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## PREHOSPITAL CARE

## Systematic review of interventions to reduce delay in patients with suspected heart attack

A Kainth, A Hewitt, J Pattenden, A Sowden, S Duffy, I Watt, D Thompson, R Lewin

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**Objectives:** To evaluate the effectiveness of interventions aiming to reduce time from onset of signs and symptoms of an acute myocardial infarction (AMI) to seeking medical help/arrival at hospital.

**Methods:** A systematic review was conducted. Fifteen electronic databases, the internet, and bibliographies of included studies were searched, and experts in the field of cardiac care were contacted. Randomised controlled trials (RCTs), controlled trials, and before and after studies conducted in any setting that assessed an intervention aimed at reducing time from onset of signs and symptoms of an AMI to seeking medical help and/or arrival in hospital were eligible for inclusion.

**Results:** Eleven media/public education intervention studies met the inclusion criteria. Five (one controlled and four before and after studies) reported the intervention to have a statistically positive effect on delay time and six (two RCTs and four before and after studies) reported no statistically significant effect. Three (one RCT and two before and after studies) of five studies evaluating the effect of the intervention on emergency department visits reported an increase in this outcome as a result of the intervention, and both studies (one RCT and one before and after study) examining calls made to emergency switchboards reported an increase in this outcome after the intervention.

**Conclusions:** There was little evidence that media/public education interventions reduced delay. There is some evidence that they may result in an increase in emergency switchboard calls and emergency department visits. Despite substantial expenditure of time and effort, methodological deficiencies of the studies mean that it is not possible to make definitive recommendations.

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Acute myocardial infarction (AMI) is the major cause of premature mortality in the UK and other western countries.<sup>1,2</sup> The importance of prompt administration of thrombolytic therapy has led to public education programmes to reduce time between onset of symptoms and treatment. This period consists of patient delay, transport time, and hospital time from admission to treatment.<sup>3</sup> Patient delay is defined as time from onset of signs and symptoms of an AMI to when medical assistance is sought.<sup>4</sup> Patient delay combined with transport time is referred to as prehospital delay.

The UK National Service Framework recommends public education programmes encouraging people to call an ambulance in the event of symptoms suggestive of myocardial infarction.<sup>1</sup> We conducted a systematic review to investigate the effectiveness of interventions aiming to reduce patient and/or prehospital delay.

## METHODS

The review was undertaken according to the Centre for Reviews and Dissemination's (CRD) systematic review guidelines.<sup>5</sup> Fifteen electronic databases, the internet, and bibliographies of included studies were searched, and experts in the field of cardiac care were contacted. Studies were included if they assessed an intervention aimed at reducing patient and/or prehospital delay, reported either patient and/or prehospital delay as the outcome, and were randomised controlled trials (RCTs), controlled trials, or before and after studies. Articles were assessed for inclusion independently by two reviewers, and data extraction and quality assessment were carried out by one reviewer and checked by a second reviewer. Disagreements were resolved through discussion and, if necessary, by recourse to a third reviewer. Study validity was assessed using a checklist adapted from CRD's guidelines,<sup>5</sup> and a previous systematic review.<sup>6</sup> Studies were synthesised in a narrative format along with appropriate summary tables.

## RESULTS

Eleven studies, evaluating media/public education campaigns, met inclusion criteria.<sup>7–17</sup> One of these also examined one to one education.<sup>17</sup> Two were RCTs,<sup>16,17</sup> one was a controlled trial,<sup>15</sup> and eight were before and after studies.<sup>7–14</sup> Table 1 summarises duration of the intervention and outcome measurement of studies.

Table 2 summarises the content of interventions. The primary outcome examined in all studies was patient and/or prehospital delay. Other outcomes were mortality rates and the use of health resources.

### Prehospital and patient delay time

Two RCTs<sup>16,17</sup> and six before and after studies<sup>8,9,11–14</sup> examined prehospital delay. Three before and after studies reported a statistically significant reduction in delay after the intervention.<sup>8,9,11</sup> In one of these studies there were also statistically significant increases in percentage of persons delaying less than one hour and less than six hours.<sup>11</sup> Another before and after study reported a statistically significant increase in percentage of persons delaying two hours or less.<sup>12</sup> Neither RCT reported any statistically significant effects of the intervention. This was also the case for two of the before and after studies.<sup>13,14</sup>

The controlled trial<sup>15</sup> and three before and after studies<sup>7,9,10</sup> examined patient delay. The controlled trial reported a statistically significant increase in percentage of patients in the intervention group calling their general practitioner after compared with before the intervention. However, these findings were not compared with the control group. One before and after study found a statistically significant reduction in median delay.<sup>9</sup> The other two found no statistically

**Abbreviations:** RCT, randomised controlled trial; AMI, acute myocardial infarction

**Table 1** Duration of the intervention and outcome measurement of included studies

Reference, country	Intervention period	Pre-intervention measurement period	Intervention measurement period	Post-intervention measurement period (time to commencement after intervention ceased)
<b>RCTs</b>				
Meischke <i>et al</i> , 1997, <sup>16</sup> USA	7 wk+10 m	None	10 m	14 m
Luepker <i>et al</i> , 2000, <sup>17</sup> USA	18 m	4 m	18 m	None
<b>Controlled trial</b>				
Rowley <i>et al</i> , 1982, <sup>15</sup> England	32 m	3 m	32 m	None
<b>Before and after studies</b>				
Mitic and Perkins, 1984, <sup>12</sup> Canada	8 wk	4 wk	8 wk	1 wk (3 m)
Ho <i>et al</i> , 1989, <sup>10</sup> USA	2 m	4.5 m	None	4.5 m
Moses <i>et al</i> , 1991, <sup>13</sup> USA	24 m	12 m	24 m	None
Rustige <i>et al</i> , 1992, <sup>14</sup> Germany	9 m (1st period) 18 m (2nd period)	6 m	9 m	6 m (after 1st period) 18 m (ongoing with 2nd period)
Bett <i>et al</i> , 1993, <sup>7</sup> Australia	1 wk	2 m	None	1 m (1 m)
Blohm <i>et al</i> , 1994, <sup>8</sup> Sweden	14 m	21 m	14 m	36 m
Gaspoz <i>et al</i> , 1996, <sup>9</sup> Switzerland	12 m	12 m	12 m	None
Maeso-Madronero <i>et al</i> , 2000, <sup>11</sup> Germany	6 m	6 m	6 m	None

m, month(s); wk, week(s).

significant difference in the percentage of people seeking help within different time periods<sup>7-10</sup> or in median delay.<sup>7</sup>

### Use of health resources

Two RCTs<sup>16,17</sup> and three before and after studies<sup>8-9,13</sup> examined the effect of the intervention on emergency department visits. One RCT reported a statistically significant increase in the overall number of visits for chest pain throughout the campaign period,<sup>16</sup> one before and after study reported a statistically significant increase in mean number

of visits per day,<sup>8</sup> and another before and after study showed a statistically significant increase in the mean number of visits per week.<sup>9</sup>

One RCT<sup>16</sup> and one before and after study<sup>9</sup> examined calls made to emergency switchboards. Both found statistically significant increases in the number of calls made after the intervention.

None of the three before and after studies examining use of ambulance/medic transport reported a statistically significant difference in this outcome from before to after the intervention.<sup>8-10</sup>

**Table 2** Summary of the key factors of the intervention content of included studies

Reference, 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
<b>RCTs</b>					
Meischke <i>et al</i> , 1997, <sup>16</sup> USA	Y	Y	Y	Y	Y
Luepker <i>et al</i> , 2000, <sup>17</sup> USA	Y	Y	Y	Y	N
<b>Controlled trial</b>					
Rowley <i>et al</i> , 1982, <sup>15</sup> England*	Y	N	Y	N	Y
<b>Before and after studies</b>					
Mitic and Perkins, 1984, <sup>12</sup> Canada	Y	Y	Y	N	N
Ho <i>et al</i> , 1989, <sup>10</sup> USA	Y	Y	Y	N	Y
Moses <i>et al</i> , 1991, <sup>13</sup> USA	Y	Y	N	N	N
Rustige <i>et al</i> , 1992, <sup>14</sup> Germany	Y	Y	N	N	N
Bett <i>et al</i> , 1993, <sup>7</sup> Australia	Y	N	N	Y	Y
Blohm <i>et al</i> , 1994, <sup>8</sup> Sweden	Y	N	Y	N	Y
Gaspoz <i>et al</i> , 1996, <sup>9</sup> Switzerland	Y	N	Y	Y	Y

The before and after study of Maeso-Madronero *et al*, 2000,<sup>11</sup> Germany, did not provide any details on intervention content. Y, yes; N, no. \*Signs and symptoms of an AMI was not a key factor, but intervention content did emphasise chest pain.

### Mortality rate

One RCT<sup>17</sup> and one before and after study<sup>8</sup> examined mortality rates. Neither reported any statistically significant effects of the intervention on mortality.

### Study quality

Methodological quality of studies was generally poor. Studies were flawed with regard to issues concerning the sample, inclusion criteria, statistical analyses, outcome assessment, and reporting of information relating to intervention content and participants.

### DISCUSSION

There is limited evidence that community wide media based or one to one educational interventions were successful in reducing delay time and they may have resulted in an increase in calls made to emergency switchboards and emergency department visits. However, because of the types of study designs used and methodological deficiencies of studies, it is unclear how much weight can be given to these findings. Evidence for the effectiveness of interventions came mainly from before and after studies suggesting a need for caution in attributing any reported effects to the actual intervention.

Studies that were effective in reducing delay appeared similar to those that were ineffective in terms of population, duration of intervention, main outcome measured, baseline delay, and year in which conducted. Few studies provided information relating to frequency and intensity of interventions for a similar assessment of these factors.

### Implications for future research

It may be beneficial for interventions to emphasise importance of thrombolytic therapy in preventing death or disability, and make it acceptable for people to access emergency services without fear that they are wasting NHS resources or that their symptoms are not serious enough.<sup>18 19</sup> It might be useful to evaluate how patients (and their partners/family) make the decision to call for help before advocating interventions. It may also be appropriate to target education at high risk groups, including family members. However, there is a need to educate the public at large to call an ambulance if they witness what could be an AMI.

Future research requires an appropriate design with baseline measurement of delay time, a reasonable follow up period, and specification of frequency, intensity, and content of the intervention. As the ultimate aim of such interventions is to save lives, mortality should be measured. Such studies are needed before any firm conclusion can be drawn.

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### CONTRIBUTORS

RL suggested the need for the review. JP obtained the funding. All authors contributed to the execution of the review and content of the paper. AS supervised the review. SD carried out the electronic search strategies. AH, AK, and JP carried out study selection, data extraction and quality assessment, and AS and IW arbitrated when necessary. AS, AH, AK, JP, IW, RL, and DT contributed to the study design, interpretation of the results and critical revisions to the manuscript.



A table giving full study details for RCTs and a longer version of the paper are available on the journal web site (<http://www.emjonline.com/supplemental>).

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