Electrocardiographic evaluation of defibrillation shocks delivered to out-of-hospital sudden cardiac arrest patients.

Gliner BE, White RD. Resuscitation 1999; 41: 133-144.

Purpose
To classify out-of-hospital cardiac arrest rhythms following shocks with a non-escalating, low-energy 150 Joule (J) SMART Biphasic waveform (Philips Medical Heartstream AED), compared to those following escalating, high-energy monophasic damped sine waveforms, in order to precisely define defibrillation efficacy and establish uniform criteria for evaluating shock performance.

Methods
Electrocardiograms from 29 SMART Biphasic patients and 87 monophasic patients, whose initial rhythm was ventricular fibrillation (VF), were retrospectively reviewed and classified as organized, asystole, or VF at 3, 5, 10, 20, and 60 seconds (s) after delivery of each shock.

Findings
- For all shocks delivered (including higher energy monophasic shocks):
  - Rhythm distributions were significantly different at 5 seconds following biphasic shocks, as compared to monophasic shocks \((p < 0.0001)\). At 5 seconds, there was an organized rhythm in 36% of biphasic-treated patients, versus only 19% of monophasic patients \((p = 0.0002)\).
  - The last recorded rhythm was more likely to be organized following biphasic shocks.
  - The last recorded rhythm was organized for 93% of biphasic patients, compared to 55% of monophasic patients \((p = 0.0003)\).
  - The last recorded rhythm was asystole for 7% of biphasic patients, compared to 26% of monophasic patients \((p = 0.04)\).
- No biphasic patients had VF as the final recorded rhythm, whereas 19% of monophasic patients had VF as the final recorded rhythm \((p = 0.01)\).
- Biphasic waveforms required significantly fewer shocks to terminate VF. An average of 1.2 biphasic shocks were required to terminate VF, as compared to 2.4 shocks for monophasic \((p = 0.0007)\).
- At each analysis time, there were more patients in VF following monophasic shocks than following biphasic shocks.
- There was no difference in the rate of VF recurrence between biphasic and monophasic shocks, indicating that refibrillation is largely a function of underlying myocardial condition.
- There was no difference in the average number of shocks (5.2) delivered to patients treated with biphasic versus monophasic waveforms.
**Conclusion**

The authors conclude, "defibrillation should uniformly be defined as termination of VF for a minimum of 5-s after shock delivery. Rhythms should be reported at 5-s after shock delivery to assess early effects of the defibrillation shock and at 60-s after shock delivery to assess the interaction of the defibrillation therapy and factors such as post-shock myocardial dysfunction and the patient's underlying cardiac disease."