). Reperfusion (n=4483): odds ratio at 1.5 years for control group: 0.96 (95% CI: 0.69, 1.34). OR trend ratio (I:C): 1.16 (95% CI: 0.70, 1.91, p =0.55). **Process outcomes** The co-ordinating centre conducted random digit dial telephone surveys of 30 to 60 adults aged 21 years and

Study details	Intervention details	Participant details	Statistical analyses/ missing data	Outcome measurements and results
				older in each study community at 4 time-points- baseline, early, mid and late in the study- to obtain measures of knowledge, attitudes, and behaviours relevant to seeking care for AMI symptoms. A total of 4389 adults were contracted in 4 surveys. Participation rates were approximately 60%. In a group with a mean age of 43.1 years, there was a progressive increase in unaided recall of the REACT name with 6% (n=643) of respondents in intervention communities providing unaided recall at the last survey compared with 0% (n=541) in the control communities (p<0.001). At the end of the intervention, 44% (n=602) of the surveyed population in the intervention communities recognised the REACT name when it was presented whereas 15.1% (n=561) recognised it in the control areas (p<0.002). There was a low but increasing level of received messages about MI symptoms (p<0.03) and a higher percentage of correct answers to appropriate action for AMI (p<0.006) among persons residing in the intervention communities compared with control sites. No statistically significant differences in these additional factors were observed between intervention and control communities. A survey of admitted patients showed similar results. **Cost information** For a typical town with 100 000 residents, the annual cost of the REACT intervention would be $156 000 to $294 000. The cost includes local staff, supplies, and media distribution. Differences between cities were a function of local labour, rent, media and distribution costs.

Controlled trial

Study details	Intervention details	Participant details	Statistical analysis/Missing data	Outcome measurements and results
Author (year), country Rowley (1982),[17] England **Language** English **Authors' objectives** To investigate whether health education influences the behaviour of individuals suffering from chest pain, by persuading them to call for help at an early stage.	**Content and setting** 'Nottingham Heartwatch' campaign: the value of early attention to patients with chest pain was outlined and the recipients were asked to ring a special telephone number if they had chest pain for more than 10 minutes. A letter outlining the value of early help in suspected heart attack drew attention to the possible importance of chest pain lasting for longer than 10 minutes and focused attention on this by means of a logo or campaign symbol: it described the availability of a hospital-based team to visit any patient with persistent chest pain and invited the patient to contact this team on an easy-to-remember number, which served a direct telephone line to the hospital coronary care unit. With the letter, the patient received self-adhesive stickers to apply to the telephone or first-aid cabinet and a card to carry in the handbag or the wallet. The telephone number was prominent in all these. The blue envelope and enclosed information was designed to avoid alarm and to provide a positive approach. The setting was 3 group practices in Nottingham (two situated in suburban Nottingham and one in an independent small town on the edge of metropolitan Nottingham). **Duration and frequency** The first letter was sent 6/77 and the second letter was sent 6/78. The	**Inclusion criteria: total sample** Patients aged over 40 and who were registered with either one of 3 group practices in Nottingham. **Inclusion criteria: suspected AMI** Patients over 40 with chest pain lasting longer than 10 minutes. **Sample size** **Control** Unclear **Intervention** Unclear **Total** **Unclear** **Participant details** **Control** Gender: 73% men Age: mean 56 yr. (men), 59 yr. (women). Suspected infarcts: 85%. Deaths by 6 weeks: 10%. **Intervention** <u>Calling direct line</u> Gender: 73% men. Age: mean 61yr. (men), 62 yr. (women). Suspected infarcts: 52%. Deaths by 6 weeks: 12%. <u>Calling own doctor:</u> Gender: 62% men. Age: mean 60 yr. (men), 67 yr. (women). Suspected infarcts: 82%. Deaths by 6 weeks: 11%.	**Statistical analyses used** Not stated **Power calculation** Not stated **Missing data** 578 were deleted from the original mailing list because of inaccuracies in the age/sex register.	**Delay time measured** Patient delay - defined as interval between onset of symptoms and first call for help. **Method of outcome evaluation** Incoming calls were received by members of the nursing staff of the CCU, who had been provided with a message pad bearing a written protocol requiring them to establish where the caller was, whether the patient was suffering chest pain or other symptoms, and whether the patient was registered with one of the study practices. **Delay time** **Baseline delay time: control** 24% of patients with definite and probable infarcts had called by 30 minutes from onset of symptoms before Heartwatch. **Baseline delay time: intervention** 24% of patients in the study practices called their general practitioner by 30 minutes from onset of symptoms before Heartwatch. Trial end delay time: control <u>During:</u> Patients with definite and probable infarcts from the control practices had not changed their behaviour during the study: 23% had called by 30 minutes from onset of symptoms during Heartwatch. **Trial end delay time intervention** <u>During</u>**:** Patients in the study practices called their general practitioner earlier after receiving Heartwatch information: 37% had called by 30 minutes from onset of symptoms ($p<0.05$). Patients with definite and probable infarction in the intervention group were calling their own general practitioners statistically significantly earlier as a result of Heartwatch: 22% had called by 30 minutes

	intervention lasted 2 years and 8 months. **Duration of outcome measurement** Not specifically stated. From 3/77 to 1/80 242 calls were received and since the first mailing occurred 6/77, baseline measures presumably lasted 3 months (3/77 to 5/77). It appears that measures were then taken for 2 years and 8 months (6/77 to 1/80) during the intervention. **Method of randomisation or control group selection** 3 of 13 practices that had participated in an earlier study were chosen as the intervention practices, and the remaining 10 practices were used as controls.	**Total** Not stated	from onset of symptoms before Heartwatch and 44% during ($p<0.05$). **Medical services** **Baseline use of medical services: control** Not stated **Baseline use of medical services: intervention** Not stated **Trial end use of medical services: control** Not stated **Trial end use of medical services: intervention** Not stated **Other outcomes** **Baseline for other outcomes: control** Not stated **Baseline for other outcomes: intervention** Not stated **Trial end for other outcomes: control** Not stated **Trial end for other outcomes: intervention** During: Of those patients in the study practices after the intervention in whom definite or probable infarction was not diagnosed 60% had called the direct line by one hour compared with 42% who called their own doctor ($p<0.05$). A similar analysis of patients in whom definite or probable infarction was the final diagnosis did not, however, show a statistically significant difference between the time of calls to the direct line and to their general practitioner. A random sample of callers on the direct line were asked whether they had tried to contact their own doctor before dialling Heartwatch and of the 69 sampled, 22 (32%) indicated that they had. **Process outcomes** Not stated **Cost information** Not stated

Before-and-after studies

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
Author (year), country Mitic (1984),[14] Canada **Language** English **Authors' objectives** To investigate the effectiveness of a media campaign in reducing the delay and decision times of persons experiencing out-of-hospital heart attack symptoms.	**Content and setting** Mass media campaign entitled 'Signals and Actions'. The campaign involved both purchased television and radio spots and public service announcements. Advertisements were placed during prime time. The content of the radio and television advertisements emphasised two basic concepts. First, the symptoms of a heart attack were clearly described, the most common being an uncomfortable pressure, squeezing or fullness in the centre of the chest behind the breastbone. Second, the viewer or listener was informed of the importance of seeking immediate professional assistance if these symptoms occur, by phoning an ambulance or going directly to hospital. The setting was a large hospital in Eastern Canada. **Duration and frequency** The media campaign was aired for eight weeks. The television advertisement lasted 30 seconds and the radio spot was 60 seconds in length. **Duration of outcome measurement** Before measurements were collected for four weeks. Measurements were then collected for 8 weeks during the media campaign and for one week, three months after the media campaign had terminated.	**Inclusion criteria: total sample** Persons in Eastern Canada who are served by a large hospital **Inclusion criteria: suspected AMI** Persons who presented with chest pain or other heart attack symptoms. **Sample size** **Before** 101 **After** 329 during, 41 after. **Total** 471 **Participant details** **Before** Gender: 64% men. Age: mean 54 yr. (men), 61 yr. (women). **After** <u>During</u>: Gender: 56.5% men. Age: mean 54 yr. (men), 58 yr. (women). <u>After</u>: Gender: 48.8% men. Age: mean 55 yr. (men), 59 yr. (women). **Total** Not stated	**Statistical analyses used** Chi-square test **Power calculation** Not stated **Missing data** Not stated	**Delay time measured** Pre-hospital delay - defined as time from symptom onset to arrival in the hospital emergency department. **Method of outcome evaluation** The medical records of persons who presented with chest pain or other heart attack symptoms were examined. During the eight-week media campaign, demographic information and delay times of persons presenting at the hospital emergency department were recorded by the admitting staff. A random selection of 44 persons who were seen by medical staff during the latter 4 weeks were contacted by phone. A standardised form was used to interview the subjects and record their responses. These persons were asked if they had seen or heard the Signals and Actions program and if they had, whether the program had influenced them to seek medical assistance more quickly. Decision times were also collected. **Delay time** **Delay time: before** Mean delay time: men: 99.1 hr. women: 62.1 hr. delay time (hr.) Number (%) 0-2 16 (15.8) 2-6 19 (18.8) 6-12 15 (14.9) 12-24 15 (14.9) 24+ 36 (36.6) **Delay time: after** <u>During:</u> mean delay time: men: 92.1 hr.

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				women: 83.4 hr. delay time (hr.) Number (%) 0-2 103 (31.3) 2-6 72 (21.9) 6-12 35 (10.6) 12-24 22 (6.7) 24+ 97 (29.5) **(for 0-2 hr., p<0.05, chi-square=9.23).** <u>After:</u> mean delay time: men: 35.1 hr. women: 165.7 hr. delay time (hr.) Number (%) 0-2 12 (29.3) 2-6 7 (17.1) 6-12 5 (12.2) 12-24 4 (9.8) 24+ 13 (31.7) **Medical services** **Use of medical services before** Not stated **Use of medical services after** Not stated **Other outcomes** **Other outcomes: before** Not stated **Other outcomes: after** Not stated **Process outcomes** Telephone interviews of 44 (29 males, 15 females with a mean age of 57 yr.) persons randomly selected from those who had presented at the hospital emergency ward complaining of heart attack symptoms during the latter 4 weeks of the campaign: 30 (68.2%) of the 44 persons had and 14 (31.8%) had not seen or heard a radio or

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				television advertisement that explained what to do if they thought they were experiencing a heart attack. Of those who had seen/heard the advertisement, 27 (90%) reported that they had viewed the advertisement on television, 2 (6.7%) had heard the message on the radio and 1 (3.3%) had been informed through a relative or friend. Of those who had seen/heard the advertisement, 28 (93.3%) were able to remember the two components of the media message and 2 (6.6%) were unable to remember one or both of the components. Of those who had seen/heard the advertisement, 20 (73.3%) reported decision times of <or= 2hr. Of those who had not seen/heard the advertisement, 7 (50%) reported decision times of <or= 2hr. (p<0.05, chi-square = 11.8). Of those who had seen/heard the advertisement, 12 (40%) reported that the message had persuaded them to act sooner than if they had not been exposed to the program, 9 (30%) reported that it had reinforced what they already knew and 9 (30%) reported that it had no effect on their behaviour. Of those who reported that the campaign had caused them to act, 10 (83.3%) reported decision times of <or= 2 hr. (p<0.05, chi-square = 21.5). Of those who reported that the campaign did not cause them to act, 3 (33.3%) reported decision times of <or= 2 hr. (p<0.05, chi-square = 4.97). Of those who reported that the campaign had reinforced their previous knowledge, all 9 (100%) reported decision times of <or= 2hr. Of persons not exposed to the media campaign, 50% reported decision times of more than two hours and 50% reported decision times of less than two hours. **Cost information** Not stated

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
Author (year), country Ho (1989),[12] USA **Language** English **Authors' objectives** To investigate the effect of a public media education campaign to shorten patient delay and increase use of emergency medical services by patients with cardiac chest pain.	**Content and setting** Public media education campaign in cooperation with the American Heart Association. The media campaign message emphasised the symptoms of an AMI, the importance of acting quickly ("saving time could save your life") and calling 911 to activate the EMS. The message was disseminated in two daily newspapers, three radio stations, and three network television stations targeted at the adult population living in King County and the greater metropolitan Seattle area. **Duration and frequency** There were 18 newspaper inserts and 216 radio spots during a six-week period and 66 television spots during a seven -week period. The radio announcements were spaced throughout the day, whereas the television announcements were clustered during the morning, evening and night news and during prime time. The intervention was presented for 2 months (it began Feb. 16th, 1987) **Duration of outcome measurement** Before measurements were taken for 4.5 months (1/10/86 to 15/2/87). Data was collected for 4.5 months after the intervention ceased.	**Inclusion criteria: total sample** Hospitals in King County, Washington with intensive care beds. Eight hospitals were initially included (from October 1, 1986) and a ninth hospital began operation in May 1987, and was included in the surveillance system from that time. **Inclusion criteria: suspected AMI** Patients admitted to the intensive or cardiac care units of one of 9 King County hospitals with intensive care beds with diagnosis of rule-out AMI, chest pain or angina. Such patients were identified from unit logs every two weeks. Excluded from the surveillance were patients admitted for scheduled procedures (e.g. bypass surgery, angioplasty, cardiac catheterisation), patients transferred from non-participating hospitals, and patients transferred from other areas of the hospital (in-hospital rule-out AMI). Patients hospitalised during one time period (pre-message, message or post-message) and interviewed in another were excluded. **Sample size** **Before** 401 **After** 489 **Total** 890	**Statistical analyses used** Student's t- (two-sided) and chi-squared tests were used, $p<0.05$ was considered statistically significant. The t-test was used for continuous variables (e.g. age), the chi-squared test was used for categorical variables (e.g. proportion who called 911). **Power calculation** Not stated **Missing data** The telephone interview rates were 48% and 45% respectively. 5% could not be reached despite multiple attempts. The refusal rate for interviews was approximately 25% for both before and after groups.	**Delay time measured** Patient delay - defined as delay between onset of chest pain and definitive care. **Method of outcome evaluation** Hospital records of patients included in the survey were reviewed for patient demographics, previous cardiac history, symptoms, delay between symptoms and ED arrival, method of transportation, discharge diagnosis, and hospital outcome. (Patients with a discharge diagnosis of AMI had additional information abstracted, including hospital treatment, complications, results of cardiac enzymes, and interpretations of ECGs). A letter requesting permission for a telephone interview was sent to all surveillance patients who lived in King County and did not reside in a retirement home, nursing home, or other extended care facility. For deceased patients, the next of kin was contacted. A 10 minute interview was conducted with the patient or spouse (or significant other) at four to eight weeks after hospitalisation to determine circumstances related to the event leading to the hospitalisation (e.g. symptoms, actions taken, demographic information), whether the interviewee had heard any information on heart attacks and, if affirmative, the source and type of information. **Delay time** **Delay time: before** Patient delay time (hr.) — Number (%) 0-2 — 143 (35.7) 2-4 — 86 (21.4) 4-6 — 38 (9.5) 6 + — 134 (33.4) Total no of patients with confirmed AMI (n=135 (33.7%)): Patient delay time (hr.) — Number (%) 0<2 — 57 (42.2)

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
		Participant details **Before** Age: mean 63.2 yr. Gender: 57.1% men History of MI or angina: 51.9% Confirmed AMI: 33.7% **After** Age: mean 62.3 Gender: 58.7% men History of MI or angina: 43.1%* Confirmed AMI: 25.2%* (* indicate statistically significant differences between before and after groups) **Total** Not stated		2<4 28 (20.7) 4<6 11 (8.1) 6 + 39 (28.9) Median patient delay time for confirmed AMI patients only: 2.6 hr. **Delay time: after** Patient delay time (hr.) Number (%) 0<2 180 (36.8) 2<4 104 (21.3) 4<6 40 (8.2) 6 + 165 (33.7) Differences between pre and post groups were not statistically significant. Total no of patients with confirmed AMI (n=123 (25.2%)): Patient delay time(hr.) Number (%) 0<2 52 (42.3) 2<4 21 (17.1) 4<6 9 (7.3) 6 + 41 (33.3) Median patient delay time for confirmed AMI patients only: 2.3 hr. When stratified by discharge diagnosis of AMI, patient delay time remained statistically non-significant between the periods. **Medical services** **Use of medical services: before** Number (%) using medic transport: 163 (42.0%) Number (%) with confirmed AMI using medic transport: 65 (49.6%) **Use of medical services: after** Number (%) using medic transport: 196 (43.7%) Differences between pre and post groups were not statistically significant. Number (%) with confirmed AMI using medic transport: 58 (50.4%) When stratified by discharge diagnosis of AMI, EMS use remained statistically non-significant between the periods.

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				Other outcomes **Other outcomes: before** Not stated **Other outcomes: after** Not stated **Process outcomes** Statistically significantly more patients in the post-message period (n=358, 73.2%) than the pre-message period (n=204, 50.9%) had heard new information about AMI (p=0.0001). Of those who reported hearing new information, statistically significantly more people in the post-message period (n=194, 54.2%) than the pre-message period (n=77; 37.7%) reported hearing one of the components of the message, symptoms of a heart attack (p=0.002). When limited to only patients hearing one of the key components of the message from one of the media sources used in the campaign, the difference remained statistically significant. There was no statistically significant difference between pre-message period and post-message period in the proportion of patients who reported hearing the importance of time or of calling 911. There was also no statistically significant difference between the two periods in the reported source of new information (television, radio or newsprint). **Cost information** Total cost of the campaign: $139, 272.
Author (year), country Moses (1991),[15] USA **Language** English	**Content and setting** Public education campaign consisting of patient education brochures, television advertisements, public talks, posters and radio spots. The program explained the warning signs of a	**Inclusion criteria: total sample** People living in Jacksonville with one hospital serving a population of 26000 in town and a total population of 55000.	**Statistical analyses used** Not stated **Power calculation** Not stated	**Delay time measured** Pre-hospital delay - defined as delay between onset of symptoms to emergency room arrival. **Method of outcome evaluation** Baseline data were gathered from a retrospective review of emergency department charts.

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
Authors' objectives To determine whether a public education campaign would improve the public's ability to recognise symptoms of an AMI and seek prompt medical attention, thereby reducing delay between onset of symptoms and hospital presentation.	heart attack and the need to seek prompt medical attention if they occurred. The setting was one hospital in Jacksonville, a town in rural central Illinois. **Duration and frequency** The intervention duration was 2 years. The program consisted of 800 brochures distributed, 15500 brochures mailed, 50 posters displayed at local businesses and in hospital lobbies, 23 television spots (2 television stations), 358 radio spots (4 radio stations), 426 public service announcements (3 radio stations), 42 newspaper spots (5 newspapers), 4 radio talk shows, 2 public speaking engagements and 1 article in senior citizen publication. Radio public service announcements were aired at low-priority listening times. Paid media spots were concentrated at high-priority times. After an initial heavy thrust during the first two months, the messages were staggered throughout the remainder of the campaign. **Duration of outcome measurement** Before measurements were taken for 1 year and then measurements were taken for 2 years during the campaign, itself.	**Inclusion criteria: suspected AMI** Persons reporting to the emergency department with 1 or more of 80 selected complaints suggestive of AMI, for example, chest pain, angina, neck pain. **Sample size** **Before** 500 **After** 668 for1st yr., 625 for 2nd yr. **Total** 1793 **Participant details** **Before** Age: mean 57 yr. Gender: 45% men. **After** Age: mean 55 yr. During 1st year: Gender: 45% men. During 2nd year: Gender: 45% men. **Total** Diagnosis of angina: 24%. Diagnosis of MI: 11% Diagnosis of non-cardiac chest pain: 65%	**Missing data** Not stated	Emergency department patient charts were reviewed weekly during the two years of the campaign. **Delay time** **Delay time: before** Pre-hospital delay time: discharge diagnosis angina (n=114): mean 204 min., median 103 min. discharge diagnosis MI (n=66): mean 217 min., median 103 min. discharge diagnosis non-cardiac chest pain (n=320): mean 248 min., median 125 min. **Delay time: after** During: Pre hospital delay time: 1st year after: discharge diagnosis angina (n=168): mean 176 min., median 103 min. discharge diagnosis MI (n=67): mean 252 min., median 103 min. discharge diagnosis non-cardiac chest pain (n=433): mean 248 min., median 108 min 2nd year after: discharge diagnosis angina (n=144): mean 234 min., median 117 min. discharge diagnosis MI (n=66): mean 175 min., median 112 min. discharge diagnosis non-cardiac chest pain (n=415): mean 239 min., median 120 min Numerous subgroups of patients with angina or AMI were categorised by age, sex, or presentation to the emergency department in < or > 6 hours after onset of pain. No statistically significant earlier presentation was found. **Medical services** **Use of medical services: before** Not stated **Use of medical services: after** During:

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				The small increase in number of emergency department visits during the 3-year study was not statistically significant **Other outcomes** **Other outcomes: before** Not stated **Other outcomes: after** During: The percentage of the study population that resulted in non-cardiac complaints increased 26% from baseline during the study period. **Process outcomes** Not stated **Cost information** Total cost of the 1-year campaign: $10 000. The campaign continued for a second year using the same media avenues donated at no extra cost.
Author (year), country Rustige (1992),[16] Germany **Language** German **Authors' objectives** To reduce patient decision time by means of intensive education of patients and physicians.	**Content and setting** Intensive educational programme using mass media. The main message of the media programme was: When experiencing heavy pains, tightness of the chest or severe pressure on the chest, don't wait but call the doctor immediately. A further educational programme focused on local and super-regional media (TV, radio and newspapers) and transmitting organisations (clubs, self help groups, primary care practices and businesses/companies). The intervention was set in Germany-Ludwigshafen (3 hospitals) and Frankenthal (1 hospital)	**Inclusion criteria: total sample** Not stated **Inclusion criteria: suspected AMI** Patients admitted to participating hospitals diagnosed with acute chest pain. Those diagnosed with cardiac infarction and available for an interview to establish the pre-hospital time and the time between hospital admission and thrombolysis were included in the study. **Sample size** **Before** 203 **After**	**Statistical analyses used** Not stated **Power calculation** Not stated **Missing data** 669 patients with acute cardiac infarction were recorded. The pre-hospital time could be established for 619 (92.5%) of these.	**Delay time measured** Pre-hospital delay - not defined. **Method of outcome evaluation** Pre-hospital delay was assessed by means of interview asking patients: start time of chest pains, time the doctor was notified, transport time, and start of treatment. No details on how interviewees were contacted were reported. **Delay time** **Delay time: before** Median pre-hospital delay time: 4.2 hr. **Delay time: after** Median pre-hospital time: 1990: 2.8 hr. 1991: 4.1 hr. 1992: 3.0 hr.

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
	Duration and frequency 9 months (7/89 to 3/90) for the intensive educational programme and 18 months (10/90 to 3/92) for the further programme. **Duration of outcome measurement** Before measurements lasted 6 months (1/89 to 6/89). Measures were then taken during the 9 months of the intensive educational programme, after this programme had finished for 6 months, and during the 18 months of the further programme.	466 **Total** 669 **Participant details** **Before** Gender: 66% men (mean age 61 yr.), 34% women (mean age 68 yr.) Definite AMI: 38% **After** Not stated **Total** Not stated		**Medical services** **Use of medical services: before** Not stated **Use of medical services: after** Not stated **Other outcomes** **Other outcomes: before** % of patients with cardiac infarction who received thrombolysis therapy: 27% (whole year 1989) **Other outcomes: after** % of patients with cardiac infarction who received thrombolysis therapy: 1990: 38% 1991: 47% 1992: 51% (first 3 months) **Process outcomes** Not stated **Cost information** Not stated
Author (year), country Bett (1993),[9] Australia **Language** English **Authors' objectives** To evaluate the effect of the National Heart Foundation (NHF) of Australia's Heart Week campaign, which was directed towards encouraging those with symptoms of possible myocardial infarction to seek help as promptly as possible.	**Content and setting** Public education campaign and professional education. The NHF repeated messages about the importance of preventing sudden death by early transport to hospital following the onset of suspected myocardial infarction, and stressed recent developments such as the benefits of coronary thrombosis. They emphasised the findings of the GISSI and ISIS trials (that hospital mortality rate was reduced substantially in patients who were treated early after the onset of symptoms) and the Australasian studies on the preservation of left	**Inclusion criteria: total sample** Not stated **Inclusion criteria: suspected AMI** Patients admitted to 22 CCU's with chest pain. **Sample size** **Before** 335 (1st survey), 221 (2nd survey) **After** 253 **Total** 809	**Statistical analyses used** Graphs were drawn of the number of patients seeking help each half hour after the onset of symptoms (bars) and cumulative percentage (line plots) with 95% confidence intervals (dotted lines) of those who had sought help at these times. A graph was drawn for each of the following: all admissions, 1988 survey, first 1989 survey and second 1989 survey.	**Delay time measured** Patient delay - defined as time from onset of symptoms to first seeking help. **Method of outcome evaluation** CCU nurses questioned patients admitted with chest pain and recorded age, sex, hospital diagnosis and any history of previous MI or of admission to a CCU. They also recorded the times of the onset of symptoms precipitating admission and the first attempt to get help. During the third survey patients in five of the hospitals (n= 253) were asked why they delayed, whether they were aware of the campaign, and whether this had influenced their decision to seek help when they did.

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
	ventricular function with early thrombolysis. Media briefing: a paper on the need to respond urgently to symptoms of suspected heart attack and the positive experience with thrombolytic therapy was distributed to media representatives. Campaign launch: the campaign was launched by the Governor General of Australia at the Sydney Opera House. The event included the simulated rescue of a heart attack victim from an Island in Sydney Harbour. A helicopter, water police and ambulance services were used to transport the "victim" rapidly to hospital. Similar events took place in other states. Media coverage: the theme "when it's heart attack, every minute counts" was promoted in television news and current affairs shows, radio news bulletins and talk back shows. Newspapers carried approximately 100 stories including several full page features. Thirteen magazines included articles on the heart week theme and several of them ran competitions related to heart health. A popular television series (A Country Practice) included two episodes in which the heroine suffered a heart attack and required urgent thrombolytic therapy. Advertising: almost all commercial radio stations broadcast a commercial on the theme at peak times during the week. Advertising appeared on trams and buses, and banners were prominently displayed in most capital cities. A national	**Participant details** **Before** Characteristics of survey 1 and 2 respectively: Age: mean (+/- SEM) 62.0 (+/- 0.6) yr., 60.4 (+/- 0.8) yr. Gender: 68% men, 62% men. Myocardial infarction: 45%, 41%. Angina: 47%, 48%. Previous CCU admission: 40%, 30%. Previous myocardial infarction: 37%, 24%. **After** Age: mean 62.3 yr. Gender: 64% men. Myocardial infarction: 52%. Angina: 38%. Previous CCU admission: 38%. Previous myocardial infarction: 29%. **Total** Diagnosis of angina: 44% Diagnosis of MI: 46% Previous MI: 31% Previous CCU admission: 37%	**Power calculation** Not stated **Missing data** Data were collected on 1402 admissions and information on patient delay was available for 809 of these.	**Delay time** **Delay time: before** Median patient delay time: 1st survey: 1.6 hr. 2nd survey: 1.0 hr. Patient delay time (hr.) % 1st survey: <1 38 <2 54 <4 69 <6 77 2nd survey <1 42 <2 61 <4 73 <6 78 **Delay time: after** Median patient delay time: 1.0 hr. Patient delay time (hr.) % <1 45 <2 62 <4 73 <6 81 **Medical services** **Use of medical services: before** Not stated **Use of medical services: after** Not stated. **Other outcomes** **Other outcomes: before** % of those with MI given fibrinolysis: 1st survey: 30.6% 2nd survey: 34.4% **Other outcomes: after** % of those with MI given fibrinolysis: 53.1% (p<0.0001, chi-square=24.2)

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
	supermarket chain reproduced the heart week message on 24 million shopping bags. One million leaflets, 50 000 car stickers, professional papers and posters for ambulance organisations, libraries, pharmacies, general practitioners and community health centers were distributed. Educational activities: community displays, usually in association with local ambulance services, were conducted in shopping centres and schools and during sporting events in each state. Professional Education: hospitals were notified that more patients with chest pain might present to emergency departments and place some strain on CCU beds. Ambulance services were given professional papers for their staff, which described the advances in the treatment of heart attack. In most states, seminars brought together ambulance officers, emergency department and CCU staff to help in the co-ordination of emergency treatment of heart attack. All general practitioners in Australia received posters and literature to display in their waiting rooms, professional papers on developments in the treatment of heart attack and guidelines for thrombolytic therapy and were invited to seminars in capital cities and regional centres. **Duration and frequency** The intervention lasted 1 week in 1989. **Duration of outcome**			**Process outcomes** 72% had been aware of the campaign, but for them the median delay (one-hour) was the same as it was for those who had been unaware of it. 42% stated that they had been influenced by the campaign in their decision to seek help, but even for them the median delay was one hour, and for those with a past history of MI it was 1.3 hours. **Cost information** Not stated

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
	measurement Three surveys were conducted and each lasted one month. The first was in1988 (6 months before), the second preceded (1 month before) and the third followed (1 month after) Heart week			
Author (year), country Blohm (1994),[10] Sweden **Language** English **Authors' objectives** To reduce delay times and increase ambulance use in patients with acute chest pain in order to improve the prognosis in patients with AMI by instituting early treatment.	**Content and setting** Media campaign, which started with a 3-week intensive phase, followed by a maintenance phase. The message stated that for chest pain lasting more than 15 minutes, immediately dial 90 000 for ambulance transport to hospital because it might indicate AMI. A slogan, 'Heart-pain-90 000' was used. (In Sweden, it translates as 'Hjarta-Smarta-90 000', which has a more emotional and rhythmic sound, often used in popular song lyrics.) During the initial intensive phase radio, newspaper, bus/tram, pillar, local district clinic, hospital, pharmacy, post office and bank were simultaneously used. During the maintenance phase, the message was repeated in the following months of the campaign period: radio- not repeated, newspaper- months 2, 3,4, 11, 12, bus/tram- months 2, 3, 4, 8, 9, 10, pillar- month 3, local district clinic- all months (i.e. 2-12), hospital- all months (i.e. 2-12), pharmacy- all months (i.e. 2-12), post office- months 2,11, bank- months 2, 5, 6, 12, and household distributed leaflet- months 4, 7, 11. Articles about AMI were written in	**Inclusion criteria: total sample** Individuals living in Goteborg, Sweden. **Inclusion criteria: suspected AMI** All patients arriving in the CCU of Sahlgrenska Hospital, Goteborg, Sweden between 2/86 and 12/91 who developed AMI during the first 3 days in hospital. At least two of the following three criteria had to be fulfilled for AMI: chest pain lasting for at least 15 minutes; appearance of Q-waves in at least two leads on a 12-lead standard electrocardiogram; or serum enzyme activity above the normal range in at least two consecutive samples of either aspartate aminotransferase or creatine kinase. **Sample size** **Before** 768 **After** 496 during, 1053 after **Total** 2317	**Statistical analyses used** Fisher's permutation test was used to test for differences between the periods before and after the campaign. All p-values were 2-sided and not corrected for multiple comparisons. **Power calculation** Not stated **Missing data** Information on delay time was not available in 1% of the patients before the campaign, in 6% of the patients during the campaign, and in 16% of the patients after the campaign. Among AMI patients in the CCU, information on delay time was missing in 2% before, and 7% during the campaign.	**Delay time measured** Pre-hospital delay - defined as delay time between onset of symptoms and arrival in hospital. **Method of outcome evaluation** Within 24 hours after arrival in the CCU, the patients were asked about the delay time between onset of pain and arrival in hospital, and whether they were transported to hospital by ambulance or not. Information about time of onset of symptoms was recorded by research personnel or doctors and nurses on duty. Information about the time of arrival in hospital was always available in hospital records. Information on survival was obtained from the Swedish National Registry of Deaths. In patients transported by ambulance during 1 year prior to, and during the campaign who developed AMI, the time between onset of symptoms and the call for the ambulance, as well as the ambulance transport time were retrospectively collected from the paramedic case record forms. **Delay time** **Delay time: before** Median pre-hospital delay time: All patients: 3hr. Men: 2hr. 40min. Women: 3hr. 30min. <70 yr. old: 2hr. 30min. >70 yr. old: 3hr. 30min.

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
	the main local newspaper in Goteborg with 4-month intervals, but advertisements in the newspaper appeared more often. Television, the most effective media in Sweden, was not used, because of costs and lack of interest among the industry. There is no information on intervention content for the last two months of the campaign. The departments of medicine in the two city hospitals took an active part in the campaign. Thus all patients admitted to the coronary care unit were given a leaflet in which not only the 'Heart-Pain-90 000' message was included, but also a careful description of AMI and the potential advantages of early intervention. **Duration and frequency** The intervention duration was 14 months (11/87 to 12/88). **Duration of outcome measurement** Before measurements were taken for 21 months (2/86 to 10/87). Measurements were then taken for 14 months during the campaign (11/87 to 12/88) and 36 months after the campaign had ceased (1/89 to 12/91).	**Participant details** **Before** Age: median 70 yr., range 24-101 yr. Gender: 70% men. History of cardiovascular diseases: MI: 29% Angina pectoris: 46% Hypertension: 36% Diabetes mellitus: 12% **After** <u>During</u>: Age: median 72 yr., range 35-97yr. Gender: 64% men. History of cardiovascular diseases: MI: 31 Angina pectoris: 41% Hypertension: 30% Diabetes mellitus: 10% <u>After</u>: Age: median 72 yr., range 26-97 yr.* Gender: 67% men. History of cardiovascular diseases: MI: 32% Angina pectoris: 41%* Hypertension: 33% Diabetes mellitus: 17%* (*p-values indicate statistically significant differences between before and after groups) **Total** Not stated		Previous AMI or angina pectoris: 3hr. 0min. No previous AMI or angina pectoris: 3hr. 0min. % of patients with delay time <2 hr.: 40% Median pre-hospital delay time: all CCU patients only with suspected AMI: 3hr. (n=2142), all CCU patients with confirmed AMI: 3hr. (n=768) all hospital wards including CCU patients, with suspected AMI: 4.0hr. (n=3308) all hospital wards including CCU patients, with confirmed AMI: 3.10hr. (n=908) % of AMI patients in CCU arriving in hospital <or=3 hrs: 51% Median pre-hospital delay time in patients admitted to CCU: patients with previous history of MI or angina pectoris: 3.0hr. (n=1411) patients with no previous history of MI or angina pectoris: 3.0hr. (n=7310) patients with previous history of MI, angina pectoris, congestive heart failure, hypertension or diabetes mellitus: 3.0hr. (n=1687) patients with no previous history of MI, angina pectoris, congestive heart failure, hypertension or diabetes mellitus: 3.05hr. (n=455) age <or=60 yr.: 3.0hr. (n=581) age 60-75 yr.: 3.0hr. (n=971) age >75 yr.: 3.30hr. (n=560) gender male: 3.0hr. (n=1430) gender female: 3.10hr. (n=712) patients with large AMI: 2.43hr. (n=390) patients with small AMI: 3.20hr. (n=377) Patients with AMI admitted to Sahlgrenska Hospital through the emergency room: median pre-hospital delay: 3hr. pre-hospital delay time(hr.) % <3 50

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				<6 67 <12 80 <24 88 % of patients showing ST elevation in ECG on admission: pre-hospital delay time(hr.) % <3 22 <6 30 <12 34 <24 37 **Delay time: after** <u>During:</u> Median pre-hospital delay time: All patients: 2hr. 20min. Men: 2hr. 15min. Women: 2hr. 45min. <70 yr. old: 2hr. 0min. >70 yr. old: 2hr. 50min. Previous AMI or angina pectoris: 2hr. 35min. No previous AMI or angina pectoris: 2hr. 18min. % of patients with delay time <2 hrs: 45% This percentage remained at a similar level during the 3 years thereafter. Median pre-hospital delay time: all CCU patients only with suspected AMI: 2.40hr. (n=1184), p<0.001. all CCU patients with confirmed AMI: 2.20hr. (n=496), p<0.001. all hospital wards including CCU patients, with suspected AMI: 2.45hr. (n=1511), p<0.001. all hospital wards including CCU patients, with confirmed AMI: 2.25hr. (n=554), p<0.001. (Pitman's non-parametric test was used.) % of AMI patients in CCU arriving in hospital <or=3 hrs: 58% (p<0.05) (Pitman's non-parametric test was used.) Median pre-hospital delay time in patients admitted to CCU:

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				patients with previous history of MI or angina pectoris: 2.45hr. (n=702), p<0.001. patients with no previous history of MI or angina pectoris: 2.35hr. (n=482), p<0.05. patients with previous history of MI, angina pectoris, congestive heart failure, hypertension or diabetes mellitus: 2.45hr. (n=867), p<0.001. patients with no previous history of MI, angina pectoris, congestive heart failure, hypertension or diabetes mellitus: 2.20hr. (n=317), p<0.05. age <or=60 yr.: 2.42hr. (n=290), p<0.01. age 60-75 yr.: 2.40hr. (n=528), p<0.001. age >75 yr.: 3.0hr. (n=326), p<0.01. gender male: 2.40hr. (n=733), p<0.001. gender female: 2.40hr. (n=420), p<0.01. patients with large AMI: 2.0hr. (n=220), p<0.001. patients with small AMI: 2.40hr. (n=261), p<0.05. (Pitman's non-parametric test was used.) Patients with AMI admitted to Sahlgrenska Hospital through the emergency room: median pre-hospital delay: 2hr. 20min. (p<0.001). pre-hospital delay time(hr.) % <3 57 (p<0.01) <6 74 (p<0.01) <12 89 (p<0.001) <24 96 (p<0.001) % of patients showing ST elevation in ECG on admission: pre-hospital delay time(hr.) % <3 29 (p<0.01) <6 36 (p<0.05) <12 39 (p>0.05) <24 42 (p<0.05) (Pitman's non-parametric test was used.) Median pre-hospital delay time for all patients admitted to a CCU during the campaign who had heard of the campaign: 2hr. 28min. Median pre-hospital delay time for all patients admitted to a CCU during the campaign who had not heard of the campaign: 2hr. 48 min. (p<0.05)

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				Median delay time for patients with confirmed AMI who had heard of the campaign: 2hr. 10min. Median delay time for patients with confirmed AMI who had not heard of the campaign: 2hr. 45min. (p<0.01) (Pitman's non-parametric test was used.) <u>After</u>: Median pre-hospital delay times: All patients: 2hr. 20min. (p<0.001). Men: 2hr. 10min. (p<0.001). Women: 2hr. 45min. (p<0.05). <70 yr. old: 2hr. 0min. (p<0.01). >70 yr. old: 2hr. 50min. (p<0.001). Previous AMI or angina pectoris: 2hr. 30min. (p<0.01). No previous AMI or angina pectoris: 2hr. 10min. (p<0.001). (p-values are for before versus after the campaign.) % of patients with delay time <2 hrs: this remained at a similar level to that during the campaign. **Medical services** Use of medical services: before % of patients who developed MI and used an ambulance service: 61% Number of patients with chest pain per day in the emergency department: 10 +/- 0.1. Use of medical services: after <u>During</u>: % of patients who developed MI and used an ambulance service: 64% (p>0.2) After: % of patients who developed MI and used an ambulance service: 60% **Other outcomes** **Other outcomes: before** % (number) of patients with 1-year mortality rate: All patients: 25% (766).

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				<70 yr. old: 15% (397). Pre-hospital delay time for all such patients: pre-hospital delay (hr.) % (number) <2 22 (306) 2-4 25 (148) >4 28 (302) Pre-hospital delay time of such patients <70 yr. old: pre-hospital delay (hr.) % (number) <2 12 (180) 2-4 17 (76) >4 17 (139) Number of patients with chest pain appearing in the emergency department: 4407 Patients with AMI admitted to Sahlgrenska Hospital through the emergency room: % (number) in-hospital mortality: all patients: 14% (919) patients <75 yr.: 10% (555) all CCU patients: 13% (777) CCU patients <75 yr.: 8% (513) % (number) 1-year mortality: all patients: 29% (905) patients <75 yr.: 19% (546) all CCU patients: 26% (766) CCU patients <75 yr.: 17% (505) **Other outcomes: after** During: % (number) of patients with 1-year mortality rate: All patients 25% (525) <70 yr. old: 16% (242). Pre-hospital delay time for all such patients: pre-hospital delay (hr.) % (number) <2 20 (216) 2-4 28 (96) >4 26 (175) Pre-hospital delay time of such patients <70 yr. old: pre-hospital delay (hr.) % (number) <2 14 (118) 2-4 16 (38)

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				>4 16 (68) Number of patients with chest pain appearing in the emergency department: 4805 Patients with AMI admitted to Sahlgrenska Hospital through the emergency room: % (number) in-hospital mortality: all patients: 13% (632) patients <75 yr.: 9% (352) all CCU patients: 11% (529) CCU patients <75 yr.: 8% (323) % (number) 1-year mortality: all patients: 28% (632) patients <75 yr.: 18% (352) all CCU patients: 25% (529) CCU patients <75 yr.: 18% (323) After: % (number) of patients with 1-year mortality rate: All patients: 25% (809). <70 yr. old: 13% (355). Pre-hospital delay time for all such patients: pre-hospital delay (hr.) % (number) <2 20 (313) 2-4 27 (153) >4 22(214) Pre-hospital delay time of such patients <70 yr. old: pre-hospital delay (hr.) % (number) <2 10 (153) 2-4 14 (65) >4 12 (96) When separately analysing patients who were less than 70 years of age, there was a weak tendency indicating at lower mortality during the 3 years after the campaign. This trend was not more marked among patients who arrived less than 2 hours after onset of pain. **Process outcomes** On two occasions (May 1988 and November 1988) 400 and 610 persons were interviewed by telephone via a telemarketing company. Persons

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				were chosen at random via Goteborg's official telephone list according to a procedure routinely used in telemarketing evaluations. This evaluation was not planned before the start of the campaign. 60% and 71% of the persons, respectively, reported that they had heard of 'Heart_Pain_90 000'. The messages that reached the most people were those on the poster advertisements on buses and trams and the articles and advertisements in newspapers. Only 46% and 58%, respectively, thought that they could interpret the campaign. Of those who thought that they could interpret the message of the campaign, 31% and 33%, respectively, spontaneously remembered all parts of the message at the two evaluations. They comprised 15% and 19%, respectively, of all those who were interviewed. More than 80% of the persons who had heard of the message thought that the campaign was useful, whereas 1% were frightened by it or uninterested. On one occasion- October 1988- an advertisement in the main daily newspaper in Goteborg was evaluated 2 days after it appeared by interviewers from a special evaluation company. 180 persons chosen at random were interviewed on the street. This evaluation was not planned before the start of the campaign. Among the 180 persons who had read the newspaper, 52% had seen the advertisement. Of all persons 47% had read the headline, 27% had read some of the text under the headline, and 16% had read all the text. 95% thought it was good and 3% reacted negatively. During the campaign 1366 patients with suspected AMI were admitted to the coronary care unit in Sahlgrenska Hospital. 1065 (78%) of these were interviewed. This evaluation was designed before the start of the campaign. Of those interviewed 65% had heard of 'Heart_Pain_90 000' but only 31% of those who had heard of it thought that the campaign influenced them to

Study details	Intervention details	Participant details	Statistical analysis/ Missing data	Outcome measurements and results
				come faster to the hospital. Of those interviewed, the percentage of patients being aware of the campaign via various media was as follows (Media type (%)): newspaper (46), bus/tram (45) , hospital (25), radio (11), pharmacy (11), post office (5), bank (4). The percentage of patients (N=1058) aware of the campaign during various periods of the campaign is as follows (Time quartile (%)): 1 (58), 2 (69), 3 (67), 4 (67). Among all patients admitted to a CCU during the campaign those who had heard of Heart-pain-90 000 had a median delay time of 2 hr. 28 min. as compared with 2 hr. 48 min. in those who had not heard of it ($p<0.05$). Among patients with confirmed AMI, the median delay time was 2hr. 10 min. for those having heard of the campaign versus 2 hr. 45 min. for those who had not ($p<0.01$) **Cost information** The costs for the campaign were as follows: total cost of printing advertisement material: $54 000, advertisements on buses and trams: $160 000, advertisements on pillars: $35 000, advertisements in newspapers: $105 000, household distributed leaflets: $40 000, salary for nurse: $18 000. Total cost of campaign: $ 412000. In summary $54 000 was spent on printing and $358 000 on distribution of material.
Author (year), country Gaspoz (1996),[11] Switzerland **Language** English **Authors' objectives** To decrease pre-hospital delay in patients with chest	**Content and setting** Multimedia public campaign with the slogan 'Heart attack? Every minute counts! Call 144!' The campaign focused on chest pain, AMI and thrombolysis, and importance of calling 144 to send physician staffed mobile intensive care unit. TV, radio, newspapers, posters and widely	**Inclusion criteria: total sample** People living in the Canton of Geneva. **Inclusion criteria: suspected AMI** People presenting with chest pain to the emergency department at the university hospital of canton.	**Statistical analyses used** Chi square test was used to compare categorical variables and student's t-test for continuous variables. Time intervals were not normally distributed and were therefore analysed by	**Delay time measured** Pre-hospital delay - defined as time from onset of symptoms to arrival at hospital. Patient delay - defined as time from onset of symptoms to alert. **Method of outcome evaluation** Data were prospectively collected by research nurses through interviews with the patients or their

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pain.	distributed leaflets (including to health and social care professionals) were used. The setting was in the Canton of Geneva, which is an urban area (282 km squared) of Switzerland. **Duration and frequency** The intervention lasted 12 months (5/92 to 4/93). Information on chest pain, AMI, and thrombolysis, was broadcast on the midday and evening news of the public speaking part of Switzerland on day 1 and six months later. Four 30 minute TV shows were also showed three and five months later, and a 30 second cartoon on chest pain, ending with a special logo for the campaign, was broadcast on TV 14 times per month for 12 months. The public radio of the French speaking part of Switzerland broadcasted information during the midday and evening news on day 1 and 6 months later, and there was a 45min programme on the campaign on day 1. Private radio broadcast 30 second messages six times a day during three separate weeks, six months after the beginning of the campaign. A press conference with the minister of health of the canton was held on day 1. This was widely reported in the newspapers. Advertisements carrying the logo of the campaign and its slogan appeared in the newspaper twice a week for 12 months. Posters were put up on the streets and on buses and trams for seven two week periods. Leaflets were distributed to	**Sample size** **Before** 1100 **After** 1295 **Total** 2395 **Participant details** **Before** Gender: 63% men. Age: mean 62 yr., SD 16. Hypertension: 38% Diabetes: 15% Previous MI: 24% Past history angina: 22% Past PTCA/CABG: 14% Typical chest pain: 66% **After** Gender: 61% men. Age: mean 64 yr.*, SD 16. Hypertension: 42%* Diabetes: 15% Previous MI: 22% Past history angina: 27%* Past PTCA/CABG: 15% Typical chest pain: 61%* (* indicate statistically significant differences between before and after groups) **Total** Not stated	Wilcoxon rank sum test. All tests were two-sided, and were regarded as statistically significant if $p<0.05$. **Power calculation** Not stated **Missing data** Detailed information on pre-hospital delay was available for 96.5% of patients before the campaign and for 96.9% of patients during the campaign period.	relatives; review of the medical, nursing, and administrative records; review of the records of the central switchboard for medical emergencies and of ambulance companies; and through information obtained from the private services that dealt with emergency home medical visits. **Delay time** **Delay time: before** Pre-hospital delay time: mean 7 hr. 50 min. (SEM=30), median 180 min. Patient delay time: mean 4 hr. 47 min. (SEM=21), median 86.5 min. **Pre-hospital delay time:** AMI (n=309): mean 9 hr. 10 min. (SEM=67), median 195 min. Unstable angina (n=257): mean 7 hr. 52 min. (SEM=51), median 200 min. Other cardiac diseases (n=164): mean 8 hr. 21 min. (SEM=116), median 150 min. Other non-cardiac services (n=370): mean 6 hr. 27 min. (SEM=34), median 169.5 min. Age <75 years: Men (n=574): mean 8 hr. 16 min.(SEM=50), median 168 min. Women (n=228): mean 6 hr. 26 min. (SEM=45), median 165 min. Age >or=75 years: Men (n=123): mean 6 hr. 58 min. (SEM=49), median 220 min. Women (n=175): mean 8 hr. 48 min. (SEM=71), median = 201 min. Delay time: after <u>During</u>: Pre-hospital delay time: mean 4 hr. 54 min. (SEM=10), median 155 min. The mean and median pre-hospital delays were statistically significantly reduced during the campaign by 2hr. 56min. and 25 min. respectively ($p<0.001$). Patient delay time:

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	households living outside the town, to all senior citizens, and to all state and town employees with one of their pay-cheques, to patients and visitors at the hospital for 12 months, in all post offices and pharmacies in the canton, and in the major supermarkets for two periods of two weeks. Leaflets were distributed to all patients admitted to the hospital for suspected AMI and to all patients following rehabilitation programmes after an AMI. They were mailed to all out-of-hospital public and private nursing services and to all medical practitioners, those who lecture to paramedics, policemen, and private hospital physicians. **Duration of outcome measurement** Before measurements were taken for 12 months and then measurements were taken during the 12 months of the campaign.			mean 3 hr. 02 min. (SEM=10 min), median 60 min. (p<0.001). Pre-hospital delay time: AMI (n=341): mean 5 hr. 10 min. (SEM=21), median 155 min. Unstable angina (n=327): mean 4 hr. 46 min. (SEM=20), median 160 min. Other cardiac diseases (n=225): mean 4 hr. 27 min. (SEM=21 min), median = 150 min. Other non-cardiac services (n=402): mean 5 hr. 01 min. (SEM=20), median 150 min. Age <75 years: Men (n=638): mean 4 hr. 49 min. (SEM=16), median = 139.5 min. Women (n=253): mean 5 hr. 14 min. (SEM=26), median = 165 min. Age >or=75 years: Men (n=157): mean 4 hr. 26 min (SEM=20), median = 150 min. Women (n=247): mean 5 hr. 04 min. (SEM=23), median = 189 min. **Medical services** Use of medical services: before Number (%) calling switchboard for medical emergencies as the first alert: 138 (13%). Number (%) coming to hospital by ambulance: 563 (51%). Mean number of visits per week to the emergency department for chest pain: 22.2 Use of medical services: after During: Number (%) calling switchboard for medical emergencies as the first alert: 256 (20%), p<0.001. Number (%) coming to hospital by ambulance: 684 (53%), NS. Mean number of visits per week to the emergency department for chest pain: 49, p<0.01. This increase in emergency department visits remained statistically significant at six and 12 months. The

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				increase of emergency department visits for chest pain during the first week was the result of a more that twofold increase in visits for AMI and unstable angina (p<0.01) and visits for chest pain of non-cardiac origin (p<0.05). Visits due to cardiac diseases other than AMI and unstable angina increased only slightly (NS). At six and 12 months the increase in emergency department visits per week for AMI and unstable angina was still statistically significant, whereas it was not statistically significant for visits owing to non-cardiac chest pain. **Other outcomes** **Other outcomes: before** Not stated **Other outcomes: after** Not stated **Process outcomes** Not stated **Cost information** Costs related to the campaign itself (TV, radio, newspaper advertisements, posters, and leaflets) totalled 300,000 Swiss Francs (£150,000).
Author (year), country Maeso-Madronero (2000),[13] Germany **Language** German **Authors' objectives** To initiate a media campaign to reduce pre-hospital delay time.	**Content and setting** A media campaign was initiated with decentralised autonomy for the participation partners in communities and counties. Local press, local radio and television as well as telephone actions, local 'Emergency-Days' or 'Cardiovascular Days', seminars and lectures in schools, companies and sport clubs were used for information transmission. Also information brochures and posters in primary care practices,	**Inclusion criteria: total sample** Residents of the district of Arnsberg, Germany. **Inclusion criteria: suspected AMI** Patients with suspected AMI. **Sample size** **Before** 412 **After** 259	**Statistical analyses used** Pre-hospital times were compared for the before and after groups using the Mann-Whitney U-test (skewed data). T-tests for independent samples were used for other comparisons. Chi-square tests were used for categorical data.	**Delay time measured** Pre-hospital delay - defined as time from onset of symptoms to arrival in hospital. **Method of outcome evaluation** Not stated. **Delay time** Delay time: before Median pre-hospital delay time (25th%- 75th%-quartile): 4.0 hr. (1.7, 15.5). Pre-hospital delay time %

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	pharmacies and public places were used. No information on the content of the campaign was presented. The setting was 36 towns of the district of Arnsberg, Germany. The emergency units of 48 corresponding community hospitals took part. **Duration and frequency** The intervention lasted 6 months (1/7/94 to 31/12/94). **Duration of outcome measurement** Between 1-1-1994 and 31-12-1997 patients with suspected AMI were recorded in 48 participating hospitals. Before measurements were taken for 6 months (1/1/94 to 30/6/94). Measurements were then taken for 6 months during the campaign.	Total **671** **Participant details** **Before** Age: mean 67.2 yr., SD 12.4 yr. Gender: 35.55% women. Known coronary heart disease: 40.5% Past cardiac infarction: 27.2% Diagnosed with acute cardiac infarction: 60.9%. **After** Age: mean 67.3 yr., SD 12.2 yr. Gender: 37.0% women. Known coronary heart disease: 51.4%*. Past cardiac infarction: 27.0%. Diagnosed with acute cardiac infarction: 45.2%* (* indicate statistically significant differences between before and after groups) **Total** Not stated	**Power calculation** Not stated **Missing data** Of the 5531 patients with suspected AMI, 5503 provided sufficient data.	<1 15.5 <6 58.5 6-12 10.9 **Delay time: after** <u>During</u>: Median pre-hospital delay time (25th%- 75th%-quartile): 2.9 hr. (1.2, 11.0), p=0.007. Pre-hospital delay time % <1 23.2 (p=0.013) <6 66.0 (p=0.051) 2 10.0 **Medical services** **Use of medical services: before** Not stated **Use of medical services: after** Not stated **Other outcomes** **Other outcomes: before** Not stated **Other outcomes: after** Not stated **Process outcomes** Not stated **Cost information** Not stated