

Singapore

DEFIBRILLATION

Guidelines 2006

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Defibrillation Sub-committee members

Chairman: Prof V. Anantharaman

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Areas of Coverage

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1. CPR Before Defibrillation

Previous Singapore Guidelines

If defib delayed > 4 min to perform at least 1 minute CPR before defibrillation

Changes in Evidence

Animal studies and 2 major clinical trials show ROSC and survival if 1 – 3 min CPR done when > 4 minutes delay from collapse to defibrillation

2006 Guidelines

If defibrillator available

1. **witnessed arrest:** immediate defibrillation, followed by rest of Defibrillation protocol
2. **unwitnessed arrest:** CPR first for 1 minute followed by defibrillation

If defibrillator not available

1. **witnessed arrest:** CPR till arrival of defibrillator
2. **unwitnessed arrest:** CPR till arrival of defibrillator

2. Precordial Thump

Previous Singapore Guidelines

Nil

Changes in Evidence

Case series and observational studies indicate effective precordial thump delivered by closed fist from height of 5 – 40 cm may convert VF or pulseless VT or even unstable SVT if given very early after onset of rhythm

2006 Guidelines

May be considered to be **given only once**, if in the case of a **witnessed and monitored arrest** if a **defibrillator is not immediately available**

3. Promotion of Public Access Defibrillation

Previous Singapore Guidelines

Recommended for the following groups:

- Crew of E and NE ambulances
- Motorcycle based paramedics
- flight attendants
- general staff of airports
- Police officers on patrol cars / motorcycles
- Security personnel
- Designated first-aiders at public buildings, work areas and recreational areas such as sports complexes and golf courses
- Medical and paramedical personnel of military establishments

Changes in Evidence

- Evidence indicates AED programs are safe and feasible and significantly increase survival from out-of-hospital cardiac arrest, if effectively implemented
- 80% of out-of-hospital cardiac arrests occur in residential and community settings
- Insufficient data to support or refute effectiveness of home or personal AED programs

2006 Guidelines

- Use of defibrillators recommended for same groups. All responders must be trained by NRC accredited AED training centres
- Use of AEDs by trained lay responders as part of PAD programs in residential estates and public settings where witnessed cardiac arrest is likely to occur

4. In-hospital defibrillation

Previous Singapore Guidelines

All medical and nursing staff of hospitals and other medical establishments should be trained in CPR and automated defibrillation

Changes in Evidence

- No published randomised trials of manual vs automated defibrillators
- Increase in hospital survival when both AEDs and manual defibrillators were available in hospital

2006 Guidelines

In addition to use of manual defibrillators in hospitals, all hospitals to re-double efforts to use **AEDs to facilitate early defibrillation**

5. Electrode pad / paddle interface

Previous Singapore Guidelines

Nil

Changes in Evidence

- **Position:** anterior – posterior position and superior anterior – infero - lateral position apparently equal. Placement of pad on female breast apparently increases TTI
- **Size:** Higher documented defib success rates with larger paddles / pads and lowered TTI. Significantly increased myocardial damage in dog experiments with small electrodes of larger electrodes
- **Pads vs Paddles:** No clear superiority of one over the other. Pads more convenient for routine monitoring and defibrillation, pre-hospital defibrillation and peri-operative defibrillation.

2006 Guidelines

- **Recommended Position** on exposed chest may be one of the following:
 - anterior – posterior position
 - left of apex – right of sternum below clavicle
 - in females to place left paddle / pad lateral to and below left breast.
- **Recommended Size:** 12 cm pads / paddles rather than 8 cm pads / paddles for external defibrillation
- **Pads vs Paddles:** Self-adhesive pads are safe and effective and an acceptable alternative to paddles

6. Biphasic vs Monophasic waveforms and energy levels

Previous Singapore Guidelines

Both were accepted at range of energy levels available, e.g 200, 300/360 joules for monophasic defib and 150 – 360 joules for biphasic defib depending on manufacturer's recommendations

Changes in Evidence

- Biphasic waveforms using equal or lower energy levels were at least as effective as monophasic waveforms in terminating VF
- Studies have not determined the optimal energy level for conversion of either VF or pulseless VT
- Studies have not determined, whether in human clinical trials or lab trials, whether there is greater benefit or harm from any of the current energy levels (100 – 360 joules) in human adults in the cardiac arrest situation
- The only studies demonstrating harm were in adult animals of up to 25 Kg weight delivered monophasic energy in the range of 120 joules – 360 joules (approx 7 to 18 joules / kg). The doses usually delivered are in the range of 2.2 joules /kg to 7 joules / kg
- A study by Weaver et al (1982) demonstrated that first shock efficacy was no worse after a 360 joule shock than after a 200 joule monophasic shock

6. Biphasic vs Monophasic waveforms and energy levels

2006 Guidelines

- Biphasic waveforms are safe and effective for terminating VF or pulseless VT when compared to monophasic shocks
- With a biphasic defibrillator, it is reasonable to use energy values in the range of 150 – 360 joules.
- With a monophasic defibrillator, an energy level of 360 joules is recommended for VF / pulseless VT in such patients

7. One shock + CPR vs three stacked shocks

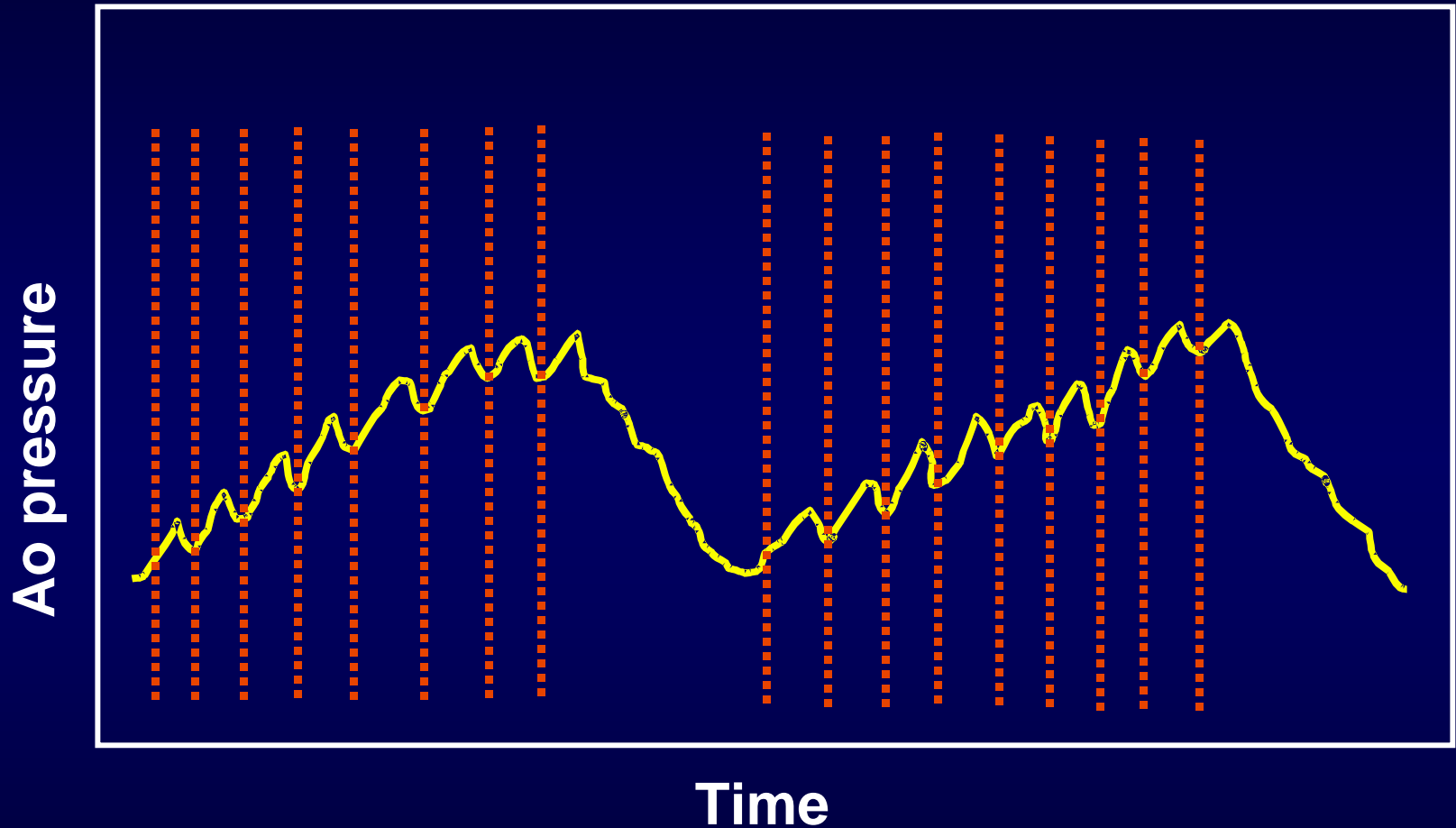
Previous Singapore Guidelines

Three stacked shocks at 200, 200/300, 360 joules followed by one minute of CPR and then three stacked shocks at 360 joules

Changes in Evidence

- No published work comparing three stacked shocks vs one-shock protocol
- There is a prolonged period of interruption of chest compressions because of the three-shock protocol. This leads to poor aortic and coronary perfusion during this phase of shocks with shocks being directed at non-perfused myocardium
- High success rates in defibrillation of AF patients possible because shocks are delivered to perfusing myocardium. Lower success rates in VF patients may be contributed by prolonged absence of chest compressions and lack of myocardial perfusion and oxygenation. Adequate myocardial perfusion requires performance of CPR almost continuously with minimal interruption.
- ILCOR has recommended resumption of chest compressions after each shock without initial checking of rhythm or pulse until after two minutes of CPR.
- Local experience with continuous performance of 30:2 CPR for up to 2 minutes indicates that the average rescuer sustains fatigue and poor quality chest compressions shortly after first minute. Since coronary perfusion pressures optimize after the first 10 compressions, it is reasonable to interrupt CPR at 1 minute, rather than go through at least 30 – 60 seconds of poor circulation prior to delivering shock energy to the heart.

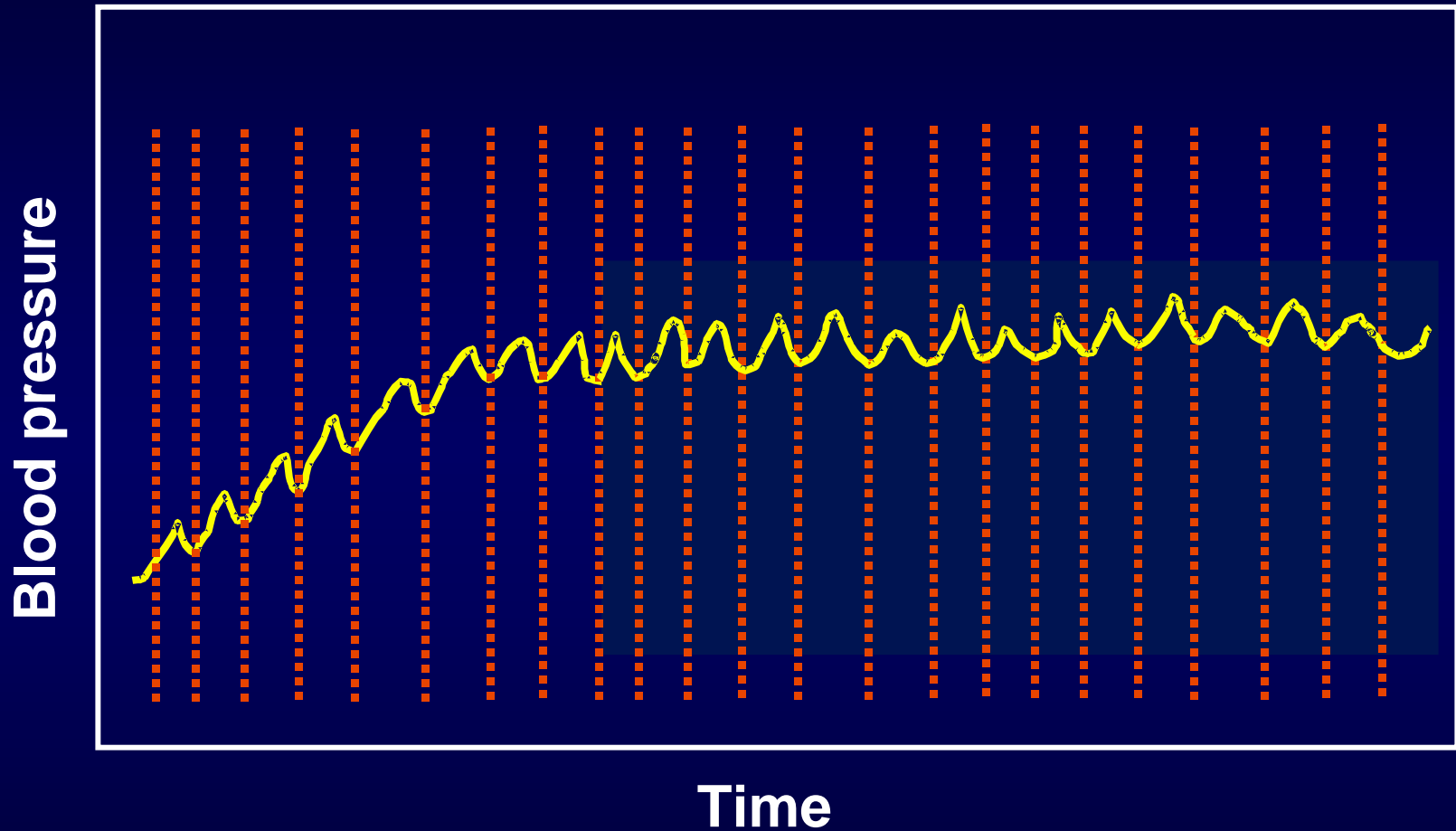
Standard CPR (CC+RB) vs. CC alone



 = chest compression

Berg et al, 2001

Standard CPR (with breaths) vs. CC alone



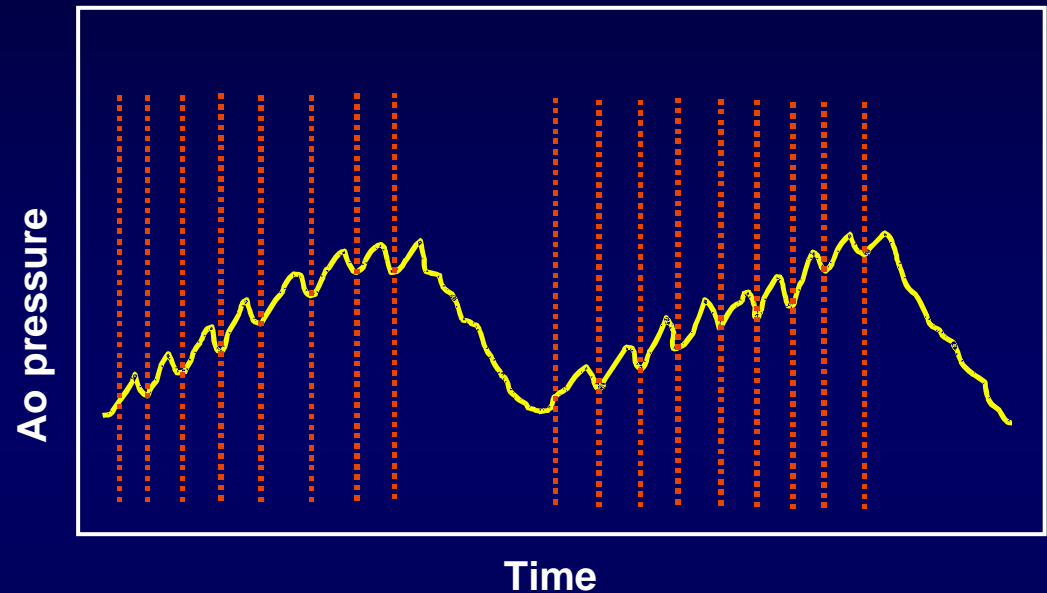
 = chest compression

Berg et al, 2001

Adverse effects of interrupting CPR

Standard CPR (CC+RB) vs. CC alone

- Stop CPR only when “Stand Clear”
- CPR interruption before next shock less than 10 seconds



⋮ = chest compression

Berg et al, 2001

- Concept of 3 x stacked shocks

No significant change in trans-thoracic resistance values between first shock and second or third of the stacked shocks: Anantharaman et al, 2005

7. One shock + CPR vs three stacked shocks

2006 Guidelines

- Every **shock** will be **followed by 1 to 2 minutes of CPR**, at the end of which assessment of patient, rhythm or pulse check may be performed to assess need for further chest compressions or defibrillations
- The shock – 1 to 2 minutes CPR – shock – 1 to 2 minutes CPR sequence would hold regardless of whether the defibrillation is being conducted in the in-hospital or out-of-hospital environment.
- **Prior to delivery of shock, a pulse check**, rhythm check or assessment of signs of life would be carried out as appropriate.
- Further enhancement of the chest compression time may be achieved by **minimizing the hands-off time for rhythm analysis**. While this may be easily implemented during manual defibrillation, currently available AEDs do not allow for such during automated defibrillation. AED manufacturers should be asked to look into allowing continuation of CPR during rhythm analysis.

Requests made to AED manufacturers

- Allow analysis of rhythm during performance of chest compressions without needing to “stand clear”
- Allow shock – 1 minute CPR – shock – 1-minute CPR – shock – and so on
- To include analysis function only after 1 minute of CPR
- To provide metronome (audio) function of 100 /minute in all AEDs to facilitate correct rate of chest compressions
- To minimize words used during rhythm analysis, e.g.
- Do it quick!

8. Use of oxygen during defibrillation

Previous Singapore Guidelines

Nil

Changes in Evidence

- Oxygen is a valuable adjunct during resuscitation
- Fire is a rare, but devastating complication of defibrillation
- Most reports link the presence of oxygen in the immediate vicinity and sparking from defibrillation attempts with fire.

2006 Guidelines

- **Remove any open sources of oxygen** (face mask, nasal cannula) from the immediate vicinity of defibrillation attempts – at least one meter away from the defibrillation pads.
- Leave **ventilation bag /ventilator connected to tracheal tube** during defibrillation.
- **Minimize the risk of sparks.** Self-adhesive defibrillation pads are less likely to cause sparks than manual pads

9. Paediatric Defibrillation

Previous Singapore Guidelines

Use of AEDs in children less than 8 years of age or less than 25 Kg weight is not recommended

Changes in Evidence

- Paediatric AED biphasic shocks of 2 joules / kg have effectively terminated shocks.
- There is insufficient information to recommend for or against the use of AEDs in infants > 1 year

2006 Guidelines

- Children of age 1-8 years, up to 25 Kg body weight or 127 cm length can be defibrillated with manual or automated attenuated defibrillators, if available
- The defibrillation dose should usually be from 2 joules / kg to 4 joules / kg.

Thank you