# Prognosis in Cardiac Arrest

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**KEYWORDS**

• Cardiac arrest • Prognosis • Cardiopulmonary resuscitation
• Neurologic outcome

Cardiac arrest (CA) remains a worldwide challenge. Nearly 450,000 Americans suffer from CA annually, with another 350,000 to 700,000 Europeans involved.[1,2] Out-of-hospital CA is the third leading cause of death in the United States.[3] Survival rates remain low, averaging 2% to 5% in most studies, occasionally as high as 10%. In-hospital arrests fare slightly better, with survival rates still a dismal 15%.[4] Several prognostic factors have been identified. These factors may be broadly divided into prearrest factors, intra-arrest factors, and postarrest factors. Of note, the great majority of the research on this topic was conducted before the development of protocols for therapeutic hypothermia (TH) for comatose survivors of CA. It is unclear whether widespread adoption of TH will alter the prognostic capabilities of some of these factors.

## PREARREST FACTORS

Several factors alter the prognosis of CA even before the initiation of advanced life support (ALS) measures. Some of these factors are specific to out-of-hospital CA (OHCA) whereas others relate to in-hospital CA (IHCA). Well-established factors in OHCA that influence the survival from CA include initial rhythm, location, age, witnessed arrest or not, bystander cardiopulmonary resuscitation (CPR), mode of arrest (respiratory vs cardiac), and delay to arrival of rescue team (**Table 1**). Other factors include time of day, day of week, and gasping or other abnormal respiratory efforts. Some factors more specific to IHCA include ward experience (more than 5 resuscitations per year), hospital location, use of automated external defibrillator (AED), and again, time of day/day of week (**Table 2**).

## OUT-OF-HOSPITAL CARDIAC ARREST

It is clear that victims of OHCA have better outcomes if they present to emergency medical services (EMS) providers in a shockable rhythm such as ventricular fibrillation

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**Table 1**
**Prognostic factors in out-of-hospital cardiac arrest**

| Factor | Association |
|---|---|
| **Initial rhythm** | **VF/VT survival 6 times as high** |
| Location | Public arrest: survival 3–4 times more likely<br>Workplace arrest: survival 6 times more likely |
| Age | Older age associated with worsened survival<br>Young adults (18–35) with marginally better outcomes |
| CPR | Any form of bystander CPR greatly increases chance of survival |
| Time to defibrillation | AED use before EMS arrival 1.75-fold more likely to survive |
| Time of day | Peak incidence 8–10 AM; lowest survival midnight to 6 AM |
| Gasping | Survival 28% vs 8%; with bystander CPR survival 39% vs 9.4% if not gasping |

*Abbreviations:* AED, automated external defibrillator; CPR, cardiopulmonary resuscitation; EMS, emergency medical services; VF/VT, ventricular fibrillation/ventricular tachycardia.

(VF) or pulseless ventricular tachycardia (VT). Survival when a patient presents in a shockable rhythm is up to 6 times as high as when they have a nonshockable rhythm.[5] These rhythms occur early in the course of an arrest and deteriorate to rhythms less amenable to intervention. Time to defibrillation is important. The use of an AED prior to EMS arrival is associated with a 1.75-fold increase in survival to hospital discharge.[6] People that have witnessed arrests in public places have a better outcome. Survival is 3 to 4 times more likely if a patient arrests in a public place and 6 times more likely if they arrest in the workplace.[7] In general, arrests in public or in the workplace tend to be younger, to be men, and to be in VF. Those that arrest at home are more likely to be elderly, female, unwitnessed, and not VF.[7] If the event is witnessed and a bystander performs CPR, outcomes from CA are improved. Delays to arrival of the rescue team and advanced age lead to worse outcomes.[5] It is interesting that although advanced age portends a poor prognosis, young adults (age 18–35) do not always fare better. In one study, their 1-month survival was only 6.3%. This group tended to suffer from "noncardiac" arrests (the majority were drug overdoses), were

**Table 2**
**Prognostic factors in in-hospital cardiac arrest**

| Factor | Association |
|---|---|
| Rhythm | VF/VT still has a better outcome but occurs much less frequently than in OHCA (fewer than 20% of all IHCAs) |
| Time to CPR and defibrillation | Survival 33% if CPR started in less than 1 min (vs 14% if >1 min)<br>Survival 38% if VF/VT defibrillated in <3 min (vs 21% if >3 min) |
| Hospital location | ICUs have better survival rates<br>Wards with >5 arrests per year have better survival rates<br>Hemodialysis units have better survival rates |
| Time of day | Night shift arrests have half the survival of daytime arrests |
| AED use | Worse survival (10.4% vs 15.4%) when used for nonshockable arrests<br>No survival benefit in shockable arrests |

*Abbreviations:* ICU, intensive care unit; IHCA, in-hospital cardiac arrest; OHCA, out-of-hospital cardiac arrest.