**WORKSHEET for Evidence-Based Review of Science for Emergency Cardiac Care**

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<th>Author:</th>
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<td>James V. Dunford, MD</td>
<td>01-23-2010</td>
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**Clinical question**

**BLS-010A:**

In adult and pediatric patients with cardiac arrest (out-of-hospital and in-hospital) (P), does the provision of dispatch CPR instructions (I) as opposed to no instructions (C), improve outcome (O) (e.g. ROSC, survival)?

Is this question addressing an intervention/therapy, prognosis or diagnosis: **intervention/therapy**

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

**Conflict of interest specific to this question:** none

Does the author listed above have conflict of interest disclosures relevant to this worksheet? **no**

**Search strategy (including electronic databases searched).**

**PubMed:** prearrival or dispatch AND instruction* AND (ACLS OR advanced cardiac life support OR cardiopulmonary resuscitation) AND (heart arrest OR death, sudden, cardiac OR heart arrest, induced = 24 citations

**Google Scholar:** heart cardiac arrest instruction* outcome "pre arrival” (1985-2009) = 31 citations

**EMbase:** heart cardiac arrest dispatch (kw) = 38 citations

**Scopus:** heart arrest, cardiac arrest; death, sudden, cardiac AND pre-arrival OR dispatch OR instruction = 39 citations

**Hand search** of references from journals and review articles

**Inclusion Criteria**

1985-present  
English language  
Human studies  
All age groups

**Exclusion Criteria**

Case reports and reviews; non-peer-reviewed literature

- Number of articles/sources meeting criteria for further review:

32/101 articles met criteria for further review: LOE 1 (0), LOE 2 (5), LOE 3 (6), LOE 4 (1) and LOE 5 (20).
# Summary of evidence

## Evidence Supporting Clinical Question

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A = Return of spontaneous circulation  
B = Survival of event  
C = Survival to hospital discharge  
D = Intact neurological survival  
E = Other endpoint  

Italics = Animal studies

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## Evidence Opposing Clinical Question

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Early bystander CPR provides an essential bridge to successful defibrillation from sudden cardiac arrest (SCA) and there is a need to increase the prevalence and quality of bystander CPR (Becker 1993, 354; Pepe 1998, 89; Ornato 2009, 2003). Based upon animal and limited human studies, in March 2008 an AHA Scientific Advisory Committee (Sayre, 2008, 2162) recommended that laypersons call 911 and perform chest-compression-only CPR for adults suffering a witnessed OOH-CA of probable cardiac origin. These recommendations were incorporated into “compressions first” dispatch protocols that advise bystanders to initially perform continuous compressions until rescuer arrival. Of note, dispatcher-assisted telephone CPR instructions (T-CPR) for rescuers of children and adults with a high likelihood of an asphyxial arrest continue to provide rescue breathing followed by chest compressions. There are no published data assessing the clinical impact of these recent changes.

Five years after the last ILCOR review there is still only one randomized clinical trial of T-CPR, and importantly this study did not include a “no T-CPR” control:

Hallstrom, 2000, 1546 (LOE 2, good) randomized 241 SCA to compression-only T-CPR vs. compressions plus ventilations T-CPR. Survival to discharge was equivalent: compressions-only (14.6% survival) vs. compressions plus ventilations (10.4% survival), P = .08. Completion of T-CPR instructions was improved for compression-only (81% complete) vs. compression-ventilation (62% complete) T-CPR, as was time to completion of T-CPR (1.4 minutes less).

Three additional studies provide evidence that T-CPR may improve survival:

Berdowski 2009, 2096 (LOE 2, fair) is a prospective, observational study (January – September 2004) from Amsterdam that compared survival at 3-months based upon the presence or absence of dispatcher recognition of SCA. Importantly, dispatchers did not provide telephone CPR instructions in this study. Results: unrecognized 4/82 (5% survival); recognized 29/203 (14.3% survival), P = .04. Failure to recognize SCA resulted in ambulance dispatch a mean of 0.94 minutes later (P < .001) and arrival on scene 1.40 minutes later (P = .01) compared with recognized calls. Lack of recognition of CA was primarily due to failure to ask if a patient was breathing, or not asking for a description of the breathing.

Kuisma 2005, 89 (LOE 2, good) is a retrospective observational cohort study from Helsinki that assessed survival when telephone CPR was given (43.1%) versus not given (31.7%), p = .0453. Survival was also associated with dispatcher T-CPR experience: survival to discharge: <4 VF managed by dispatcher over 5 years, 17/77 (22.1%); 4-9 VF managed by dispatcher over 5 years, 50/131 (38.2%); > 9 VF managed by dispatcher over 5 years, 65/165 (39.4%), P = .0227.

Rea 2001, 2513 (LOE 2, fair quality) is a retrospective, observational study (1983-2000, n = 7265) in King County, WA that compared survival to discharge for 3 distinct adult CPR cohorts: (1) no bystander CPR before EMS arrival (2) bystander CPR requiring T-CPR; (3) bystander CPR without T-CPR. Using no bystander CPR as the reference group, the multivariate adjusted odds ratio of survival was 1.45 (95% [CI] 1.21, 1.73) for T-CPR assisted bystander CPR and 1.69 (95% [CI], 1.42, 2.01) for bystander CPR without T-CPR assistance.

Effective T-CPR requires that a critical series of steps be rapidly accomplished, including the recognition of SCA and the provision of clear instructions that aid rescuers in performing high-quality CPR. 5 studies provide evidence that T-CPR improves survival.
CPR dispatcher training improves recognition of CA (i.e., improve the “cardiac arrest quotient) and thereby increase provision of T-CPR.

Eisenberg 1985, 47 (LOE 3, fair) is a retrospective, observational study in King County, WA that measured the performance of bystander CPR 20 months before/after introduction of T-CPR dispatch training programs in eight communications centers: before: 86/191 (45%); after: 143/255 (56%).

Culley 1991, 362 (LOE 3, good) is a retrospective, observational study in King County, WA that measured the performance of bystander before/after introduction of T-CPR dispatch training programs in eight communications centers: before (1976-1980): 816/2544, 32%; after (1982-1988): 2355/4374, 54%.


Roppolo 2009, 769 (LOE 3, good) is a prospective before-after observational study in Dallas, TX that measured EMD recognition of agonal breathing 8 months before/after implementation of a protocol (that included counting respiratory rate, holding the phone next to the patient and use of identifiers of agonal breathing). Unrecognized SCA: before 168/599, 28.0%; after 68/362, 18.8%, p=0.0012). Bystander CPR: before 60.9%; after 71.5%, p=0.006).

Bohm 2009, epub. (LOE 3, good) is a retrospective, observational study in Stockholm, Sweden that that measured frequency that T-CPR was offered before (2004) after (2006) implementation of a dispatch protocol to identify agonal breathing: before: 36/76, 47%, after: 52/76, 68% (P = 0.006).

One study provides evidence that dispatcher experience in the management of SCA improved survival:

Kuisma 2005, 89 (LOE 2, fair) is a retrospective observational cohort study (1997-2002) in Helsinki of emergency calling processing. Survival to discharge:<4 VF managed by dispatcher over 5 years, 17/77 (22.1%); 4-9 VF managed by dispatcher over 5 years, 50/131 (38.2%); > 9 VF managed by dispatcher over 5 years, 65/165 (39.4%), P = .0227.

Two studies (Clawson 2007, 298, LOE 5, good; Clawson 2008, 257, LOE 5, good) demonstrate that modifications to standardized dispatch protocols can improve the discrimination of true SCA from epileptic seizures and non-SCA causes of difficulty breathing.

There are no human studies evaluating the quality of T-CPR in infants or children. One mannequin study (Dawkins 2008, 63, LOE 5, good) found adults were unable to achieve CPR performance consistent with the 2000 Guidelines.

There is evidence that simplified chest compression-only T-CPR reduces barriers to bystander CPR without impacting survival (Hallstrom 2000, 1546 LOE 2, good). Mannequin studies establish that instructions to “push as hard as you can” improve compression depth (Mirza 2008, 97, LOE 5 fair) and that compression-only instructions result in more chest compressions (Williams, 2006, 247, LOE 5 good; Woolard 2003, 123, LOE 5 good; Dorph 2003, 265 LOE 5, good), more rapid initiation of compressions (Dorph 2003, 265 LOE 5, good; Woolard 2003, 123, LOE 5 good), and more time on the chest (Dias 2007, 108 LOE 5, good; Dorph 2003, 265 LOE 5, good).

Simulation studies employing T-CPR via interactive voice and video cell phone demonstrate: improved information acquisition and ease of support (Johnsen 2008, 320, LOE 5 fair), improved quality of rescue breathing (Yang 2008, 327, LOE 5 good), and improved depth and rate compression-only CPR (Yang 2009, 490, LOE 5 good). A simulation-based study demonstrated audiovisual animated CPR instruction via cellular phone resulted in better checklist assessment and time interval compliance than with voice instruction (Choa, 2008, 87, LOE 5 good). The role and content of current telephone-directed T-CPR protocols may need adjustment if video-calls are employed (Johnsen 2008, 320, LOE 5 fair).

Significant challenges to T-CPR remain: one simulation study demonstrated elderly rescuers performed CPR poorly despite the use of simplified T-CPR instructions (Dorph 2003, 265, LOE 5 good).
Acknowledgements:

I appreciate the thorough reviews of this worksheet provided by Drs. Clif Calloway and Peter Morley.

Citation List


LOE 2. Methodology fair. Neutral. Conflicts: No comment regarding industry funding. Gothenburg, Sweden. Retrospective observational review (1 reviewer) grouping 427 concurrent CA patients according to whether telephone CPR (T-CRP) was offered, completed or declined. Non-significant increase in survival for group 1,2 patients with T-CPR performed (9%) versus groups that did not have T-CPR performed (groups 3,5,6)(6%).


LOE 2. Methodology fair. Supportive (C – dispatcher recognition of SCA improved survival; E – recognition of SCA reduced time to dispatch); Conflicts: No comment regarding industry funding. Amsterdam. Prospective observational study of influence of EMD recognition of OOH-CA. Of note, no telephone CPR instruction was offered. 82/285 SCA not recognized primarily due to failure to ask if victim was breathing or describe breathing. Unrecognized SCA led to longer time to dispatch (+0.94 minutes) and arrival at scene. Study employed concurrent controls (dispatcher recognition of CA v. not recognized). Survival at 90 days: 5% (not recognized) vs. 14% (recognized), P = .04.


LOE 3. Methodology poor. Neutral. Conflicts: Senior author (Roth) reports serving as medical consultant for 'SHL'-Telemedicine, Israel. Israel. Observational review of 1810 out-of-hospital SCA among subscribers to SHL –Telemedicine service (1987-1997) for whom resuscitation was attempted by physician-staffed mobile intensive care teams or by laypersons receiving telephone CPR instruction. 121 SCA (7%) received T-CPR instruction. Overall survival to discharge (10%) vs. 1988 historical control (7%), no statistical analysis performed nor whether EMD-assisted CPR itself enhanced survival.


LOE 3. Methodology. Good. Supportive (E-improved rate of T-CPR offered, accepted and completed); Neutral (C – survival). Conflicts: No comment regarding industry funding. T-CPR performed in 47% (n = 36) before training and 68% (n = 52) after (p = 0.01) T-CPR was accepted and completed in 25 calls (33%) in 2004 and in 36 calls (47%) in 2006. The 30-day survival was 3% in 2004 and 7% in 2006 (p = 0.27).


LOE 5. Methodology Good. Neutral. Conflicts: No comment regarding industry funding. Mannequin. Randomized, double-blind, controlled comparing modified MPDS v 11.2 v. simplified protocol each with/without instruction to "put the phone down" during CPR. "Put the phone down" had no effect on quality of bystander initiated dispatcher-assisted CPR. No analysis whether EMD-assisted CPR itself resulted in enhanced survival.

Mannequin simulation employing specific telephone message demonstrated quality of CPR was comparable to the performance by individuals with formal CPR training. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


Mannequin study demonstrating the inability of volunteers to correctly perform telephone-assisted CPR (as assessed by review of video recordings when provided instruction according to the MPDS v 11.1 protocol), which required rescuers to check airway, check breathing, start mouth-to-mouth breathing, check breaths, check (recheck) pulse, identify landmarks and begin compressions. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


LOE 5. Methodology good. Supportive (E-animation assisted CPR had better ‘check-list score’ and time to complete 1 CPR cycle, more accurate hand positioning and compression rate. Conflicts: No comment regarding industry funding. Mannequin simulation. Randomized single blind study demonstrated mixed benefit of animation-assisted CPR instruction (delivered by cell phone) v. dispatcher-assisted CPR to guide untrained volunteers in performance of CPR. Animation resulted in improved hand positioning and compression rate but inferior compression depth, ventilation volume and flow rates. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


LOE 5. Methodology Fair. Supportive (T-CPR is effective in identifying SCA and excluding non-SCA). Conflicts: No comment regarding industry funding.
Descriptive review of calls over 4-month period with high suspicion for CA; concluded inappropriate EMD-assisted CPR instructions were infrequently provided to non-SCA patients. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.

LOE 5. Methodology Good. Neutral Conflicts: see above
A protocol that employs a caller-verified history of epilepsy adds predictive value toward excluding the presence of SCA. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


LOE 3. Methodology Good. Neutral (survival to discharge); Supportive (increased bystander CPR) Conflicts: none
Convenience sample of 267/383 dispatch tapes involving CA retrospectively reviewed to determine the average time required to deliver each component of T-CPR instruction. Delays common due to excessive questioning and lack of proximity of victim. Bystander CPR increased 32% (before) > 54% (after), but survival was unchanged.


Mannequin simulation employing MPDS v11.2 - verbal instructions via telephone to adult volunteers with audio and video recording. None of volunteers correctly identified that the mannequin was not breathing nor achieved a level of performance consistent with the 2000 guidelines. Participants felt instructions were too long and few compressed hard enough for fear of causing harm. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


Mannequin simulation study employing modified MPDS v11.1 to address previously identified weaknesses with regard to duration of rescue breaths being too short, rescue breath volumes inadequate, rate of chest compression too slow, depth of chest compression inadequate, duty cycle poor and long delays between commencement of the AMPDS protocol and delivery of the first breath and compressions. Overall results mixed. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


LOE 5. Methodology Good. Supportive (E – improved time to start chest compressions and total hands-off time). Conflicts: No comment regarding industry funding.
Mannequin simulation study – randomized double-blind, comparing NAEMD v11.2 (with additional text since it was not designed as a chest compression-only protocol) with investigational protocol for chest compression only CPR instructions for adults. Simplified protocol easier and at least as good. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


LOE 5. Methodology good. Supportive (E – improved time to start chest compressions and total hands-off time). Conflicts: No comment regarding industry funding.
Norway. Mannequin simulation study - RN trained to deliver verbatim from a printed text in a randomized manner either the standard Norwegian Index template for T-CPR or a simplified compressions-only version. Median age of (primarily women) volunteers was 78 and none had CPR training within 10 years. Chest compressions alone resulted in shorter time to continuous CPR and greater total chest compressions. Overall CPR quality was poor in both groups. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


King County, WA. 8 communication centers trained to provide T-CPR instruction (estimated to take 1.5 minutes to complete) May 1981-December 1982. 58/98 (59%) offers to perform T-CPR were accepted, 22% refused. 41/58 accomplished both ventilation and compression prior to EMS arrival. Inclusion criteria patients with OOH CA who received CPR at some point (telephone, 1st responder, EMS). Survival to discharge before training (6%) > after (21%), P = ?; Bystander CPR before (45%) > 56% (after). Similar to Culley 1991, 362 but limited to the 20 months before/after intro of T-CPR training.


Toronto. Correlated MPDS v 11.1 with EMT & Paramedic--assigned out-of-hospital patient acuity score. The best performing protocol was cardiac arrest = 91.8% of all cases were identified correctly as high acuity. No analysis re whether EMD -assisted CPR itself resulted in enhanced survival.


LOE 2. Methodology Good. Supportive (E – improved provision of complete instructions; reduced time for compressions instructions). Neutral (C). Conflicts: No comment regarding industry funding.

Seattle. Randomized trial of chest compression-only CPR versus CP plus ventilation. 776 randomized episodes excluded (not actual cardiac arrest, drug OD, ACLS not performed, etc.). Survival to hospital discharge was better among patients assigned to chest compression alone than those assigned to chest compression plus mouth-to-mouth ventilation (14.6 percent vs. 10.4 percent, p = 0.18). No control group to answer basic question, i.e. does dispatch CPR improve outcome?


Authors estimate potential number of patients that might theoretically benefit from T-CPR. 682/3320 (20%) of patients received T-CPR. The remaining patients were categorized into four groups and based upon certain assumptions (patients unlikely to benefit included arrest after EMS arrival, location in a medical facility, relayed 911 call, in accessible location, overdose patients, age < 18, arrest after 911 call, dispatcher failure to identify CA, refusal of instructions, etc.) the authors estimated overall 29.9% (993/3320) might benefit from dispatcher assisted CPR.


LOE 5. Methodology fair. Supportive (E – improved information, easier CPR assistance). Conflicts: No comment regarding industry funding.

Norway. Descriptive mannequin study employing 60 students randomized to mobile telephones with two-way v. mobile telephones. For audio-calls, dispatchers used a telephone with a standard headset; for video-calls, dispatchers used a laptop equipped with camera, video communication software and headset. During video communication, the dispatcher could see the rescue scene and instruct the caller to change camera position. The caller could see the dispatcher on the phone’s screen. During video, mobile phone enabled hands-free audio which allowed rescuers to hear voice of dispatcher. No analysis re whether EMD -assisted CPR itself resulted in enhanced survival.

LOE 5. Methodology good. Supportive (E – recorded CPR message produced CPR of a quality similar (but initiated much later than) previously trained individuals. Conflicts: No comment regarding industry funding. Mannequin simulation - volunteers (previously untrained, trained assessed for quality of CPR by observers with or without T-CPR: time to ventilations, time to compressions and number of cycles in 5 minutes. Telephone CPR was beneficial. No analysis re whether EMD -assisted CPR itself resulted in enhanced survival.


LOE 2. Methodology Good. Supportive (C – survival to discharge. E – shorter time to dispatch; experience of dispatcher correlated with survival). (). Conflicts: No comment regarding industry funding. Helsinki. Retrospective cohort study analyzing all witnessed VF arrests, analyzing effect of call processing times, calls/dispatcher and T-CPR on survival to discharge (1/1/97 – 12/31/02); beginning 9/02 T-CPR instructions provide chest compressions only unless the victim is child or the CA is probably caused by near-drowning or choking. 123/346 (35.5%) bystander-witnessed CA received dispatcher-assisted CPR; 86 (76.8%) of those who were given CPR instructions received bystander CPR; survival to discharge was 43.1% (53/123) when CPR instructions were given v. 31.7% (72/223) when they were not given (p = 0.0453). 42% of survivors received telephone guided CPR instructions. Dispatcher T-CPR experience also correlated with survival.


LOE 5. Methodology Fair. Supportive (E – improvement in depth of chest compressions). Conflicts: No comment regarding industry funding. Mannequin simulation - study combines data from 2 prior studies (Dias, Resuscitation 2009 and Brown, Resuscitation 2008) concluding that instructions to “push as hard as you can” are superior to instructions to “push down firmly 2 in. (5 cm)” in achieving improvement in chest compression depth. No analysis re whether EMD -assisted CPR itself resulted in enhanced survival.


LOE 2. Methodology Fair. Supportive (C – improved OR for survival). Conflicts: No comment regarding industry funding. Seattle. Retrospective observational review of concurrent dispatch and EMS records demonstrating beneficial association between dispatcher-assisted CPR (defined if rescue breaths were actually delivered by bystander) and survival (OR 1.45, 95%CI 1.21, 1.73 overall and for BLS response times > 5 minutes. No comment re: why some patients did not receive T-CPR: there were fewer witnessed arrests in “no T-CPR” group (43.2%) than in the latter 2 groups: T-CPR (53.7%) vs. bystander CPR w/o T-CPR (58.1% witnessed).


LOE 3. Methodology good. Neutral(C-survival). Supportive (E – improved recognition of CA and bystander CPR). Conflicts: No comment regarding industry funding. Training in the recognition of agonal breathing decreased the number of unrecognized CA and increased appropriate T-CPR, but survival was not affected.


Before-after observational study 7/2003 – 12/2004 demonstrating introduction of T-CPR resulted in increase in bystander CPR from 16.7% to 26.4% (p=.006). Not powered to study survival. There were significant delays to initiating ventilation and compressions, which were accomplished in 17% and 8% of cases, respectively. CPR instructions were often not initiated by dispatchers or were declined by 9-1-1 caller because CPR was already in progress or because callers claimed to know CPR. When dispatch-assisted CPR instructions were initiated, only a few callers could complete the instructions and perform chest compression due to time to identify CA and to provide mouth-to-mouth ventilation instructions; agonal breathing was identified as a significant confounder.


LOE 5. Methodology Good. Supportive (E – improved completion of 4 cycles of CPR, fewer pauses) . Conflicts: No comment regarding industry funding

Mannequin simulation. Convenience sample quality of CPR telephone dispatch-assisted CPR. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


LOE 5. Methodology Good. Supportive (E – reduced time to compressions, more compressions delivered) . Conflicts: No comment regarding industry funding

Mannequin simulation. Assessed quality of CPR in telephone dispatch-assisted CPR. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


LOE 5. Methodology Good. Supportive (E – improved rescue breathing). Conflicts: No comment regarding industry funding

Mannequin. Improved quality of rescue ventilations with video cell phone vs. voice dispatch-assisted CPR. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


LOE 5. Methodology Good. Supportive (E – improved chest compressions, quicker initiation, less hands-off time). Conflicts: No comment regarding industry funding

Mannequin. Improved quality of rescue chest compressions with video cell phone vs. voice dispatch-assisted CPR. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


Bang, A., J. Herlitz, et al. (2003). "Interaction between emergency medical dispatcher and caller in suspected out-of-hospital cardiac arrest calls with focus on agonal breathing. A review of 100 tape recordings of true cardiac arrest cases." Resuscitation 56(1): 25-34. Retrospective review of 100 dispatch tapes involving SCA to identify ability of EMD to recognize SCA and offer CPR instructions. CPR only offered in only 14/100 cases. 25% were hospitalised alive and 5% were discharged alive from hospital but no analysis of role of telephone CPR. Authors conclude combination of unconsciousness and agonal breathing should prompt offer of dispatcher-assisted CPR.


Bobrow, B. J., M. Zuercher, et al. (2008). "Gasping during cardiac arrest in humans is frequent and associated with improved survival." Circulation 118(24): 2550-4. Retrospective analysis of 1218 patients with out-of-hospital cardiac arrests in Arizona demonstrating that gasping or abnormal breathing is common after cardiac arrest but decreases rapidly with time and is associated with increased survival; thus importance of EMD recognition of gasping as sign of SCA.

Bohm, K., M. Rosenqvist, et al. (2007). "Dispatcher-assisted telephone-guided cardiopulmonary resuscitation: an underused lifesaving system." Eur J Emerg Med 14(5): 256-9. Prospective review of 76/313 consecutive OOH SCA calls: 47% (n=36) received telephone CPR instruction, which were given in 69% (n=25). T-CPR was offered to 23% (n=10) of patients with signs of breathing v. 92% (n=23) of those who were not breathing (P<0.001). Agonal breathing is often mistaken for normal breathing and is a cause of delay in the diagnosis of cardiac arrest.


Belgium. MPDS-like training to recognize OOH SCA resulted in improved dispatch of second-tier ALS resources (physicians) and improved survival without neurological damage. No EMD-assisted T-CPR provided.

Broad implementation of AEDs operated by trained volunteers and laypersons was associated with a significantly higher long-term survival of SCA victims.

Discussion of important elements of public access defibrillation programs.

Despite instruction, synchronization of AED clocks is not widespread in Finland.

Discussion of elements of a seamless 9-1-1 system in Florida for acute coronary syndromes.

An increase number of BLS and ALS crews that were dispatched did not improve 1-month survival from OOH SCA.

Retrospective review of taped recordings of calls reporting cardiac arrests and EMT and PM incident reports for 1991. A high incidence of agonal activity was associated with OOH SCA.

EMD "overrides" of recommended response levels did not improve predictive accuracy of MPDS to identify CA or other acute status "blue-in" calls. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.

MPDS Protocol 32-Uncertain Problem 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. EMD reliance on caller-volunteered information to identify predefined critical situations does not appear to add to the protocol's ability to differentiate high-acuity and CA patients.

Retrospective review of prioritization with MPDS v11.2 of 1,137,873 calls resulting in 599,093 patient contacts September 2005 - August 2006. Certain ALS response-levels (CHARLIE/DELTA) were associated with CA. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.

The addition of a new assessment question for "breathing regularly" to MPDS seizure protocol improved identification of true cardiac arrest patient. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


Domanovits, H., G. Meron, et al. (1998). "Successful automatic external defibrillator operation by people trained only in basic life support in a simulated cardiac arrest situation." Resuscitation 39(1-2): 47-50. In-hospital personnel trained only in BLS were able to deliver three sequential shocks with an AED in a simulated persistent VF cardiac arrest.

Eisenberg, M. S., W. Carter, et al. (1986). "Identification of cardiac arrest by emergency dispatchers." Am J Emerg Med 4(4): 299-301. Review of 516 cardiac and 146 non-cardiac calls to identify features of a probable CA. For patients > 50 years old when the caller is emotional, the possibility of CA is high and questions about consciousness and breathing should be asked immediately.


Flynn, J., F. Archer, et al. (2006). "Sensitivity and specificity of the medical priority dispatch system in detecting cardiac arrest emergency calls in Melbourne." Prehosp Disaster Med 21(2): 72-6. Melbourne. 3-month analysis: MPDS identified 76.7% of cardiac arrest cases; the study provided a baseline for comparison for subsequent changes to MPDS. No analysis of whether T- CPR resulted in enhanced survival.

Freese, J., N. J. Richmond, et al. (2006). "Impact of a citywide blackout on an urban emergency medical services system." Prehosp Disaster Med 21(6): 372-8. The ability of the NYC EMS dispatch center to process the increased requests for EMS assistance proved to be the rate-limiting step in responding to these emergencies.


Garza AG, Gratton MC, et al. (2003). “The accuracy of predicting cardiac arrest by emergency medical services dispatchers: the calling party effect”. Acad Emerg Med 10(9): 955-960. Retrospective analysis (January 1, 2000, through June 30, 2000) of 506 patients determined SEN of dispatcher identification of cardiac arrest was 68.3% (95% CI = 63.3% to 73.0%) with a PPV of 65.0% (95% CI = 60.0% to 69.7%).

Describes plan for public access defibrillation program in Turin, Italy.


Discussion of prehospital care with potential to affect the outcome of cardiovascular emergencies.


Retrospective review of impediments to implementing dispatcher-assisted CPR. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


Reviews the evidence that supports multi-layered and innovative approaches to the treatment of out-of-hospital cardiac arrest including dispatch-assisted CPR.


London. Convenience sample of 100 calls (MPDS v?) using data collection form; analyzed time intervals associated with t-CPR. Barriers included emotional callers, difficulty in moving the patient to a suitable location, and language problems; processing times were prolonged when barriers existed. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.


CPR training can be disseminated in a population by distributing personal resuscitation manikins among children in primary schools.


1-year observational, multicentre study of OOH-CA after ambulance personnel (volunteers, RN, MD trained in ACLS and dispatch-guided CPR adopted. ROSC, hospital discharge, and % with favourable neurological outcome improved vs. 1994 historical control. Rate of bystander CPR did not differ. Authors believe dispatch-guided CPR assured significant improvement in ROSC and survival. No data re frequency of T-CPR nor analysis whether EMD-assisted CPR itself resulted in enhanced survival.


Retrospective review of audiotapes from 3 dispatch centers with MPDS or APCO protocols: of 168 identified callers who needed CPR instructions, only 25 callers (15%) provided compressions. Authors unable to confirm patients were in CA or to obtain confirmation that caller was performing the actions; no outcome data. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.

Retrospective, observational study examined audio recordings to assess for ability of EMD to identify CA; remarkably high SEN and PPV for OHCA with excellent inter-rater reliability. Interestingly only 1/3 of eligible cases were offered t-CPR; No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.

Describes interhospital network for ACS/STEMI.

Denmark. Retrospective review (2000 – 2006) of dispatch assignments determined only 32% of cardiac arrest were correctly identified. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.

Retrospective review of dispatch of OOH-CA in Vienna.

Mitchell MJ, Stubbs BA, Eisenberg MS. Socioeconomic status is associated with provision of bystander cardiopulmonary resuscitation. Prehosp Emerg Care 2009 Oct-Dec;13(4):478-86. This study demonstrated higher bystander socioeconomic status is associated with increased rates of bystander CPR with and without dispatcher instructions and suggests CPR training programs that target lower-SES communities and assessment of these training methods may be warranted.


1-year prospective analysis (1996) demonstrated dispatchers were able to identify 83% of 776 cases of non-traumatic cardiac arrest despite poor protocol compliance by dispatchers.

Termination-of-resuscitation protocols are not being implemented as intended in this EMS system.


Hyperventilation was common mostly through high respiratory rates rather than excessive tidal volumes.

Retrospective review of dispatch assignment of OOH-CA, concluding that only a minority of OOH-CA were actually identified by current system. 40/101 received chest compressions. No analysis re whether EMD-assisted CPR itself resulted in enhanced survival.
Review of EMD literature.

Prospective outcome study of OOH-CA 2-yr period - resuscitative efforts for patients presenting with AS, EMD and PEA all contribute significantly toward a community's total survivorship.

Review emphasizing importance of chain of survival for stroke including EMD training.

Prospective single-blinded human simulation study of 1" year medical students (with or without training in agonal respirations) demonstrated training improved recognition of SCA and initiation of CPR. SCA.Did not address T-CPR.

Review of the physiologic understanding and clinical implications of agonal respirations during cardiac arrest.

Medications are given late during out-of-hospital cardiac arrest, even in cohorts where drug delivery is a key study intervention.

New recommendations from the Council of Standards for the National Academies of Emergency Dispatch for adult and pediatric dispatch-assisted CPR.

A review of the evidence in favor or head rotation (a hands-free method of airway control) and abdominal compressions during bystander CPR.

Discussion of current ACLS guidelines regarding immediate v delayed defibrillation and CPR instructions involving chest compressions alone.

There is significant unexplained hospital variation in the use of ICD therapy among potentially eligible HF patients.

Discussion of unexpected sudden death when excited delirium victims are restrained in the out-of-hospital setting.


White L, Rogers J, Bloomingdale M, Fahrenbruch C, Culley L, Subido C, Eisenberg M, Rea T. Dispatcher-assisted cardiopulmonary resuscitation: risks for patients not in cardiac arrest. Circulation. 2010 5;121(1):91-7. This prospective review from King County, WA demonstrated the frequency of serious injury related to dispatcher-assisted bystander CPR among nonarrest patients was low.