Clinical question.
In adult and pediatric patients with cardiac arrest (prehospital [OHCA]), does the description of any specific symptoms to the dispatcher compared with the absence of any specific description, improve accuracy of the diagnosis of cardiac arrest?

Is this question addressing an intervention/therapy, prognosis or diagnosis? Diagnosis

State if this is a proposed new topic or revision of existing worksheet: New topic

Search strategy (including electronic databases searched).

***ORIGINAL ELECTRONIC SEARCH***
The Medline (Ovid) (1950 to June week 2 2008) database was searched using the following strategy:
heart arrest (MeSH, mp), death, sudden, cardiac (MeSH), cardiac arrest (mp), cardio: arrest (mp)
AND

The Cochrane Library (2nd quarter 2008), including the database of systematic reviews, the controlled clinical trials registry and the database of abstracts of reviews of effects was searched using the following strategy:
heart arrest (mp), cardiac arrest (mp) or cardio: arrest (mp)
AND
emerg: med: dispat: (mp), 9?1?1 (mp), call?taker (mp), dispat: (mp).

Embase (Ovid) (1980 to 2008 week 25) was searched using the following strategy:
heart arrest (SH, mp), cardiac arrest (mp), cardio: arrest (mp)
AND
Emergency Health Service (SH), 9?1?1 (mp), 9?9?9 (mp), call?taker (mp), dispat: (mp), emerg: med: dispat: (mp), emd (mp), clawson (mp), mpds (mp), medical: prior: dispat: sys: (mp)
AND
pre?hospital (mp), out-of-hospital (mp), ohca (mp), out?patient (mp).

In addition, the AHA Endnote database was searched using the key words:
heart arrest, cardiac arrest, ohca, dispatch, 911 and 999.

The reference lists of all articles selected for further review were scanned to locate any additional papers meeting the inclusion criteria that were not located in the electronic literature searches.

The original literature searches were repeated on August 30th, 2009 and January 13, 2010 for Medline (to December week 5, 2009), Embase (to 2010 week 01) and the Cochrane Library (to 4th quarter 2009). In addition, key resuscitation and emergency medicine journals were hand-searched in January 2010 to identify any further potentially eligible studies not yet indexed in the electronic databases.

• State inclusion and exclusion criteria
Papers meeting the following criteria were eligible for inclusion:
- prospective or retrospective designs involving adult or pediatric patients experiencing out-of-hospital cardiac arrest
- reporting simulated or real dispatcher interactions with a caller
- reporting on the diagnosis of cardiac arrest, either as a percentage of correctly identified confirmed cases or using some other convention

The following were excluded:
- comments, letters and editorials
- study involving animal models
- studies only available in abstract form
Number of articles/sources meeting criteria for further review:

Originally, the electronic search strategy identified 425 unique citations. The titles and abstracts were screened by two reviewers and 58 citations were flagged by at least one reviewer to be reviewed in full (kappa = 0.74). One additional article was located through searching the reference lists of the selected articles, for a total of 59. Of these, 17 studies met the inclusion criteria and are described in this review (kappa = 0.57). We used consensus agreement to determine final eligibility for inclusion. Our updated electronic search (Aug. 30, 2009) identified an additional 48 unique citations, among which 10 were flagged to be reviewed in full (kappa = 0.93). Of these, 4 met inclusion criteria and are described in this review (kappa = 1.0). The most recent update (January 2010) identified an additional 23 citations, of which five were flagged for full review (kappa = 0.59). Of these, two met the stated inclusion criteria and are included in this version of the review (kappa = 1.0). TOTAL = 23 in this review.

Summary of evidence

**Evidence Supporting Clinical Question**

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<th>Level of evidence</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
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<tr>
<td>A = Return of spontaneous circulation</td>
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<td>C = Survival to hospital discharge</td>
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<td>D = Intact neurological survival</td>
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<td>E = Other endpoint*</td>
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<td>* = Recognition of cardiac arrest</td>
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**Evidence Neutral to Clinical question**

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<tr>
<td>A = Return of spontaneous circulation</td>
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<tr>
<td>B = Survival of event</td>
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<td>C = Survival to hospital discharge</td>
<td>BANG 1999, 175&lt;sup&gt;ABC&lt;/sup&gt; CAIRNS 2008, 349&lt;sup&gt;E&lt;/sup&gt; CASTRENI 2001, 265&lt;sup&gt;E&lt;/sup&gt; CLARK 1994, 1022&lt;sup&gt;E&lt;/sup&gt; FLYNN 2006, 72&lt;sup&gt;E&lt;/sup&gt; GARZA 2003, 955&lt;sup&gt;E&lt;/sup&gt; HAUFF 2003, 731&lt;sup&gt;BCE&lt;/sup&gt; KUISMA 2005, 89&lt;sup&gt;ACE&lt;/sup&gt; MA 2007, 236&lt;sup&gt;BE&lt;/sup&gt;</td>
<td>EISENBERG 1985, 47&lt;sup&gt;CE&lt;/sup&gt;</td>
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*Italics = Animal studies*
**Evidence Opposing Clinical Question**

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**REVIEWER’S FINAL COMMENTS AND ASSESSMENT OF BENEFIT / RISK:**

**DISCUSSION:**

There is a paucity of science pertaining to the recognition of cardiac arrest over the telephone by emergency medical dispatchers. We found no systematic review or meta-analysis, and no randomized controlled trials on this topic. We identified five before-after trials, and three case-control trials. All the other studies were descriptive. Most studies used “unconsciousness” and “absence of breathing” or “abnormal breathing” in some kind of protocol to help dispatchers recognize cardiac arrest. Only a few studies explored the description of other symptoms for the purpose of identifying cardiac arrest victims. One study systematically explored which “trigger words” elicited during telephone interview could help better identify cardiac arrest victims. Many studies identified agonal or abnormal breathing as a potential barrier/facilitator to recognizing cardiac arrest over the phone, and two before-after studies explored educational or system strategies to improve dispatchers’ ability to recognize cardiac arrest when such abnormal breathing is present.

We have identified a total of 23 manuscripts with the following characteristics:

1) Bang, 1999, 175 (Level D4. Neutral, fair)

473 cases included; Dispatchers suspected cardiac arrest when “unconsciousness” and “respiratory arrest” were present. 427 of suspected cardiac arrest cases were confirmed by EMS for a recognition rate of 90.3%. Reasons for missed diagnosis included incomplete interview, caller did not give enough information, callers' psychological state. Survival to hospital discharge was 4%.

2) Bohm, 2007, 256 (Level D4. Supportive, fair)

Only included cases of witnessed out-of-hospital cardiac arrest (OHCA) where CPR was not already ongoing (those eligible for telephone CPR (T-CPR)). N=76. T-CPR offered to 36 (47%). Dispatchers complied with protocol in more than 90% of cases i.e. must determine whether patient is awake and able to talk and if patient is breathing normally. Description of breathing was available in 69/76 cases - 44/69 reported patient breathing, 34 described abnormal breathing and 25 not breathing. T-CPR was offered to 23% of patients with agonal breathing versus 92% of patients who were not breathing (p<0.001). Authors felt that under diagnosis of cardiac arrest was the main reason why T-CPR was not offered in more cases, and likely because of confusion resulting from breathing status.


Used the medical priority dispatch system (MPDS). 181 calls given dispatch code of cardiac arrest (unconscious and not breathing); 106 were confirmed and 9 cases where OHCA could not be excluded for positive predictive value of 63.5%. An additional 57 cardiac arrest events were found when manually examining autopsy reports, medical records, and death certificates. EMS was not deployed in 5 cases. Dispatcher’s reported sensitivity was 68.9% (95% CI, 61.3 to 75.8%).

4) Castren, 2001, 265 (Level D4. Neutral, fair)

328 calls included where cardiac arrest was witnessed or where bystander CPR was ongoing - 33 callers were doctors or nurses, 19 callers were other health care professionals or police, 276 callers were laypeople. Cardiac arrest was recognized by the dispatcher in 239/328 cases (72.9%). Authors noted a clear trend by dispatcher of not asking further questions, even ones required by protocol when caller was a doctor, nurse or health care professional. There were no significant differences in survival to hospital or recognition of cardiac arrest by dispatcher between groups.

5) Clark, 1994, 1022 (Level D4. Neutral, fair)

Study objective was to identify and determine rates of delivery and performance of telephone CPR in non-cardiac arrest incidents. Cardiac arrest victim were defined as unconscious and not breathing normally. 358 incidents of cardiac arrest, respiratory arrest and potential cardiac arrest were included. T-CPR offerered in appropriately 61 (70%) of 87 cases (68 cardiac arrests and 19 respiratory arrests) and inappropriately in 8 (5.2%) of 154 potential cardiac arrests (44 respiratory difficulty, 31 syncope, 24 stroke, 24 febrile seizure, 21 seizure, and 10 other).

6) Clawson, 2007, 298 (Level D4. Supportive, fair)

The study objective was to determine the predictability of cardiac arrest from a patient past medical history of seizure or epilepsy ("E" history). Among callers reporting a seizure event, confirming a past medical history of seizure reduced the risk of not recognizing a cardiac arrest presenting with anoxic seizure.
7) Eisenberg, 1986, 299 (Level D3 (case-control, non-concurrent). Neutral, poor
The characteristics of cardiac arrest calls were compared to non-cardiac arrest calls. No information given on how non-cardiac arrest controls were selected. Information about sex, location and activity prior to collapse were not found to be important in distinguishing cardiac arrest from non-cardiac arrest calls. A victim over 50 years old and an emotional caller (score >2/5) were more common among cardiac arrest calls and could have identified 96% of all cardiac arrest cases (specificity of 38%). Authors suggest that questions about consciousness and breathing should be asked immediately for calls meeting these criteria.

8) Eisenberg, 1985, 47 (Level D3 (before-after). Neutral, fair)
Bystander-initiated CPR (including T-CPR) increased from 45% before to 56% after the program was initiated. T-CPR was offered to 98 of 255 cases (38%). Reasons for not offering T-CPR included: communication errors, dispatcher errors and other or unknown reasons. Communication errors usually involved inability of caller or dispatcher to distinguish normal breathing from agonal breathing.

9) Flynn, 2006, 72 (Level D4. Neutral, fair)
The objective of the study was to determine the ability of the MPDS system to recognize cardiac arrest. Sensitivity was 76.7% (95% CI, 73.6-79.8%); specificity was 99.2% (95% CI, 99.1% to 99.3%).

10) Garza, 2003, 955 (Level D4. Neutral, fair)
The study objective was to analyze the accuracy of dispatchers in predicting cardiac arrest and to assess the effect of the caller party on dispatcher accuracy. Overall, sensitivity was 68.4% (95% CI, 63.3 to 73.0) using the MPDS. The type of caller did not significantly affect the sensitivity of diagnosing cardiac arrest. Positive predictive value was 65.0% (95% CI, 60.0 to 69.7).

11) Hallstrom, 2003, 123 (Level D4. Supportive, fair)
Large study. 682/3320 (20.5%) received T-CPR, 66 patients no diagnosis made, 221 patients false negative (FN), 222 false positive (FP) T-CPR instructions offered in most FP; instructions accepted in 68% and completed for approximately one-third. No adverse events attributed to CPR. Failure to follow protocol evident in 153/221 (69%) of FN (unconsciousness established in 76% of FN vs. 98% TP; p<0.05; breathes normally established in 65% FN vs. 97% TP; p<0.05). Protocol deviation found in 5.3% (64/1203) of CA with potential benefit correctly identified by dispatchers. In most FP (90.1%) protocol was followed correctly.

12) Hauff, 2003, 731 (Level D4. Neutral, fair)
The study objective was to examine factors that may impede implementation of telephone CPR. 25% (99/404) received CPR without dispatcher assistance. 34% (139/404) received T-CPR, 41% (166/404) did not receive CPR – in 80 of these calls, T-CPR was not offered by dispatcher; in 64% (51/80) dispatcher did not recognize CA or signs of life were reported by caller.

13) Heward, 2004, 115 (Level D3 (before-after). Supportive, fair)
Authors analyzed data for a one-month period (April) in 4 consecutive years before and after MPDS implementation. Since implementation of MPDS, the percentage of cardiac arrest detection by dispatchers increased (15% before, vs. 50% after). Compliance with protocols increased the percentage of CA detection.

14) Kuisma, 2005, 89 (Level D4. Neutral, fair)
This study included only bystander-witnessed VF cardiac arrest of cardiac origin for which CPR was initiated. Cardiac arrest was recognized in 296/373 cases (79.4%) (CA to be suspected when patient is not awake, not responding to painful stimuli, and is not breathing normally) – Protocol adherence was not measured, and no mention whether any one symptom reported resulted in increased recognition. Survival to discharge: 37.2% if CA recognized; 28.6% if not recognized.

15) Ma, 2007, 236 (Level D4. Neutral, fair)
There were 199 calls in final analysis, with a reported survival rate of 27.1% (survival to ICU) 193 OHCAs were identified by dispatcher; 189 of which were confirmed by field provider. 6 patients thought not to be in CA were later found to be in arrest (5/6 caller reported breathing as present). 51 callers reported breathing, but recognized as OHCA by dispatcher giving a sensitivity of 96.9% and positive predictive value of 97.9%. Level of consciousness and breathing status were most important questions to be asked to identify OHCA: 1) Level of consciousness: 62/199 cases where info was provided without asking; dispatcher asked in 62/137 cases and did not ask about it in 75/137. 2) Breathing status: 24/199 cases provided the information without being asked; dispatcher asked in 119/175 cases and did not ask in 56 cases. 75/199 (38%) received CPR. CPR instructions were not offered by dispatcher in 113/199 (57%) of cases, and bystander were unwilling in 11/199 (5%) of cases. Note: Authors did not report rate of recognition as a function of whether protocol was adhered to or not.

16) Nurmi, 2006, 463 (Level D4. Supportive, fair)
This study included 776 calls among which 660 were classified as CA by dispatcher, and 116 where dispatchers did not recognize CA, but patient was in CA when the ambulance arrived. The protocol asked about consciousness and breathing, and was adhered to in 52.4% of calls. The protocol was adhered to more often in witnessed (72.3%) compared to unwitnessed (45.0%) cases (p=0.001). CA identification rate did not significantly change when the protocol was adhered to or not for witnessed cases (80.4% vs. 74.4%; p=0.51), but was lower when the protocol was adhered to compared to when it was not adhered to for unwitnessed cases (79.7% vs. 87.8%; p=0.012).

Identification rate of CA was 69% when breathing was not described; 80% when described as abnormal; and 89% when described as absent. Identification of CA was 80% when described as unconscious; and 78% when not described.

17) Vaillancourt, 2007, 877 (Level D3 (before-after). Supportive, good)
This study compared bystander CPR and survival rates before and after the implementation of a telephone CPR program. Cases were identified retrospectively from a cardiac arrest registry (cardiac arrest cases of cardiac origin, not witnessed by EMS, for which resuscitation was attempted by EMS). There were 529 cardiac arrests during study phases (9 months before and 9 months after T-CPR). 295 cases were included in the before group, and 234 in the after group – recordings were available for 192/234 (82.1%) of cases in the after group. Dispatchers correctly identified 108/192 CA cases in the after phase (sensitivity = 56.3%, 95% CI, 48.9-63.0%). Agonal breathing was present in 71/192 cases (37.0%), and accounted for 42/84 (50%) of CAs not identified. There was excellent inter-rater agreement for identification and consequence of agonal breathing.

18) Berdowski, 2009, 2096 (Level D3 (case-control. Supportive, good)
This study prospectively audited a large number of consecutive voice recording for content and cardiac arrest recognition. Of the 285 cardiac arrest identified, 82 (29%) were not recognized, resulting in worst survival outcomes. Authors also performed multivariate regression analyses and determined that, in addition to "absence of breathing" or "abnormal breathing", descriptors spontaneously provided by the caller such as facial color or that the victim “is dead” are significantly associated with the presence of cardiac arrest.
19) Bobrow, 2008, 2550 (Level D4. Supportive, Good)
This study examined the prevalence of agonal breathing among a population of cardiac arrest victims evaluated at different stages of their cardiac arrest either by fire or EMS. Agonal breathing was present in 39% of cardiac arrest victims upon fire arrival and 33% of victims upon EMS arrival. The prevalence of agonal breathing appeared to decrease rapidly over time. While the authors did not directly study the impact of agonal breathing on dispatch-assisted CPR protocols, they offer the suggestion that agonal breathing recognition should be taught to bystanders and dispatchers.

20) Clawson, 2008, 290 (Level D4. Supportive, Good)
This study evaluated the components of the MPDS “Unknown problem” protocol. The authors conclude that “This dispatch protocol for unknown problems successfully differentiates dispatch coding of low-acuity and non-CA patients only when specific situational information such as the patient's standing, sitting, moving, or talking can be determined during the interrogation process. They also conclude that caller-volunteered information did not add to the ability of the protocol to identify cardiac arrest.

21) Clawson, 2008, 257 (Level D3.(case-control) Supportive, Good)
Authors compared the protocols pertaining to seizure activity from two different versions of the MPDS; one inquiring about regularity of breathing, one without. The addition of this new assessment question increased the recognition of cardiac arrest among callers reporting seizing activity.

22) Roppolo, 2009, 769 (Level D3 (before-after). Supportive, Good)
This study prospectively evaluated cardiac arrest calls eight months prior to (n=599) and four months following (n=362) implementation of a new protocol designed to increase recognition of agonal breathing. The new protocol involved counting the respiratory rate of the victim, flagging specific adjectives (gasping, slow/barely breathing, noisy gurgling respirations) used by the bystander to describe breathing and holding the phone next to the patient. Agonal breathing was not detected in any patient prior to implementation of the new protocol, but was detected in 22 patients following implementation. Identification of cardiac arrest increased from 72.0% of cases before to 81.2% after (p=0.0012), as did rates of bystander CPR (60.9% [before] vs. 71.5% [after]; p=0.006). Survival to emergency department admission was not significantly different between the two groups. Follow-up was short and some of the findings could potentially be inflated by a study effect since the dispatchers were aware that they were being studied.

23) Bohm, 2009, 1025 (Level D3 (before-after). Supportive, Fair)
Rates of T-CPR were compared before and after a one-day training course offered to dispatchers on the identification of agonal breathing. The before period occurred more than two years before the after period, so it is not clear whether this was conducted prospectively. Seventy-six cases from each time period (total n=152) met the inclusion criteria and were included in the study. A description of respiration was present in 91% of the calls in the “before” phase and 82% of the calls in the “after” phase and descriptors such as wheezing, snoring, snuffling, hard breathing, laboured breathing, difficult and heavy breathing, bad breathing, occasional, poor and irregular breathing were most commonly used. The rates of agonal breathing, as assessed by the reviewers were similar in both phases (64% before vs. 63% after). T-CPR was offered in 47% of cases before and 68% after (p=0.01). T-CPR rates were also increased in cases where agonal breathing was judged to be present (23% before vs. 56% after; p=0.006). There was no difference in 30-day survival. It is not clear when the training was conducted in relation to the after phase of the study, and whether the results were sustained in light of the relatively short time frame of the after phase (<3 months).

Acknowledgements:
We are grateful to the Department of Emergency Medicine, University of Ottawa, for their unrestricted financial support of this review
Citation List


   Level D4. Neutral, fair.
   473 cases included; Dispatchers suspected cardiac arrest when “unconsciousness” and “respiratory arrest” were present. 427 of suspected cardiac arrest cases were confirmed by EMS for a recognition rate of 90.3%. Reasons for missed diagnoses included incomplete interview, caller did not give enough information, callers' psychological state. Survival to hospital discharge = 4%.


   Level D4. Supportive, fair.
   Only included cases of witnessed OHCA where CPR was not already ongoing (those eligible for telephone CPR (T-CPR)). N=76. T-CPR offered to 36 (47%). Dispatchers complied with protocol in more than 90% of cases i.e. must determine whether patient is awake and able to talk and if patient is breathing normally. Description of breathing was available in 69/76 cases - 44/69 reported patient breathing, 34 described abnormal breathing and 25 not breathing. T-CPR was offered to 23% of patients with agonal breathing versus 92% of patients who were not breathing (p<0.001). Authors felt that under diagnosis of cardiac arrest was the main reason why T-CPR was not offered in more cases, and likely because of confusion resulting from breathing status.


   Level D4. Neutral, fair.
   Medical priority dispatch system used. 181 calls given dispatch code of cardiac arrest (unconscious and not breathing); 106 were confirmed + 9 cases where OHCA could not be excluded for positive predictive value of 63.5%. An additional 57 cardiac arrest events were found when manually examining autopsy reports, medical records, and death certificates. EMS was not deployed in 5 cases. Dispatcher’s reported Sensitivity = 68.9% (95% CI, 61.3 to 75.8%).


   Level D4. Neutral, fair.
   328 calls included where cardiac arrest was witnessed or where bystander CPR was ongoing - 33 callers were doctors or nurses, 19 callers were other health care professionals or police, 276 callers were laypeople. Cardiac arrest was recognized by the dispatcher in 239/328 cases (72.9%). Authors noted a clear trend by dispatcher of not asking further questions, even ones required by protocol when caller was a doctor, nurse or health care professional. There were no significant differences in survival to hospital or recognition of cardiac arrest by dispatcher between groups.

Level D4. Neutral, fair.
Study objective was to identify and determine rates of delivery and performance of telephone CPR in non-cardiac arrest incidents. Cardiac arrest victim defined as unconscious and not breathing normally. 358 incidents of cardiac arrest, respiratory arrest and potential cardiac arrest were included. T-CPR offered in appropriately 61 (70%) of 87 cases (68 cardiac arrests and 19 respiratory arrests) and inappropriately in 8 (5.2%) of 154 potential cardiac arrests (44 respiratory difficulty, 31 syncope, 24 stroke, 24 febrile seizure, 21 seizure, and 10 other).


Level D4. Supportive, fair.
The study objective was to determine the predictability of cardiac arrest from a patient past medical history of seizure or epilepsy ("E" history). Among callers reporting a seizure event, confirming a past medical history of seizure reduced the risk of not recognizing a cardiac arrest presenting with anoxic seizure.


Level D3 (case-control, non-concurrent). Neutral, poor.
The characteristics of cardiac arrest calls were compared to non-cardiac arrest calls. No information given on how non-cardiac arrest controls were selected. Information about sex, location and activity prior to collapse were not found to be important in distinguishing cardiac arrest from non-cardiac arrest calls. A victim over 50 years old and an emotional caller (score >2/5) were more common among cardiac arrest calls and could have identified 96% of all cardiac arrest cases (specificity of 38%). Authors suggest that questions about consciousness and breathing should be asked immediately for calls meeting these criteria.


Level D3 (before-after). Neutral, fair.
Bystander-initiated CPR (including T-CPR) increased from 45% before to 56% after the program was initiated. T-CPR was offered to 98 of 255 cases (38%). Reasons for not offering T-CPR included: communication errors, dispatcher errors and other or unknown reasons. Communication errors usually involved inability of caller or dispatcher to distinguish normal breathing from agonal breathing.


Level D4. Neutral, fair.
The objective of the study was to determine the ability of the MPDS system to recognize cardiac arrest. Sensitivity = 76.7% (95% CI, 73.6-79.8%); specificity = 99.2% (95% CI, 99.1% to 99.3%).

Level D4. Neutral, fair.
The study objective was to analyze the accuracy of dispatchers in predicting cardiac arrest and to assess the effect of the caller party on dispatcher accuracy. Overall, sensitivity = 68.4% (95% CI, 63.3 to 73.0) using the MPDS. The type of caller did not significantly affect the sensitivity of diagnosing cardiac arrest. Positive predictive value = 65.0% (95% CI, 60.0 to 69.7).


Level D4. Supportive, fair.
Large study. 682/3320 (20.5%) received T-CPR, 66 patients no diagnosis made, 221 patients false negative (FN), 222 false positive (FP)
T-CPR instructions offered in most FP; instructions accepted in 68% and completed for approximately one-third. No adverse events attributed to CPR.
Failure to follow protocol evident in 153/221 (69%) of FN (unconsciousness established in 76% of FN vs. 98% TP; p<0.05; breathes normally established in 65% FN vs. 97% TP; p<0.05). Protocol deviation found in 5.3% (64/1203) of CA with potential benefit correctly identified by dispatchers. In most FP (90.1%) protocol was followed correctly.


Level D4. Neutral, fair.
The study objective was to examine factors that may impede implementation of telephone CPR. 25% (99/404) received CPR without dispatcher assistance, 34% (139/404) received T-CPR, 41% (166/404) did not receive CPR – in 80 of these calls, T-CPR was not offered by dispatcher; in 64% (51/80) dispatcher did not recognize CA or signs of life were reported by caller.


Level D3 (before-after). Supportive, fair.
The authors analyzed data for a one-month period (April) in 4 consecutive years before and after AMPDS implementation. Since implementation of AMPDS, the percentage of cardiac arrest detection by dispatchers increased (15% before, vs. 50% after). Compliance with protocols increased the percentage of CA detection.


Level D4. Neutral, fair.
Study included only bystander witnesses VF cardiac arrest of cardiac origin for which CPR was initiated. Cardiac arrest recognized in 296/373 cases (79.4%) (CA to be suspected when patient is not awake, not
responding to painful stimuli, and is not breathing normally) – Protocol adherence not measured, and no mention whether any one symptom reported resulted in increased recognition. 
Survival to discharge: 37.2% if CA recognized; 28.6% if not recognized.


Level D4. Neutral, fair.
199 calls in final analysis; survival = 27.1% (survival to ICU)
193 OHCAs identified by dispatcher; 189 confirmed by field provider
6 pts thought not to be in CA later found to be in arrest (5/6 caller reported breathing as present)
51 callers reported breathing, but recognized as OHCA by dispatcher
Sensitivity = 96.9%; PPV = 97.9%
Level of consciousness and breathing status most important questions to be asked to identify OHCA
1. Level of consciousness: 62/199 cases info provided without asking; dispatcher asked in 62/137 cases and did not ask about it in 75/137 (55%)
2. breathing status: 24/199 cases info provided without asking; dispatcher asked in 119/175 cases and did not ask in 56 cases
38% received CPR (75/199); 62% no CPR (124/199) – not offered by dispatcher in 113/199 (57%) of cases, bystander unwilling in 11/199 (5%) of cases
Note: Authors did not report rate of recognition as a function of whether protocol was adhered to or not.


Level D4. Supportive, fair.
776 calls included (660 classified as CA by dispatcher; 116 not classified as CA by dispatcher, but pt in CA when ambulance arrived)
Correctly identified witnessed CA: 122
Correctly identified unwitnessed CA: 441
False negatives: 116
False positives: 97
Protocol is to ask about consciousness and breathing. Protocol followed in 52.4% of calls. Followed more often in witnessed (72.3%) than unwitnessed (45.0%) cases (p<0.001).
CA identification rate not significantly higher when protocol was followed vs. not followed in witnessed cases (80.4% vs. 74.4%; p=0.51).
CA identification rate lower when protocol was followed vs. not followed in unwitnessed cases (79.7% vs. 87.8%; p=0.012).
Identification rate of CA 69% when breathing not described; 80% when described as abnormal; 89% when described as absent. Identification of CA 80% when described as unconscious; 78% when not described.


Level D3 (before-after). Supportive, good.
This study compared bystander CPR and survival rates before and after the implementation of a telephone CPR program. Cases were identified retrospectively from a cardiac arrest registry (cardiac arrest cases of cardiac origin, not witnessed by EMS, for which resuscitation was attempted by EMS). There were 529 cardiac arrests during study phases (9 months before + 9 months after T-CPR). 295 cases were included in the before
group, and 234 in the after group – recordings were available for 192/234 (82.1%) of cases in the after group. Dispatchers correctly identified 108/192 CA cases in the after phase (sensitivity = 56.3%, 95% CI, 48.9-63.0%). Agonal breathing was present in 71/192 cases (37.0%), and accounted for 42/84 (50%) of CAs not identified. There was excellent inter-rater agreement for identification and consequence of agonal breathing.

***Additional references included after we repeated the electronic search strategy on August 30th, 2009.


Level D3 (case-control). Supportive, good.
This study prospectively audited a large number of consecutive voice recording for content and cardiac arrest recognition. Of the 285 cardiac arrest identified, 82 (29%) were not recognized, resulting in worst survival outcomes. Authors also performed multivariate regression analyses and determined that, in addition to “absence of breathing” or “abnormal breathing”, descriptors spontaneous provider by the caller such as facial color or that the victim “is dead” are significantly associated with the presence of cardiac arrest.


Level D4. Supportive, Good.
This study examined the prevalence of agonal breathing among a population of cardiac arrest victims evaluated at different stages of their cardiac arrest either by fire or EMS. Agonal breathing was present in 39% of cardiac arrest victims upon fire arrival and 33% of victims upon EMS arrival. The prevalence of agonal appeared to decrease rapidly over time. While the authors did not directly study the impact of agonal breathing on dispatch-assisted CPR protocols, they offer the suggestion that agonal breathing recognition should be thought to bystanders and dispatchers.


Level D4. Supportive, Good.
This study evaluated the components of the MPDS “Unknown problem” protocol. The authors conclude that “This dispatch protocol for unknown problems successfully differentiates dispatch coding of low-acuity and non-CA patients only when specific situational information such as the patient's standing, sitting, moving, or talking can be determined during the interrogation process. They also conclude that caller-volunteered information did not add to the ability of the protocol to identify cardiac arrest.


Level D3. (case-control). Supportive, Good.
Authors compared the protocols pertaining to seizure activity from two different versions of the MPDS; one inquiring about regularity of breathing, one without. The addition of this new assessment question increased the recognition of cardiac arrest among callers reporting seizing activity.

***Additional references included after we repeated the electronic search strategy on January 13, 2010.


Level D3. (before-after). Supportive, Good.
Prospective before-after. N=599 before; 362 after. New protocol had dispatchers specifically counting respiratory rate of victim, flagging adjectives or having bystander hold phone next to patient in order to increase identification of agonal breathing. Agonal breathing not detected in any patient before new protocol; 22 patients after. Identification of cardiac arrest increased (72.0% to 81.2%; p=0.0012) following new protocol; bystander CPR rates increased (60.9% vs. 71.5%; p=0.006). No difference in survival to ED admission. After phase of study short (four months); may potentially be study effects present since dispatchers aware of study.


Level D3. (before-after). Supportive, Fair.
Before-after. N=76 before; 76 after. Small number of cases; unclear if prospectively conducted, or if after data compared to data that had previously been collected for another purpose. Emergency medical dispatchers attended 1-day training course focusing on identification of agonal breathing. Rates of T-CPR increased from 47% to 68% (p=0.01). Rates of T-CPR also increased in cases where agonal breathing was assessed to be present (23% vs. 56%; p=0.006). No difference in 30-day survival.