

SMART CPR

Make Better-informed Treatment Decisions



Philips HeartStart FR2+ Defibrillator with SMART CPR

Shock or CPR First?

The HeartStart FR2+ with SMART CPR advises the responder whether initial treatment of cardiac arrest should be a shock or CPR followed by a shock.

The responder's dilemma

Professional rescuers must quickly decide the best course of treatment when responding to sudden cardiac arrest (SCA). Until recently, immediate defibrillation with an automated external defibrillator (AED) was the general rule. However studies now show the benefit of providing one to two minutes of quality CPR prior to a defibrillation shock if the response time to the patient is greater than five minutes.^{1,2} Unfortunately, it is often not possible for responders to determine on arrival how long the patient has been down. Should they immediately shock the patient, or should they first administer an interval of CPR followed by a shock?

Automate treatment advice with SMART CPR

In response to this dilemma, Philips has introduced SMART CPR in its HeartStart FR2+ AED. When SMART CPR is enabled, the HeartStart FR2+ evaluates key attributes of the patient's presenting heart rhythm and advises whether to initially treat shockable rhythms such as ventricular fibrillation (VF) with a shock, or with CPR immediately followed by a shock. If a patient in VF is likely to experience a return of circulation with a shock (as is typical of short-duration VF), the FR2+ advises an immediate shock. Otherwise, the FR2+ advises CPR prior to a shock.

SMART CPR is designed to help responders make better-informed, more refined treatment decisions. It supports an emerging response protocol that current scientific literature, and 2005 American Heart Association Guidelines³, suggest may improve survival for more patients.

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Not all VF is the same

Studies have revealed that early in a cardiac arrest, the heart is usually relatively strong, its fuel reserves are rich, and the blood's oxygen supply is high in the cardiac arteries. In this state, the heart's rhythm is coarse and of high frequency and vitality. Such a heart is receptive to a defibrillation shock, and is highly likely to return to circulation (Figure 1a).

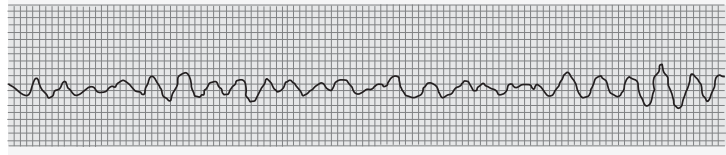


Figure 1a: Short-term VF rhythm with high frequency and amplitude, characteristic of a heart receptive to a defibrillation shock.

As the minutes pass, however, the heart depletes its oxygen and fuel supplies, and the rhythm becomes progressively weaker. Although the rhythm is treatable with a shock, the likelihood that the patient will actually survive decreases because the heart is so depleted (Figure 1b).

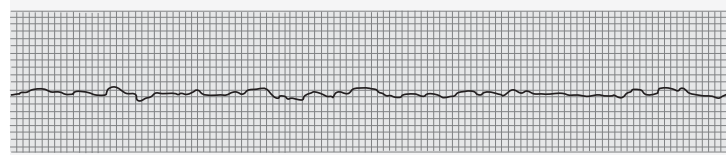


Figure 1b: Long-term VF rhythm with low frequency and amplitude, characteristic of a heart that is unlikely to return to circulation with a shock. CPR prior to a shock may improve the outcome.

These patients may be better served with an initial period of CPR, followed by a shock. Good CPR can temporarily revitalize the heart rhythm and increase the likelihood that subsequent defibrillation will result in a return of circulation.

A landmark study² looked at cardiac arrest patients in an EMS system. Patients were divided into two groups. One group received shocks as the initial treatment. The other group received an interval of CPR followed by shocks. Patients in short-duration cardiac arrest had higher observed survival rates when they received immediate shocks. However those in long-duration arrest generally had higher survival rates when receiving CPR prior to a shock (Figure 2).

The opportunity to “raise the survival curve”

The data from this study suggests an opportunity to improve survival of sudden cardiac arrest with a change in response protocol: provide immediate shocks to patients in short-duration VF (when EMS response time is within four to five minutes), and otherwise provide initial CPR followed by a shock (Figure 3). In fact, the literature calls for such a protocol and for AEDs that support it as a way to improve survival⁴.

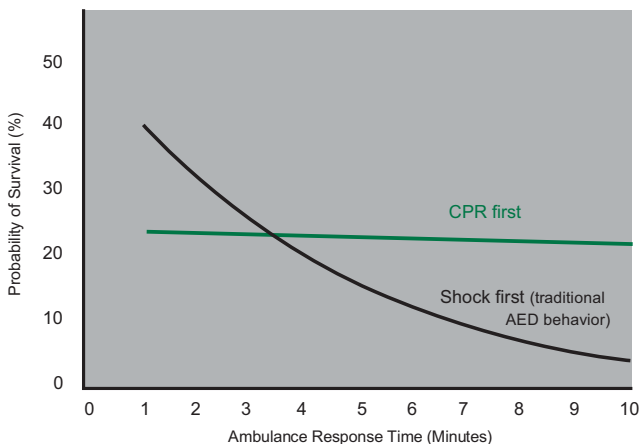


Figure 2: Patients with short-duration VF had good survival rates when they received immediate shocks. However, those with long-duration VF had higher survival rates when receiving CPR prior to a shock.

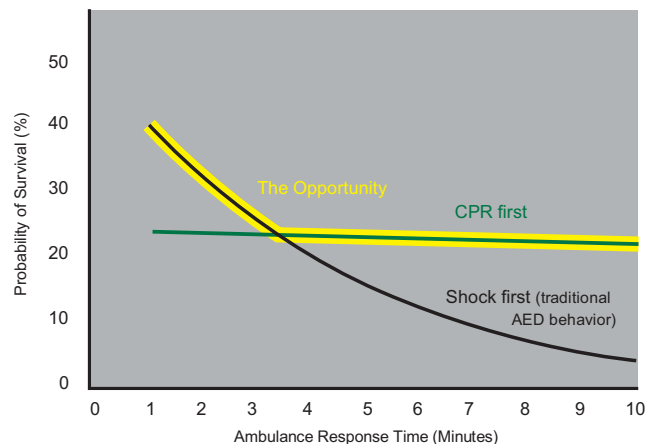


Figure 3: The opportunity to improve survival of SCA with a change in response protocol.

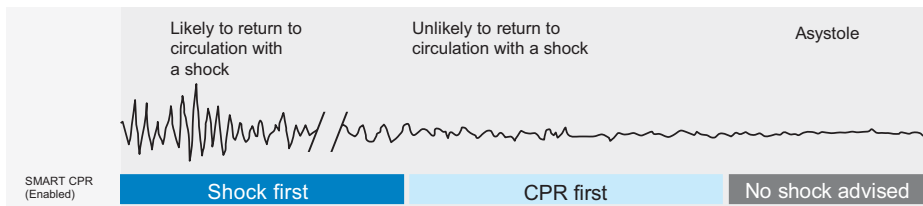


Figure 4: A conceptual representation of the progression of VF over time, showing SMART CPR's response.

However, as noted earlier, the EMS responder faces a dilemma when, as is often the case, there is insufficient information upon arrival to determine the best course of treatment: Did EMS witness the arrest? How long has the patient been in arrest? How long after the victim's collapse was it before emergency response was called? Was bystander CPR performed prior to arrival of EMS? If so, was it effective CPR? What is the underlying condition of this individual patient's heart? What should the arriving responder do—shock first or perform CPR first? The choice may not be obvious. And rigid “give CPR first all of the time” protocols may not best serve individual patients, particularly those with short-duration VF, who have the best prognosis for survival. (It is worth noting that there were indeed patients with short-duration SCA in the aforementioned EMS system. In fact, another study⁵ reported that 15% of arrests were witnessed by EMS.)

An end to the guesswork

The HeartStart FR2+ with SMART CPR enabled assesses the initial heart rhythm to determine if it is shockable. If it is, SMART CPR determines if the rhythm has the specific attributes of a heart likely to benefit from an initial defibrillation shock. If this is the case, the FR2+ will advise a shock. Otherwise, it will advise a period of CPR first, followed by a shock, anticipating that CPR may render the heart more receptive to that shock (Figure 4). Either way, the FR2+ adjusts its voice instructions accordingly.

SMART CPR bases its treatment decision on objective physiological measurements of each individual patient's heart rhythm. In contrast, other protocols dictate treatment based solely on the time that a patient has been down (which is often impossible for responders to know), without regard to differences in individual patients.

Accordingly, a clinical study⁶ found SMART CPR to be more accurate than a time-based protocol: SMART CPR was significantly better at identifying those patients with the best chances of survival if given shocks first. And SMART CPR also had a higher observed ability to identify patients who would not survive a shock-first protocol, suggesting a CPR-first treatment alternative.

For EMS systems that do prefer a protocol calling for CPR first all the time, the FR2+ can also be configured to let the responder invoke a CPR interval as soon as the device is turned on, giving the added benefit of voice prompts and rescue data recording. The default configuration for the FR2+ is the more traditional “shock first all the time” protocol.

A new level of refinement

Philips HeartStart FR2+ with SMART CPR takes automated patient analysis and treatment advice to a new level of refinement. It helps responders make better-informed treatment decisions. SMART CPR supports an emerging response protocol that the literature suggests may improve survival.



Philips—the trusted choice:

- A Fortune Global 500 company, Philips is one of the world's largest medical products companies with annual revenue of over \$7 billion.
- Philips is the world leader in automated external defibrillators (AEDs) sales.⁷
- More than 325,000 Philips defibrillators are deployed on airlines, and in airports, workplaces, buildings and communities worldwide.
- Over 7 billion HeartStart Defibrillator service hours have been logged, with an additional 7 million hours added every day.
- Over 44% of Fortune 100 companies, 8 out of 10 major airlines and 43 professional sports teams rely on Philips HeartStart Defibrillators.

To learn more about the HeartStart FR2+ Defibrillator with SMART CPR and Philips, call 1-800-453-6860 or visit www.philips.com/heartstart.

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