# Dispatch-assisted cardiopulmonary resuscitation: the anchor link in the chain of survival

*Bentley J. Bobrow*[a], *Micah Panczyk*[a], *and Cleo Subido*[b]



**Purpose of review**
Early bystander cardiopulmonary resuscitation (CPR) provides a vital bridge after collapse from cardiac arrest until defibrillation can be performed. However, due to multiple barriers and despite large-scale public CPR training, this life-saving therapy is still not rendered in a majority of cardiac arrest events. As a result, cardiac arrest survival remains very low in most communities.

**Recent findings**
Several large-scale studies have shown the benefits of dispatch-assisted CPR. These studies have confirmed that on-going dispatch-assisted CPR programs that use a simplified and abbreviated set of standardized questions can hasten the recognition of cardiac arrest. Dispatchers can also utilize strategies to help bystanders overcome the obstacles to beginning CPR. In some communities, dispatch-assisted CPR accounts for up to half of all bystander CPR. Dispatch-assisted CPR programs combined with large-scale public CPR training may be what is needed to elevate CPR rates and survival from out-of-hospital cardiac arrest nationally.

**Summary**
This review focuses on the rationale and evolving science behind dispatch CPR instructions, as well as some best practices for implementing and measuring dispatch-assisted CPR with the goal of maximizing its potential to save lives from sudden cardiac arrest.

**Keywords**
cardiac arrest, cardiopulmonary resuscitation, dispatch, emergency medical service

## INTRODUCTION

Statistical estimates suggest that almost 383 000 people experience EMS-assessed out-of-hospital cardiac arrests in the United States every year [1]. Early bystander cardiopulmonary resuscitation (CPR) can significantly improve the likelihood of survival after OHCA [2]. Indeed, Sasson *et al*. [3▪] showed that any bystander CPR can increase survival two-fold or three-fold. Yet despite this recognition, studies estimate that a mere one in three victims receives CPR before trained medical rescuers arrive [4,5]. This shortfall largely explains a nationwide survival rate of 7.6% [3▪]. The first minutes after cardiac arrest are decisive – advances in subsequent emergency care are largely for naught if bystander CPR is not started. For this reason, dispatch-assisted CPR represents a true anchor link in the chain of survival. Properly trained dispatchers can provide timely instructions that elevate bystander involvement and significantly improve survival in their communities [6,7]. This article focuses on the current science and rationale for providing dispatch-assisted CPR instructions and identifies some best practices for applying and measuring this life-saving intervention.

## THE IMPORTANCE OF EARLY BYSTANDER CARDIOPULMONARY RESUSCITATION

Performing bystander CPR before the arrival of EMS is vital for several reasons. There is a rapid decline in cardiac substrate (adenosine triphosphate) during ventricular fibrillation and the likelihood of survival falls by 7–10% per minute after collapse [8,9]. Although many EMS agencies strive for response

[a]Arizona Department of Health Services, Phoenix, Arizona and [b]King County Regional EMS System, Seattle, Washington, USA

Correspondence to Bentley J. Bobrow, MD, Arizona Department of Health Services, 150 North 18th Avenue, Suite 540, Phoenix, AZ 85007, USA. Tel: +1 602 364 3154; e-mail: bentley.bobrow@azdhs.gov

**Curr Opin Crit Care** 2012, 18:228–233
DOI:10.1097/MCC.0b013e328351736b

## KEY POINTS

- Early bystander cardiopulmonary resuscitation (CPR) can double or triple the chance of survival after out-of-hospital cardiac arrest, but several barriers prevent the majority of victims from receiving any bystander CPR.
- Many 9-1-1 calls requesting medical aid represent opportunities to engage bystanders in CPR and improve the odds of survival from cardiac arrest.
- The inability to recognize out-of-hospital cardiac arrest is a significant barrier to bystander CPR, but properly trained 9-1-1 dispatchers can use an abbreviated set of questions to help lay rescuers quickly identify cardiac arrest and perform CPR until trained medical rescuers arrive.
- Dispatchers should direct callers in a calm, assertive manner and give chest compression-only instructions for adults thought to be in cardiac arrest.
- Dispatch-assisted CPR programs that continuously measure and improve performance can significantly improve survival from out-of-hospital cardiac arrest.

times of 4–6 min in 'high-priority' 9-1-1 medical calls, it often takes longer for trained rescuers to arrive at the scene, access and assess the victim, and begin medical treatments [10]. Studies confirm that bystander CPR can provide limited but adequate coronary and cerebral blood flow until circulation is restored [11]. There is a short period for CPR to be successful. CPR can prolong the duration of ventricular fibrillation, thus expanding the window for successful defibrillation [12,13]. In order for CPR to be maximally effective, it must be started without delay after collapse. Because of these factors, dispatch-assisted CPR can double the rate of bystander CPR and, thus, improve survival from cardiac arrest [6].

Public education and CPR training campaigns are useful wholesale approaches to increase bystander CPR, but they confront obvious problems of scale: it is numerically and financially impractical for most communities to train enough residents to maintain an effective citizen-rescue force. Dispatch-assisted CPR, on the contrary, represents a more targeted approach that can reinforce any previous CPR training and augment the number of potential rescuers. Communication infrastructures are already in place, and the public largely knows to call 9-1-1 in medical emergencies. Dispatchers can, thus, serve as efficient force-multipliers, helping bystanders recognize cardiac arrest events and providing 'just-in-time' instructions that can save thousands of lives.

## BARRIERS TO BYSTANDER CARDIOPULMONARY RESUSCITATION

Any approach to increasing bystander CPR must identify and tackle the many physical, psychological, and communication barriers that prevent bystanders from taking action when they see or hear someone collapse. Population-based surveys and interviews with lay rescuers cite several obstacles, including inability to recognize cardiac arrest, panic, lack of confidence, fear of causing harm, fear of medico-legal ramifications, concerns about disease transmission, and lack of physical ability to perform CPR [14–20]. In real-life events, these barriers and their solutions are often multifactorial and vary among populations, settings, and situations (Table 1).

Dispatch-assisted CPR represents an opportunity to overcome these barriers. Trained dispatchers can quickly calm panic-stricken callers, help them identify cardiac arrest, give them confidence, and instruct them in CPR.

## EARLY RECOGNITION OF CARDIAC ARREST

Early recognition of cardiac arrest is essential to improving bystander CPR rates and survival. Several common presentations of cardiac arrest can confuse

**Table 1. Barriers and solutions to getting cardiopulmonary resuscitation started**

| Barrier | Dispatch response |
|---|---|
| Difficulty identifying cardiac arrest | Apply straightforward, two-question algorithm |
| Fear that CPR will injure or harm victim | Assure bystander that CPR will not injure or cause harm |
| Fear disease transmission through mouth-to-mouth contact | Provide compression-only CPR instructions |
| Lack of confidence bystander can perform CPR | Assure bystander that he or she can perform CPR and that dispatcher will assist |
| Emotional distress prevents action | Assure bystander that he or she can perform CPR and that dispatcher will assist |
| Fear of medico-legal liability | Assure bystander of Good Samaritan Laws protecting citizen action |

CPR, cardiopulmonary resuscitation.

both lay and trained rescuers and delay the start of CPR. One such presentation is agonal respirations, which are frequently mistaken for signs of life. These respirations (often described as gasping, snoring, snorting, gurgling, moaning, breathing every once in a while, or labored or noisy or heavy breathing) can persist for several minutes after collapse and occur in up to half of all cases [21,22]. They represent a brainstem reflex to ischemia and indicate decreased but marginally adequate cerebral perfusion. Not surprisingly then, survival appears to be higher if gasping is present when trained rescuers begin resuscitation attempts. One observational study of 1218 OHCAs found an odds ratio of 3.4 for survival to hospital discharge when EMS providers noted gasping [23].

Despite these observations, agonal breathing can have profoundly adverse effects on survival by postponing the recognition of cardiac arrest and the start of CPR [24–27]. Dispatchers can be trained to identify agonal respirations over the telephone or to recognize them from a caller's description [27].

It is also important for dispatchers to recognize that 'seizure-like' symptoms can accompany OHCA. Victims often twitch or shake immediately after collapse. Although these movements are generally brief, they can lead bystanders to mistake the event as a seizure rather than a cardiac arrest, thus delaying the start of CPR [28,29]. This is particularly true when the victim is relatively young.

## COMPONENTS OF A DISPATCH-ASSISTED CARDIOPULMONARY RESUSCITATION PROGRAM

Dispatch-assisted CPR programs can be built on any scale, from the smallest 9-1-1 center to county and statewide programs. Whatever the size, agencies interested in building programs must first recruit support from key decision makers, such as fire chiefs, medical directors, and others who oversee 9-1-1 center operations. Once this support is achieved, programs are built on three components: protocol development, dispatcher training/continuing education, and continuous quality improvement (CQI) regimes that shed light on performance. Programs should be dynamic and include iterative feedback that helps revise protocols and inform continuing education.

### Protocols

Dispatch CPR protocols aim to recognize cardiac arrest and begin CPR as soon as possible. An achievable target is to start CPR within 1 min of call receipt. This requires a specific mindset: dispatchers should assume the need for bystander CPR until proven otherwise, rather than the other way around. Because callers are frequently panicked, dispatchers should take a calm, assertive approach to focus the caller's attention and gain his or her trust. Once the caller is focused, the dispatcher should ask two questions as early as possible: first, 'is the victim responsive/conscious?' and, second, 'is the victim breathing normally?' If the answer to both is no, then dispatchers should provide immediate compression-only CPR (COCPR) instructions for adults, telling the rescuer to push hard and fast in the center of the chest [30].

There are many physiologic and pragmatic reasons for dispatchers to provide instructions for COCPR rather than conventional CPR (CPR with rescue breaths) for adults who suddenly collapse. These reasons include the complexity of conventional CPR instructions [31], the reduced time required for dispatchers to provide COCPR instructions over the telephone [7], the reluctance of lay rescuers to perform mouth-to-mouth ventilation on strangers, and the rapid deterioration of forward blood flow that occurs during even brief disruptions of chest compressions [32,33].

Three randomized clinical trials comparing outcomes from COCPR with conventional CPR support this approach [7,34▪▪,35]. Hallstrom *et al*. found that dispatchers completed conventional CPR instructions in 62% of cases, whereas they completed COCPR instructions in 81% ($P = 0.005$) of cases. In addition, conventional instructions took 1.4 min longer to deliver than compression-only instructions. In each of these dispatch-assisted CPR trials, COCPR provided at least comparable overall survival benefit vs. conventional CPR. The largest of these studies showed a trend toward improved survival for victims who suffered arrests of cardiac causes and received COCPR (15.5 vs. 12.3%, $P = 0.09$ all rhythm and 31.9 vs. 25.7%, $P = 0.09$ shockable rhythm). Furthermore, a meta-analysis of these dispatch-assisted CPR randomized trials by Hupfl *et al*. [36▪▪] showed that COCPR was associated with improved survival compared with conventional CPR [14% (211 of 1500) vs. 12% (178/1531); risk ratio 1.22, 95% confidence interval (CI) 1.01–1.46]. The absolute increase in survival was 2.4% (95% CI 0.1–4.9), and the number needed to treat was 41 (95% CI 20–1250). Instructions for chest compressions and rescue breathing should be provided for children and for cases of asphyxial arrests (e.g., drowning, drug overdose) in both children and adults (see http://www.resuscitationacademy.org/downloads/DACPRToolkit1010.pdf and http://9-1-1CPRDispatch.azshare.gov for protocol examples).

### Training

Training should provide dispatchers with an overview of the what, why, and how of dispatch-assisted CPR. Trainers should emphasize that dispatch-assisted CPR instructions are potentially lifesaving and part of the nationally vetted guidelines [30]. The goal is to develop a culture in which dispatch centers pride themselves on delivering pre-arrival CPR instructions as consistently and effectively as possible. A train-the-trainer model can efficiently prepare an entire dispatch center. This approach cultivates program ownership and creates responsible 'point people' to maintain continuing education efforts.

### Continuous quality improvement

Continuous measurement and benchmarking is the key to success. Dispatch CPR programs can gauge themselves through a modest set of metrics (Table 2). Program managers should review all audio recordings in which dispatchers identified the need for CPR in order to assure protocol compliance and that time benchmarks (such as call receipt to start of CPR $<1$ min) are met. Additionally, programs should evaluate calls in which dispatchers fail to recognize cardiac arrest and use these calls as opportunities for improvement. It is also important to highlight instances of exemplary dispatch-assisted CPR to further motivate dispatch personnel.

## THE KING COUNTY EXAMPLE

The King County Regional EMS system launched its first dispatcher-assisted CPR training in 1982 [37]. Eisenberg *et al*. [38] were among the first to report an increase in survival to discharge after implementing a dispatch-assisted CPR program. They found that OHCA survival to discharge before training dispatchers was 6% (one of 17) and after training it was 21% (12 of 58). The rates of bystander CPR in King County were 30–32% prior and 54–55% ($P = 0.001$) after implementation of their dispatch CPR program [6]. Thirty years later, King County is able to report one of the highest cardiac arrest survival rates in the world due in part to the early recognition and prompt actions of their dispatchers [6].

The focus of the King County dispatch-assisted CPR program is on clear and consistent training of 9-1-1 personnel as well as thorough evaluation of each and every cardiac arrest call with the objective of identifying areas for improvement. Using the two-question model previously described, 9-1-1 dispatchers are able to identify patients reported to be unconscious and not breathing normally. The scenario-driven training mimics expected obstacles and provides trainees with the confidence needed to move apprehensive citizens to start CPR quickly. Program managers provide feedback on every cardiac arrest call, recognizing superior performance and suggesting strategies for improvements if needed. The motto of the dispatch centers in King County is 'every 9-1-1 medical call is a cardiac arrest until proven otherwise'.

## CHALLENGES TO IMPLEMENTING A DISPATCH-ASSISTED CARDIOPULMONARY RESUSCITATION PROGRAM

Although dispatchers' instructions can clearly improve the rates of bystander CPR, 9-1-1 centers may be reluctant to implement formal dispatch-assisted CPR programs for several reasons. Many simply do not recognize the life-saving potential of such programs, whereas others believe they already provide optimal pre-arrival CPR instructions, although they do not quantify this intervention. It is important to recognize that some centers can be under-resourced, lack the culture of measurement necessary to gauge and improve performance, or fear they cannot handle the workload such efforts entail.

Misconceptions about dispatch-assisted CPR are common. Many 9-1-1 centers equate it with 'medical dispatch' services they are not certified to provide, even though pre-arrival CPR instructions

**Table 2. Metrics for evaluation of dispatch-assisted cardiopulmonary resuscitation**

| Performance category | Time component |
|---|---|
| Appropriate EMS resources sent? | Time from call receipt to EMS dispatch |
| Two-question algorithm employed? | Call receipt to completion of algorithm |
| OHCA recognition/CPR instructions given? | Call receipt to provision of CPR instructions |
| Bystander CPR performed? | Call receipt to performance of CPR |
| Barriers to CPR encountered? | — |

CPR, cardiopulmonary resuscitation; EMS, emergency medical service; OHCA, out-of-hospital cardiac arrest.

fall under the rubric of 'telephone first-aid.' Another common fallacy is that dispatch CPR instructions can potentially cause more harm than benefit by causing injuries to persons ultimately found not to be in cardiac arrest. However, in a prospective cohort study of 247 adult patients who were not in cardiac arrest, White *et al.* [39] found no instances of visceral organ damage and only six cases (2%) in which patients sustained injuries likely or possibly caused by bystander CPR. On balance, the benefits of bystander CPR clearly outweigh the risks [30]. This fact challenges another misconception that dispatch CPR instruction will increase a center's medico-legal liability. Given the risk–benefit ratio, it appears that the true liability is in not providing such instructions to the public when appropriate.

## CONCLUSION

Bystander CPR improves survival from OHCA but remains underutilized for many reasons. The failure to recognize cardiac arrest is a significant barrier to bystander CPR, but properly trained 9-1-1 dispatchers can use an abbreviated set of questions to help lay rescuers quickly identify cardiac arrest and start CPR. Because it is early in the sequence of events after collapse, this telephone interface is a catalyst for many subsequent time-sensitive interventions: the early recognition of cardiac arrest, the immediate commencement of bystander CPR, and the acceleration of access to advanced life support. In conjunction with public education campaigns, EMS systems can maximize bystander involvement by measuring and improving their dispatch-assisted CPR instructions. Although the science behind dispatch-assisted CPR continues to grow, we already have strong evidence that this intervention represents the anchor link in the chain of survival.

### Acknowledgements

*We are grateful to the 911 centers in Arizona and King County, Washington, which have worked so hard to save lives from cardiac arrest.*
*We thank Paula Brazil, M.A., for her assistance with this manuscript.*

### Conflicts of interest

*Dr. Bobrow is a Co-Principal Investigator on the Heart-Rescue Project which is funded by the Medtronic Foundation and seeks to develop statewide cardiac arrest systems of care.*
*Micah Panczyk has no COI.*
*Cleo Subido has no COI.*

## REFERENCES AND RECOMMENDED READING

Papers of particular interest, published within the annual period of review, have been highlighted as:
- ■ of special interest
- ■■ of outstanding interest

Additional references related to this topic can also be found in the Current World Literature section in this issue (p. 288).

1. Roger VL, Go AS, Lloyd-Jones DM, *et al.* Heart disease and stroke statistics - 2012 update: A report from the American Heart Association. Circulation 2012; 125:e2–e220.
2. Stiell IG, Wells GA, Field B, *et al.* Advanced cardiac life support in out-of-hospital cardiac arrest. N Engl J Med 2004; 351:647–656.
3. ■ Sasson C, Rogers MA, Dahl J, Kellermann AL. Predictors of survival from out-of-hospital cardiac arrest: a systematic review and meta-analysis. Circ Cardiovasc Qual Outcomes 2010; 3:63–81.

This meta-analysis of 79 studies of bystander CPR over 30 years showed an odds ratio of 2.4 for survival when bystander CPR was performed. This study underscores the tremendous impact of bystander involvement in OHCA.

4. Nichol G, Thomas E, Callaway CW, *et al.* Regional variation in out-of-hospital cardiac arrest incidence and outcome. JAMA 2008; 300:1423–1431.
5. Vaillancourt C, Stiell IG. Cardiac arrest care and emergency medical services in Canada. Can J Cardiol 2004; 20:1081–1090.
6. Rea TD, Eisenberg MS, Culley LL, Becker L. Dispatcher-assisted cardiopulmonary resuscitation and survival in cardiac arrest. Circulation 2001; 104:2513–2516.
7. Hallstrom A, Cobb L, Johnson E, Copass M. Cardiopulmonary resuscitation by chest compression alone or with mouth-to-mouth ventilation. N Engl J Med 2000; 342:1546–1553.
8. Neumar RW, Brown CG, Van Ligten P, *et al.* Estimation of myocardial ischemic injury during ventricular fibrillation with total circulatory arrest using high-energy phosphates and lactate as metabolic markers. Ann Emerg Med 1991; 20:222–229.
9. Caffrey SL, Willoughby PJ, Pepe PE, Becker LB. Public use of automated external defibrillators. N Engl J Med 2002; 347:1242–1247.
10. Spaite DW, Valenzuela TD, Meislin HW, *et al.* Prospective validation of a new model for evaluating emergency medical services systems by in-field observation of specific time intervals in prehospital care. Ann Emerg Med 1993; 22:638–645.
11. Chandra NC. Mechanisms of blood flow during CPR. Ann Emerg Med 1993; 22:281–288.
12. Waalewijn RA, Nijpels MA, Tijssen JG, Koster RW. Prevention of deterioration of ventricular fibrillation by basic life support during out-of-hospital cardiac arrest. Resuscitation 2002; 54:31–36.
13. Eftestol T, Wik L, Sunde K, Steen PA. Effects of cardiopulmonary resuscitation on predictors of ventricular fibrillation defibrillation success during out-of-hospital cardiac arrest. Circulation 2004; 110:10–15.
14. Brenner BE, Kauffman J. Reluctance of internists and medical nurses to perform mouth-to-mouth resuscitation. Arch Intern Med 1993; 153:1763–1769.
15. Brenner B, Stark B, Kauffman J. The reluctance of house staff to perform mouth-to-mouth resuscitation in the inpatient setting: what are the considerations? Resuscitation 1994; 28:185–193.
16. Brenner B, Kauffman J, Sachter JJ. Comparison of the reluctance of house staff of metropolitan and suburban hospitals to perform mouth-to-mouth resuscitation. Resuscitation 1996; 32:5–12.
17. McCormack AP, Damon SK, Eisenberg MS. Disagreeable physical characteristics affecting bystander CPR. Ann Emerg Med 1989; 18:283–285.
18. Michael AD, Forrester JS. Mouth-to-mouth ventilation: the dying art. Am J Emerg Med 1992; 10:156–161.
19. Locke CJ, Berg RA, Sanders AB, *et al.* Bystander cardiopulmonary resuscitation. Concerns about mouth-to-mouth contact. Arch Intern Med 1995; 155:938–943.
20. Ornato JP, Hallagan LF, McMahan SB, *et al.* Attitudes of BCLS instructors about mouth-to-mouth resuscitation during the AIDS epidemic. Ann Emerg Med 1990; 19:151–156.
21. Clark JJ, Larsen MP, Culley LL, *et al.* Incidence of agonal respirations in sudden cardiac arrest. Ann Emerg Med 1992; 21:1464–1467.
22. Bang A, Herlitz J, Martinell S. 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 2003; 56:25–34.
23. Bobrow BJ, Zuercher M, Ewy GA, *et al.* Gasping during cardiac arrest in humans is frequent and associated with improved survival. Circulation 2008; 118:2550–2554.
24. Hauff SR, Rea TD, Culley LL, *et al.* Factors impeding dispatcher-assisted telephone cardiopulmonary resuscitation. Ann Emerg Med 2003; 42:731–737.
25. Zabala Arguelles JI, Maranon Pardillo R, Gonzalez Serrano P, Serina Ramirez C. Main vascular access in situations of extreme urgency: intra-osseous infusion. An Esp Pediatr 1992; 37:489–492.

**26.** Rea TD. Agonal respirations during cardiac arrest. Curr Opin Crit Care 2005; 11:188–191.
**27.** Eisenberg MS. Incidence and significance of gasping or agonal respirations in cardiac arrest patients. Curr Opin Crit Care 2006; 12:204–206.
**28.** Nurmi J, Pettila V, Biber B, *et al.* Effect of protocol compliance to cardiac arrest identification by emergency medical dispatchers. Resuscitation 2006; 70:463–469.
**29.** Clawson J, Olola C, Heward A, Patterson B. Cardiac arrest predictability in seizure patients based on emergency medical dispatcher identification of previous seizure or epilepsy history. Resuscitation 2007; 75:298–304.
**30.** Berg RA, Hemphill R, Abella BS, *et al.* Part 5: Adult basic life support – 2010 American Heart Association guidelines for cardiopulmonary resuscitation and emergency cardiovascular care. Circulation 2010; 122:S685–S705.
**31.** Assar D, Chamberlain D, Colquhoun M, *et al.* Randomised controlled trials of staged teaching for basic life support. 1. Skill acquisition at bronze stage. Resuscitation 2000; 45:7–15.
**32.** Coons SJ, Guy MC. Performing bystander CPR for sudden cardiac arrest: behavioral intentions among the general adult population in Arizona. Resuscitation 2009; 80:334–340.
**33.** Sanders AB, Kern KB, Atlas M, *et al.* Importance of the duration of inadequate coronary perfusion pressure on resuscitation from cardiac arrest. J Am Coll Cardiol 1985; 6:113–118.
**34.** ■■ Rea TD, Fahrenbruch C, Culley L, *et al.* CPR with chest compression alone or with rescue breathing. N Engl J Med 2010; 363:423–433.
This multicenter randomized control trial of dispatch CPR showed equivalent outcomes for coventional vs. COCPR overall and a trend toward better outcomes when COCPR instructions were given for the subgroup of arrests due to cardiac causes and those with a shockable rhythm. This supports the strategy of COCPR for dispatchers.
**35.** Svensson L, Bohm K, Castrèn M, *et al.* Compression-only CPR or standard CPR in out-of-hospital cardiac arrest. N Engl J Med 2010; 363:434–442.
**36.** ■■ Hupfl M, Selig HF, Nagele P. Chest-compression-only versus standard cardiopulmonary resuscitation: a meta-analysis. Lancet 2010; 376:1552–1557.
This meta-analysis of studies comparing COCPR and conventional CPR instructions by dispatchers showed improved chance of survival when COCPR instructions were provided.
**37.** Carter WB, Eisenberg MS, Hallstrom AP, Schaeffer S. Development and implementation of emergency CPR instruction via telephone. Ann Emerg Med 1984; 13:695–700.
**38.** Eisenberg MS, Hallstrom AP, Carter WB, *et al.* Emergency CPR instruction via telephone. Am J Public Health 1985; 75:47–50.
**39.** White L, Rogers J, Bloomingdale M, *et al.* Dispatcher-assisted cardiopulmonary resuscitation: risks for patients not in cardiac arrest. Circulation 2010; 121:91–97.