3rd SRFAC Townhall (Virtual) BCLS+AED Guidelines 2021 Update

Prof. Lim Swee Han

SRFAC BCLS+AED Sub-Committee

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- ITE College East
- Nanyang Polytechnic
- Parkway College
- SAF Medical Training Institute
- Society of Emergency Medicine, Singapore
- Singapore Civil Defence Force
- Singapore Nursing Board, MOH
- Singapore Red Cross
- St John Association Singapore
- Singapore First Aid Training Centre
- Singapore Heart Foundation
- ST Healthcare
- Unit for Pre-hospital Emergency Care
- Changi General Hospital
- Institute of Mental Health
- Khoo Teck Phuat Hospital
- KK Women and Children Hospital
- Mount Alvernia Hospital
- Ng Teng Fong General Hospital
- National Heart Centre, Singapore
- National University Hospital Systems
- SengKang General Hospital
- Singapore General Hospital
- Tan Tock Seng Hospital

was in ventricular fibrillation for eight minutes. Simultaneously recorded on a four-channel recorder were the blood flow in a carotid artery, the instantaneous and average pressures in a femoral artery, and the cardiogram. The tracings in the first column of figure 1 are the normal values of these respective phenomena immediately before fibrillation was induced by a 110-volt shock. The second column shows the build-up of blood flow and pressures that took place when closed-chest cardiac massage was started, one minute after the onset of fibrillation. The third column is a record of what took place about seven minutes later. Note that vigorous fibrillation has been maintained throughout the entire period. The fourth and last column shows the immediate return of normal sinus rhythm when the closed chest defibrillator shock was given. The electrocardiograph was temporarily disconnected when the counter shock was applied.

Method.—The method of closed-chest cardiac massage developed during these animal studies is simple to apply; it is one that needs no complex equipment. Only the human hand is required. The principle of the method as applied to man is readily seen by consideration of the anatomy of the bony thorax and its contained organs. The heart is limited anteriorly by the sternum and posteriorly by the vertebral bodies. Its lateral movement is restricted by the pericardium. Pressure on the sternum compresses the heart between it and the spine, forcing out blood. Relaxation of the pressure allows the heart to fill. The thoracic cage in unconscious and anesthetized adults is surprisingly mobile. The method of application is shown in figure 2. With the patient in a supine position, preferably on a rigid support, the heel of one hand with the

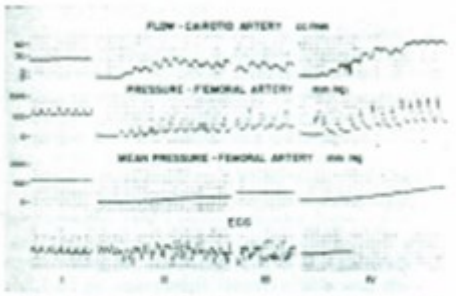


Fig. 1.—Record of blood flow, pressures, and electrocardiogram of dog whose heart was in ventricular fibrillation for eight minutes. I: normal initial values; II: start of closed-chest massage; III: seventh minute of massage; IV: closed-chest defibrillation.

other on top of it is placed on the sternum just cephalad to the xiphoid. Firm pressure is applied vertically downward about 60 times per minute. At the end of each pressure stroke the hands are lifted slightly to permit full expansion of the chest. The operator should be so positioned that he can use his body weight in applying the pressure. Sufficient pressure should be used to move the sternum 3 or 4 cm. toward the vertebral column.

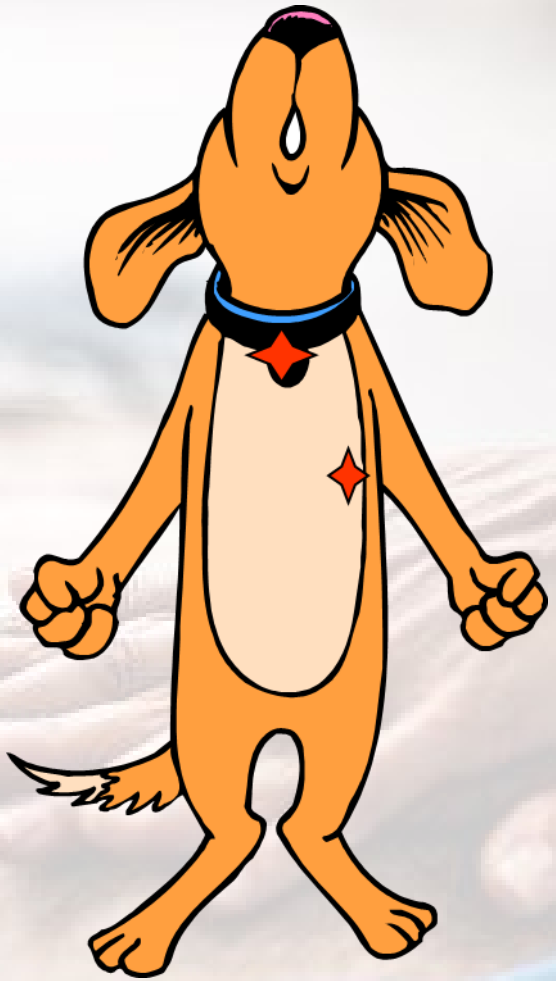
Closed-chest cardiac massage provides some ventilation of the lungs, and if there is only one person present in a case of arrest, attention should be

Fig 2.—Position of hands during massage of adult.

concentrated on the massage. If there are two or more persons present, one should massage the heart while the other gives mouth-to-nose respiration.

Clinical Application.—About nine months prior to time of writing, at Johns Hopkins Hospital, clinical application of closed-chest cardiac massage was successfully illustrated in a case of cardiac arrest. Initially, it was felt that the method might be useful in treating arrest in children, whose ribs are known to be flexible, but that it would not be effective in adults. This latter assumption was proved to be incorrect, since the chest of an unconscious adult was found to be remarkably flexible.

During the 10 months prior to writing this method alone has been applied on 20 patients aged from 2 months to 80 years. In 13 of these patients artifi-



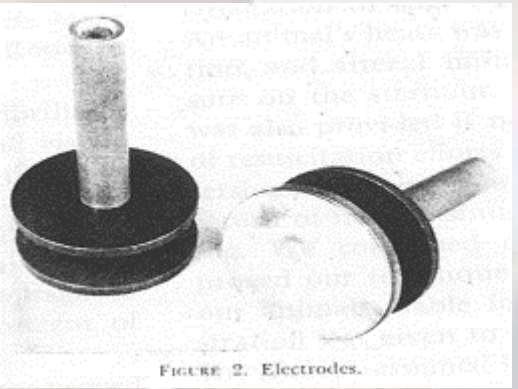
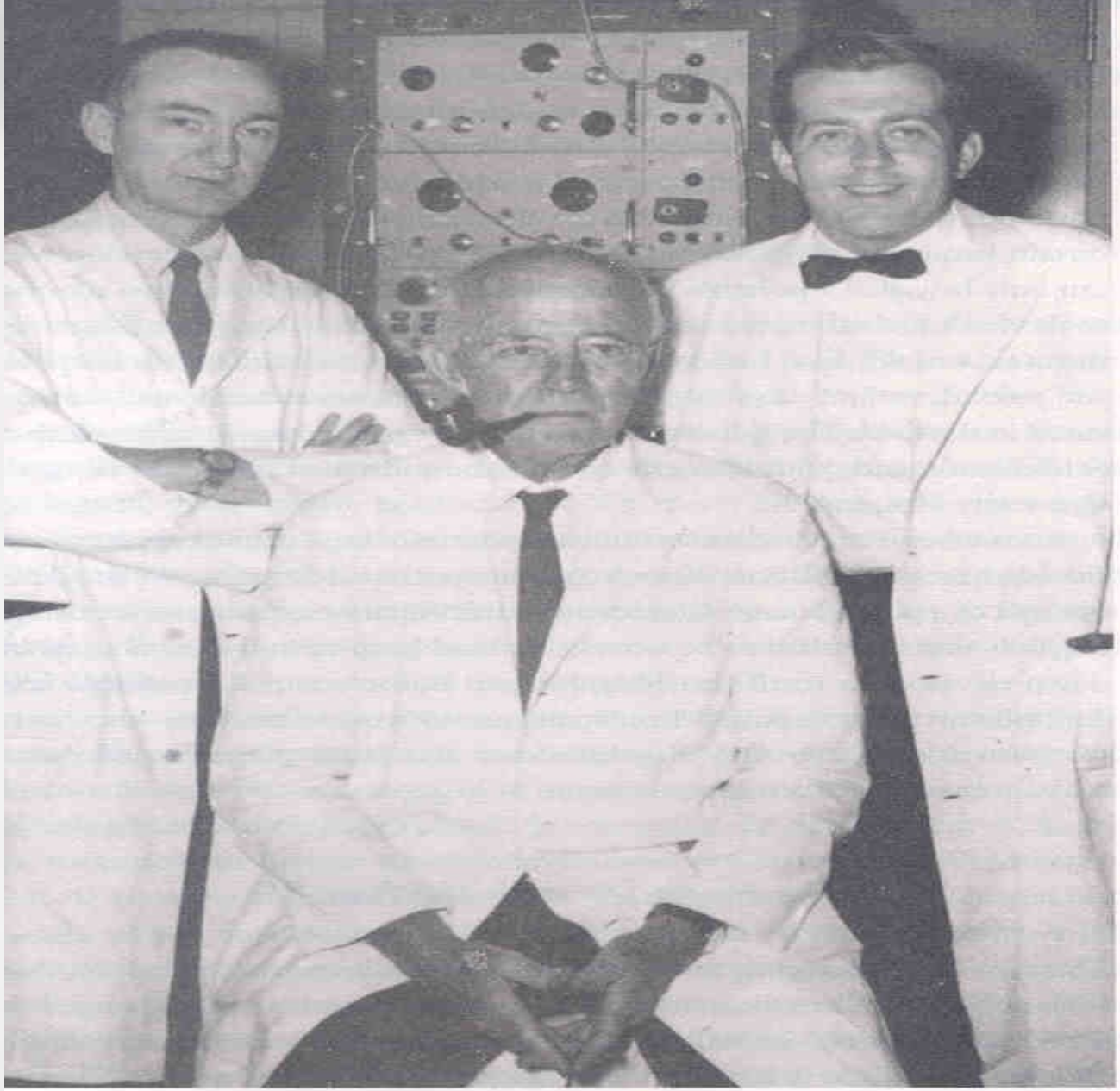
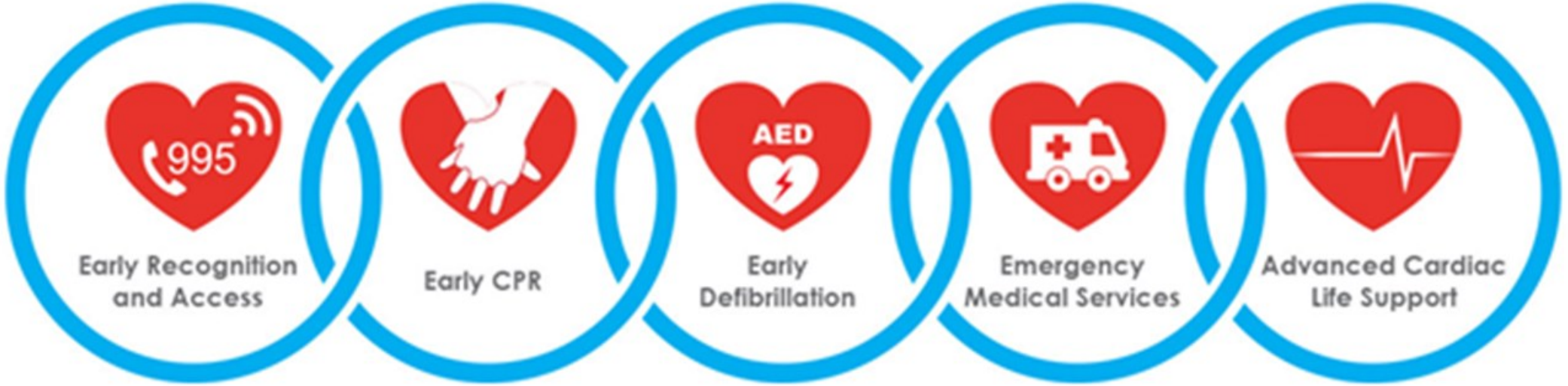


FIGURE 2. Electrodes.

Kouwenhoven et al JAMA
1960, 173(10):1065-67



IGURE 19. *James R. Jude, MD (left), William Kouwenhoven, PhD (center), nd G. Guy Knickerbocker, PhD (right), in Kouwenhoven's laboratory at Johns Iopkins Hospital, 1961. (Courtesy of Peter Safar)*



Early Recognition and Access	Early CPR	Early Defibrillation	Emergency Medical Services	Advanced Cardiac Life Support
✓ Look for normal breathing ✓ Gasping ✓ EMS Dispatcher	✓ Quality of CPR ✓ Hands only CPR ✓ CPR training in schools	✓ Public Access Defibrillation	✓ High-performance CPR ✓ Advanced airway ✓ Adrenaline	✓ Emergency drugs ✓ Targeted Temperature Management ✓ PCI

National Heart, Lung, and Blood Institute

American Heart Association

US Army Medical Research & Materiel Command

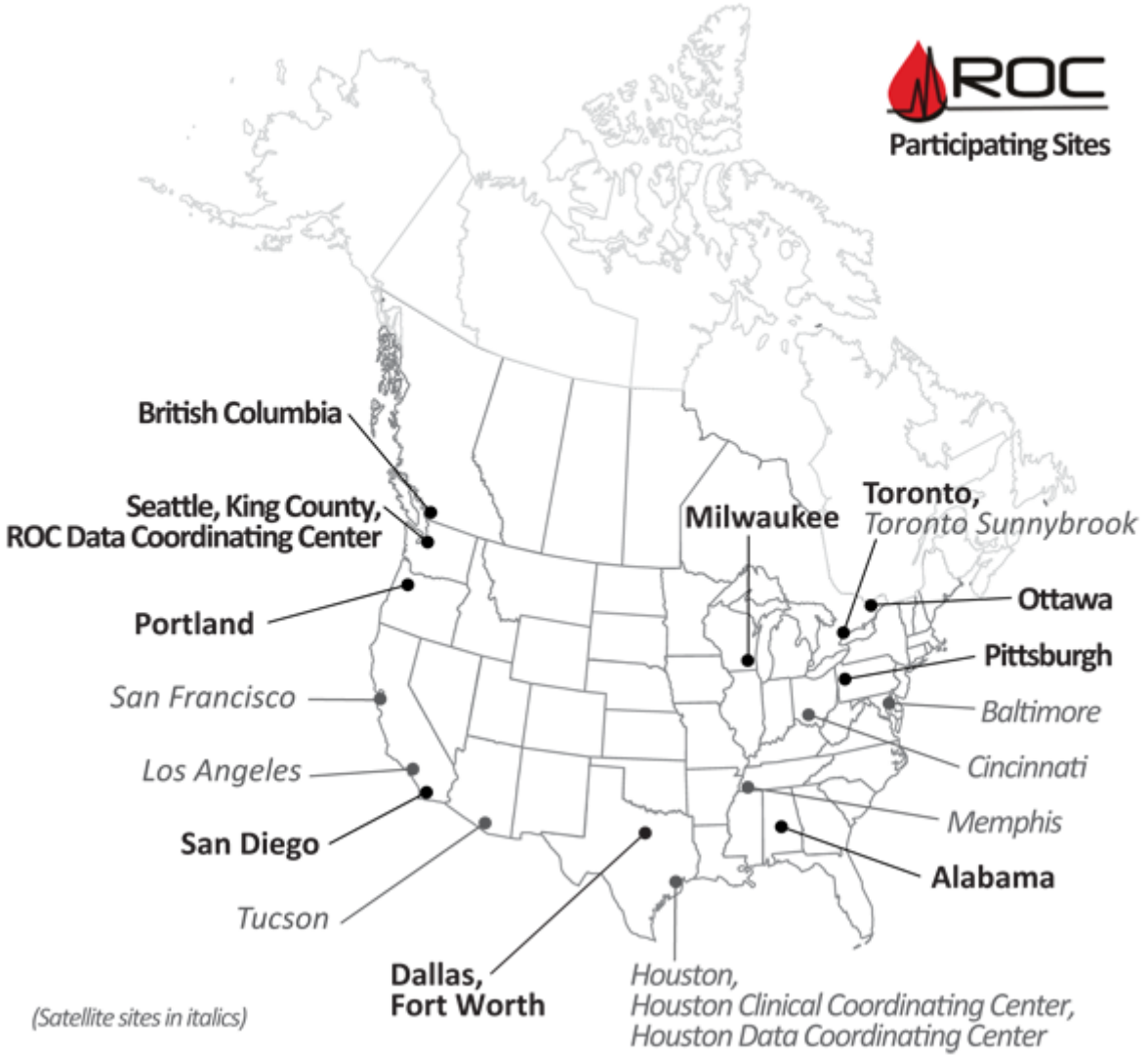
CIHR IRSC
Canadian Institutes of Health Research | Instituts de recherche en santé du Canada

HEART & STROKE FOUNDATION OF CANADA

DEFENCE R&D DÉFENSE
Defense R&D Canada

Participants

Participating Sites



Total population : 21,380,723

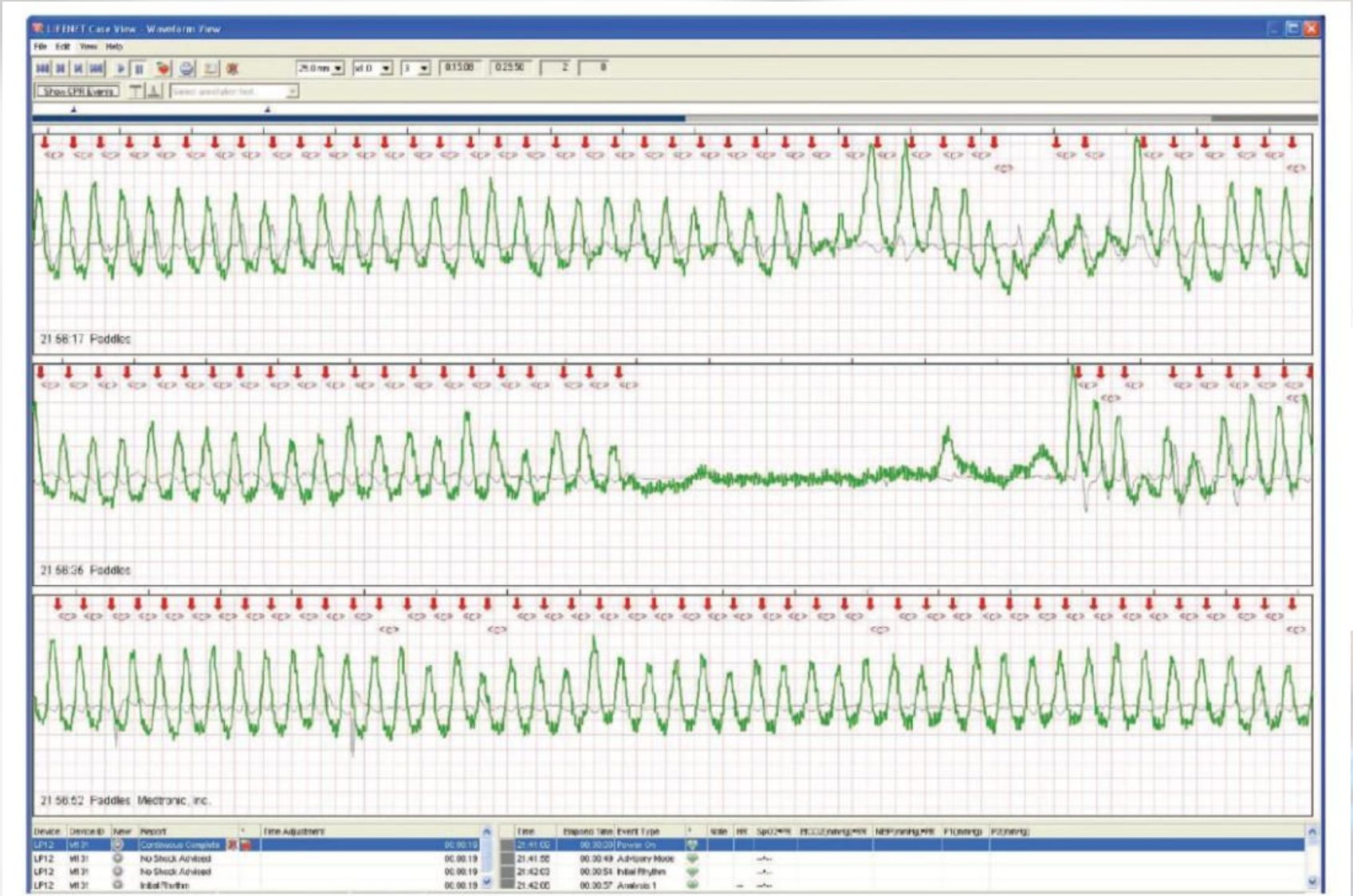


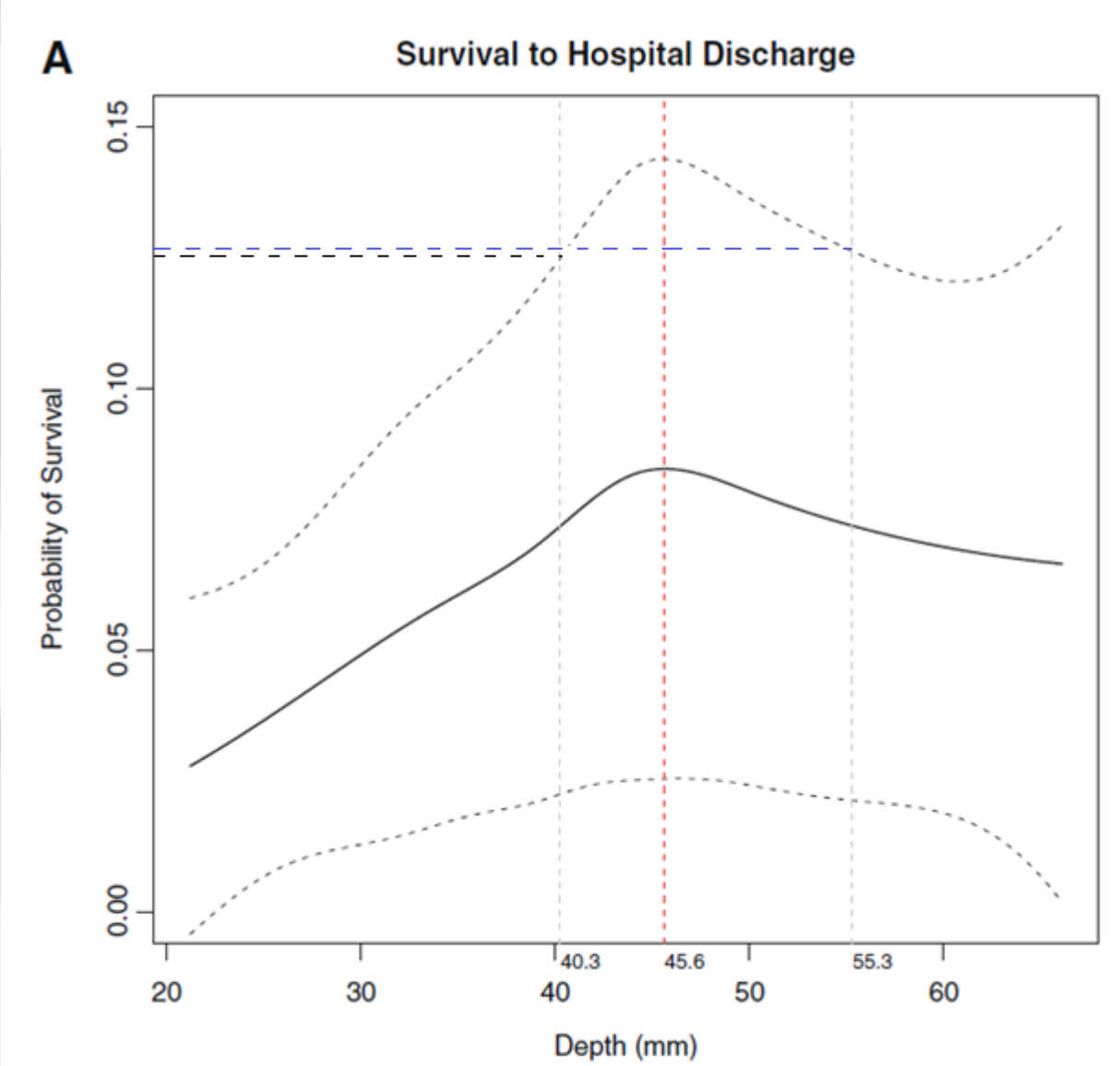
Figure 1. An example of an electronic recording from a monitor-defibrillator showing the electric channel (black line), the bioimpedance channel (green line), and red arrows marking each chest compression.

What Is the Optimal Chest Compression Depth During Out-of-Hospital Cardiac Arrest Resuscitation of Adult Patients?

Ian G. Stiell, MD; Siobhan P. Brown, PhD; Graham Nichol, MD; Sheldon Cheskes, MD; Christian Vaillancourt, MD; Clifton W. Callaway, MD; Laurie J. Morrison, MD; James Christenson, MD; Tom P. Aufderheide, MD; Daniel P. Davis, MD; Cliff Free, EMT-P; Dave Hostler, PhD; John A. Stouffer, EMT-P; Ahamed H. Idris, MD; and the Resuscitation Outcomes Consortium Investigators

- **Inclusion**:
  - Cardiac Arrest for whom electronic CPR compression depth data were available (Phillips, N=1869 and ZOLL, N=7246)
- **Exclusion**:
  - Whose arrests were EMS witnessed
  - Who received a shock from a bystander applied AED
  - Who had more than 5 minutes of CPR before the pads were applied
  - Whom at least one minute of electronic CPR compression depth data was not available

Stiell IG et al. Circulation 2014



May 2007 to Dec 2010

- Initial rhythms:
  - VF/VT 23.9%,
  - PEA 20.2%,
  - Asystole 49.4%
  - AED no shock,no strip 6.4%
  - Cannot determine/missing 0.2%
- Outcomes:
  - ROSC 31.3%,
  - 1-day survival 22.8%,
  - Discharge **7.3%**

Stiell IG et al. Circulation 2014

Rescuer's weight vs CPR quality

Hasegawa *et al. Journal of Physiological Anthropology* 2014, **33**:16
http://www.jphysiolanthropol.com/content/33/1/16

Journal of PHYSIOLOGICAL ANTHROPOLOGY

ORIGINAL ARTICLE Open Access

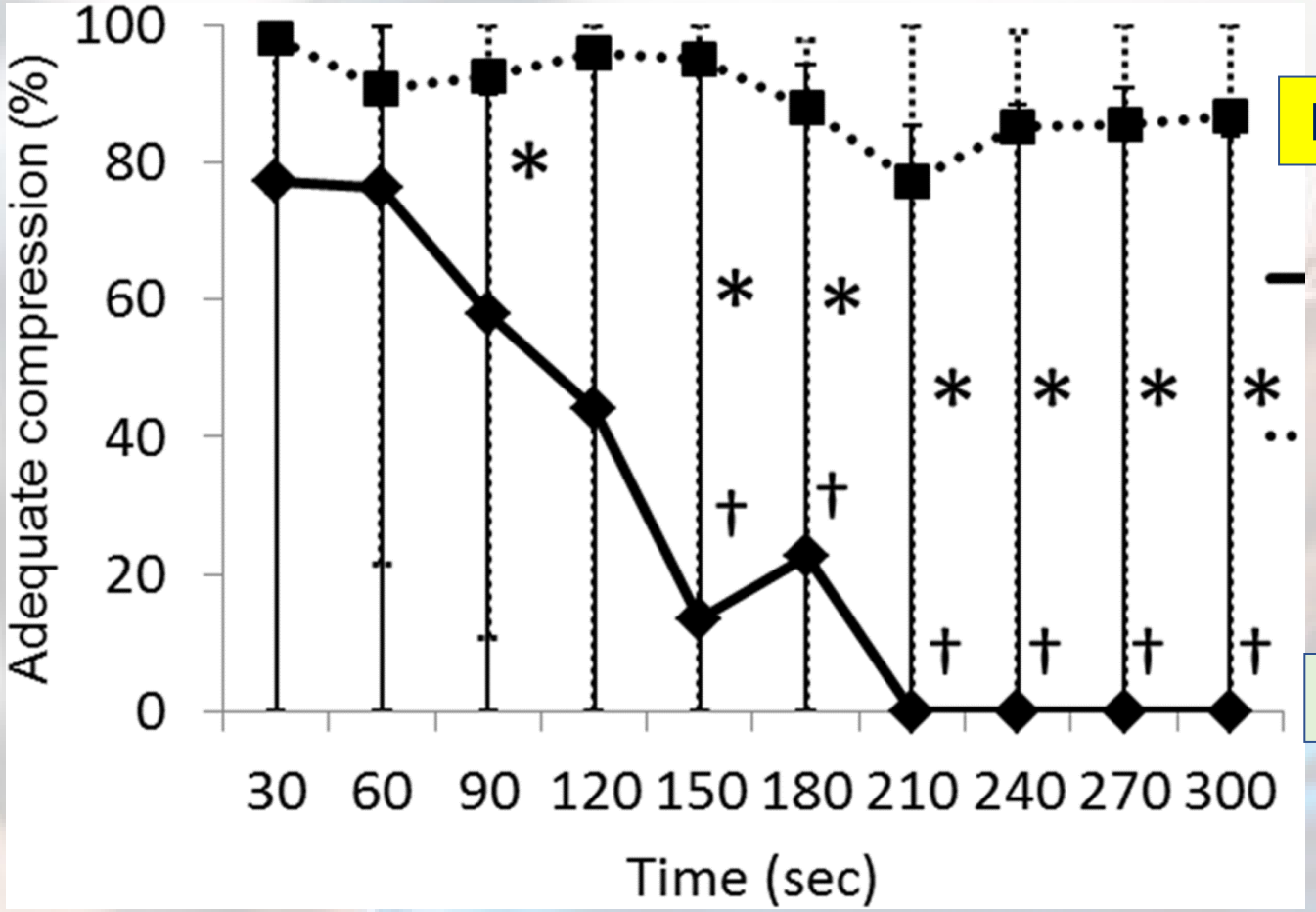
Relationship between weight of rescuer and quality of chest compression during cardiopulmonary resuscitation

Tomoyuki Hasegawa[1,2*], Rie Daikoku[1], Shin Saito[2] and Yayoi Saito[1]

- Female nurse in Japan
- Average body weight: only 53kg

Hasegawa et al. J Physiol Anthropol 2014;33:16

Practiced chest compression till compress consistently ≥ 5cm → rest 5min → chest compression 5min



Heavy weight

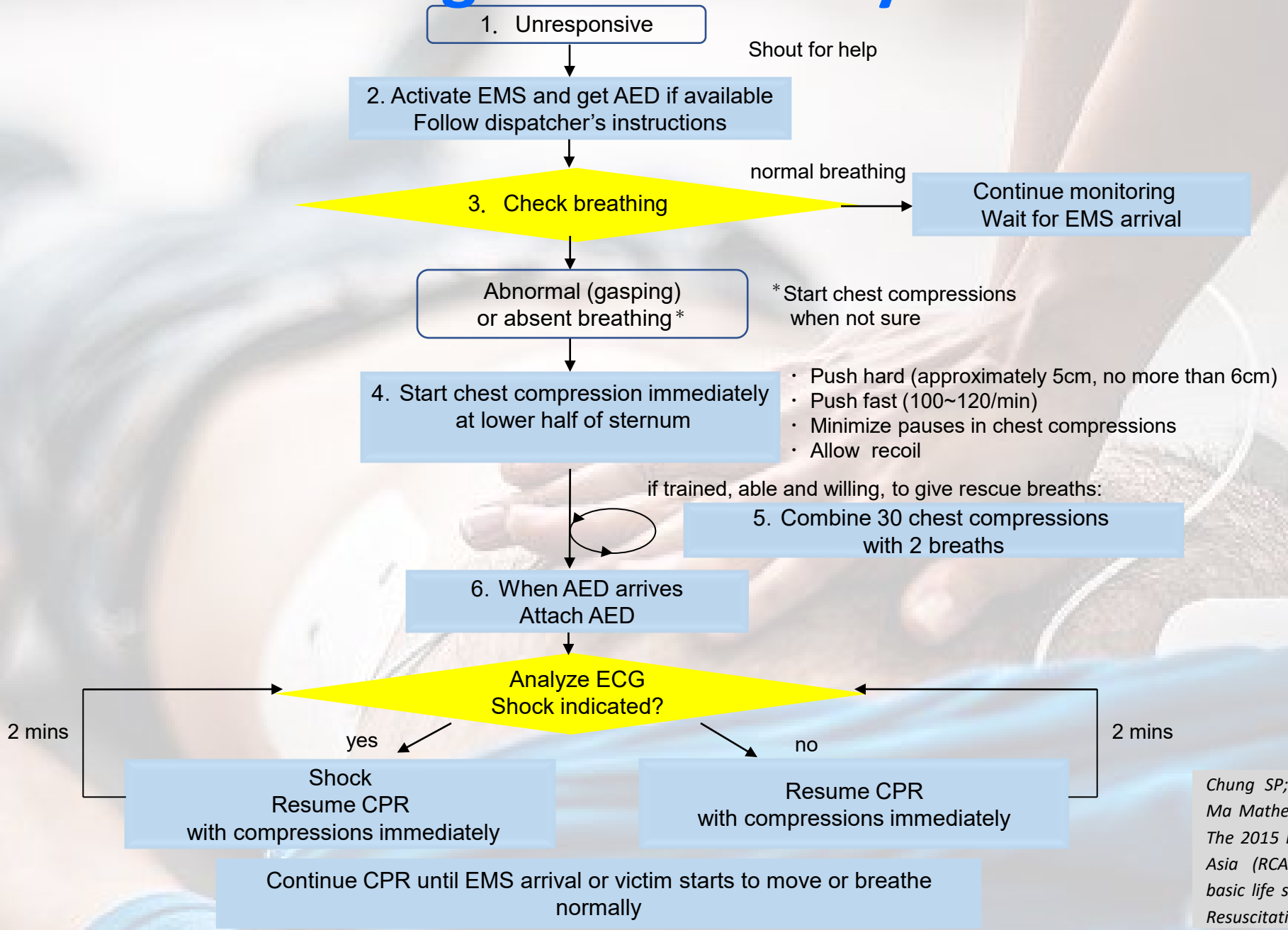
68.0 ± 7.5kg

Light weight

50.6 ± 6.5kg

Hasegawa et al. J Physiol Anthropol 2014;33:16

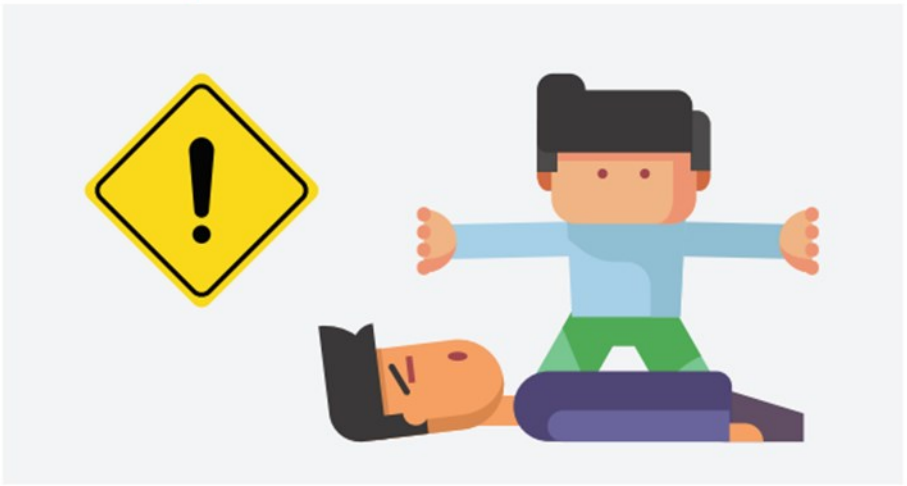
RCA Adult BLS algorithm for lay rescuers



Chung SP; Sakamoto T; Lim SH; Ma Mathew HM; Wang TL; et al. The 2015 Resuscitation Council of Asia (RCA) guidelines on adult basic life support for lay rescuers. Resuscitation 2016; 105:145-188

CPR and AED Use

1. Stay Safe



Move away from dangers such as roads, fires, falling objects, wet floor, etc.

D Check for **Danger**

R Check **Responsiveness**

S **Shout** "Help!"
Call 995 for SCDF and follow dispatcher's instruction **OR** activate the emergency response system (for in-facility/in-hospital cardiac arrest)

A
- ✓ If there is another person around, ask him/her to get the **AED**.
- ✓ If alone, **DO NOT** leave the casualty.

B **Check for normal Breathing and Pulse**
- ✓ Look for rise and fall of chest (not more than 10 seconds)
- ✓ If normal breathing (gasping is not normal breathing) is absent or unsure, start CPR.

Healthcare Provider only:
- ✓ *Check for carotid pulse as well.*

C **Expose the chest adequately**
Provide continuous Chest Compressions
- ✓ Lower half of sternum
- ✓ Depth: 4 – 6 cm
- ✓ Rate: 100 – 120 per min
- ✓ Allow complete chest recoil

Healthcare Provider only:
After 30 chest compressions
- ✓ *Head-Tilt, Chin-Lift*
- ✓ *Provide 2 Ventilations via BVM*
- ✓ *1 second per ventilation*
- ✓ *Tidal Volume 400 – 600ml or chest rises*

AED arrives

Check for AED Hazards:
- ➢ Wet surfaces
- ➢ Metallic surfaces
- ➢ Flammable gases nearby

- ✓ **Continue CPR**
- ✓ **Turn on the AED**
- ✓ **Ensure chest is bare and dry**
- ✓ **Apply pads as printed on the AED pads**

Stay clear when AED is analysing the heart rhythm

Shock advised ?

Yes → Stay clear and apply Shock

No → *AED re-analyses every **2** minutes*

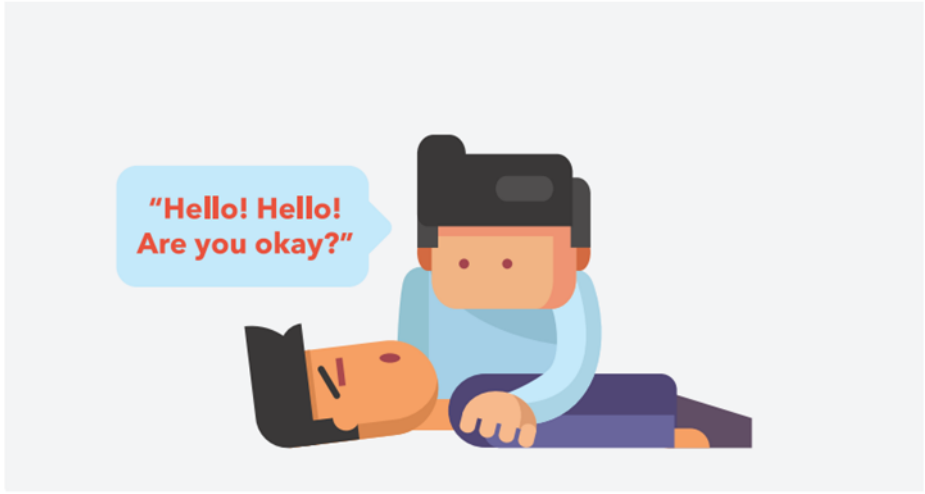
CPR

Continue CPR until:
- ✓ Paramedic or in-facility/hospital emergency response team takes over from rescuer.
- ✓ Casualty wakes up or regains normal breathing.

Notes:
1. If you are a single rescuer and feeling tired, you may take a rest of not more than 10 seconds (preferably after 100 continuous compressions).
2. For Healthcare Provider only: If no BVM is available and you are unable or unwilling to do mouth-to-mouth ventilations, perform continuous chest compressions.

CPR and AED Use

2. Tap and Shout



Tap the shoulders to check for response.
If unresponsive, get help!

D Check for **Danger**

R Check **Responsiveness**

S **Shout** "Help!"
Call 995 for SCDF and follow dispatcher's instruction **OR** activate the emergency response system (for in-facility/in-hospital cardiac arrest)

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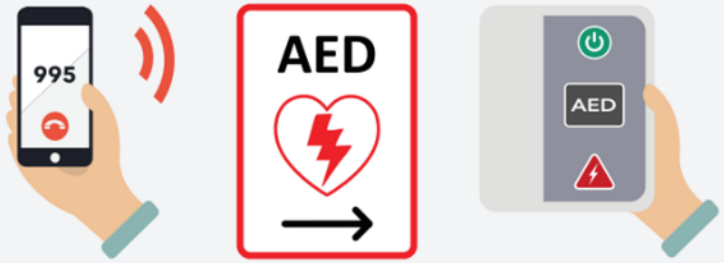
CPR and AED Use

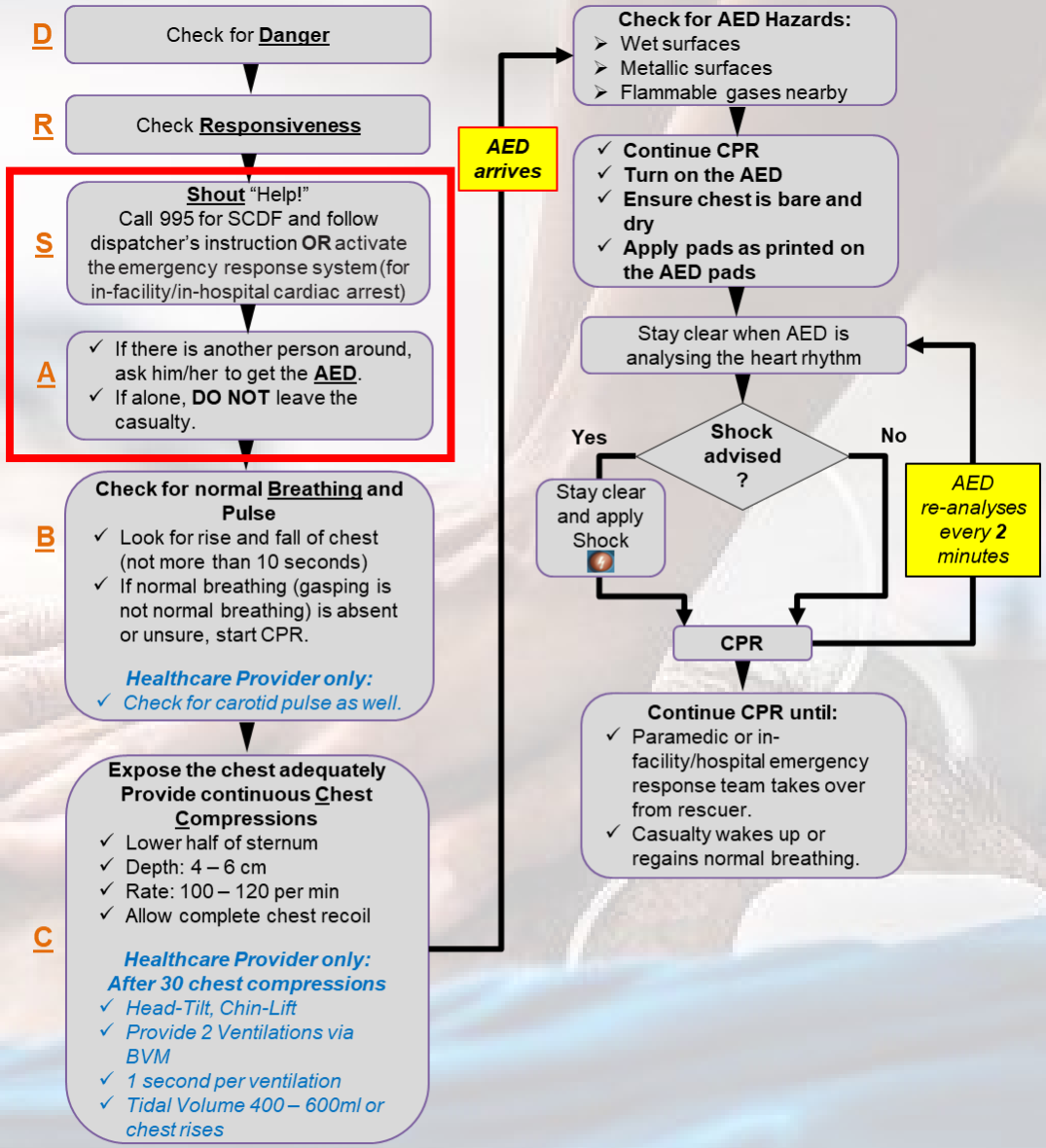
3. Call 995 and get AED

Activate the speaker mode of the phone and follow the dispatcher's instruction



* Singapore Civil Defence Force

Call 995 for SCDF* and stay on the line;
get an AED (if nearby and visible) to the casualty.



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CPR and AED Use

4. Check for Breathing

Look for normal breathing

If breathing is absent, abnormal or unsure, start chest compression and use the AED. (See steps 5 & 6)

D Check for **Danger**

R Check **Responsiveness**

S **Shout** "Help!"
Call 995 for SCDF and follow dispatcher's instruction **OR** activate the emergency response system (for in-facility/in-hospital cardiac arrest)

A
- ✓ If there is another person around, ask him/her to get the **AED**.
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- ✓ *Provide 2 Ventilations via BVM*
- ✓ *1 second per ventilation*
- ✓ *Tidal Volume 400 – 600ml or chest rises*

AED arrives

Check for AED Hazards:
- ➢ Wet surfaces
- ➢ Metallic surfaces
- ➢ Flammable gases nearby

Continue CPR
- ✓ **Turn on the AED**
- ✓ **Ensure chest is bare and dry**
- ✓ **Apply pads as printed on the AED pads**

Stay clear when AED is analysing the heart rhythm

Shock advised ?

Yes → Stay clear and apply Shock

No → *AED re-analyses every **2** minutes*

CPR

Continue CPR until:
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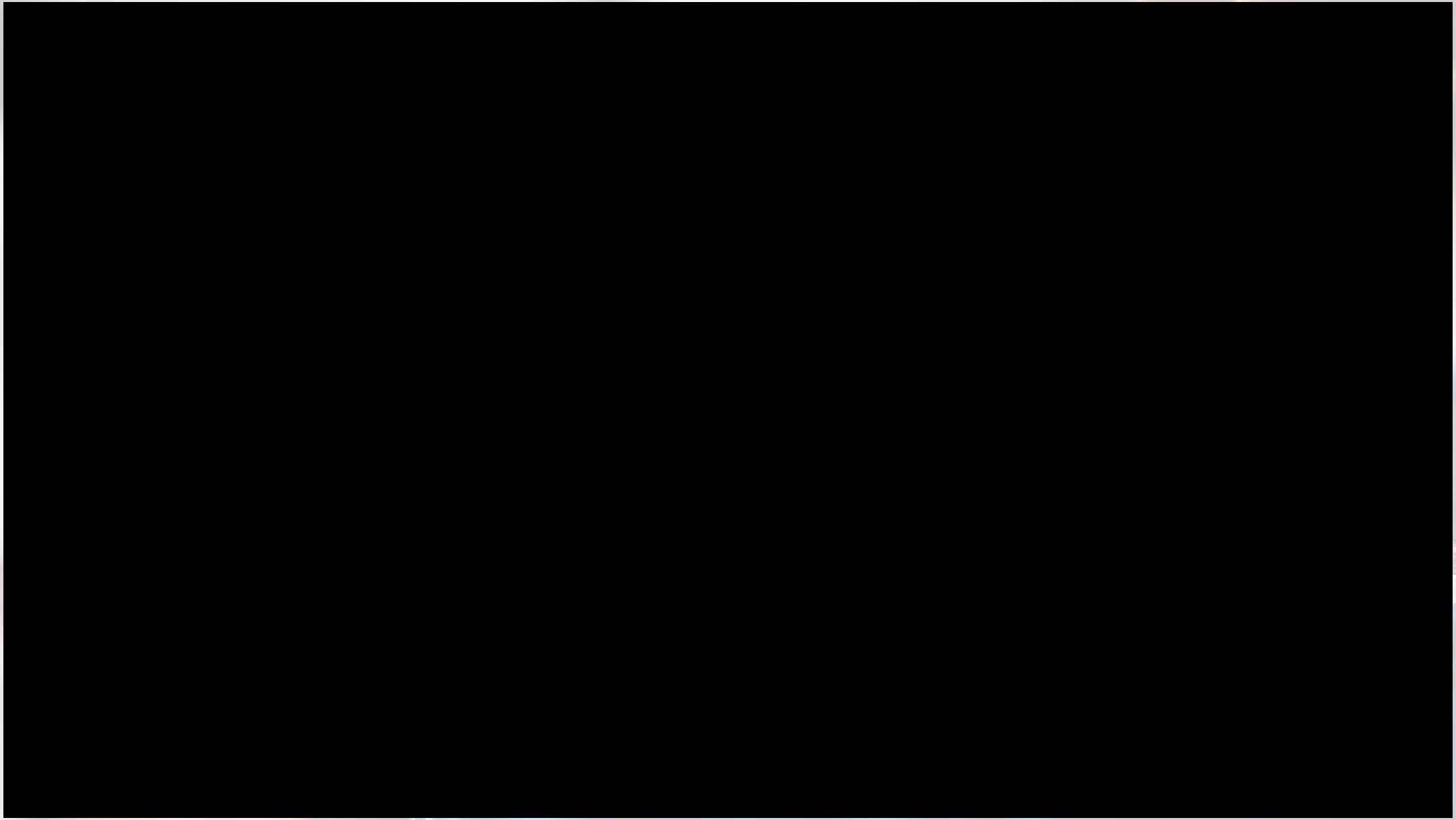
2. For Healthcare Provider only: If no BVM is available and you are unable or unwilling to do mouth-to-mouth ventilations, perform continuous chest compressions.

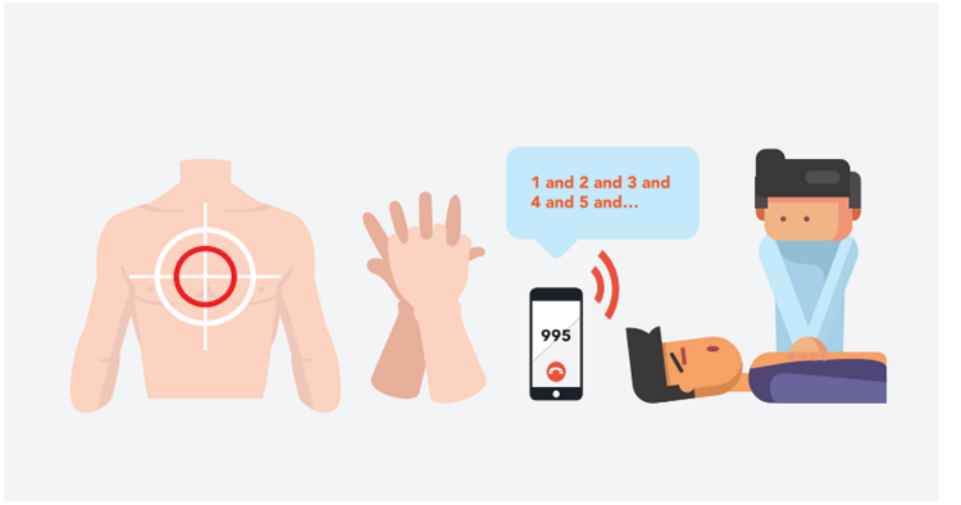
Full video can be found at https://srfac.sg/videos/ or https://youtu.be/T85vd3CBs04

Full video can be found at https://srfac.sg/videos/ or https://youtu.be/fx0fWq3-oDY

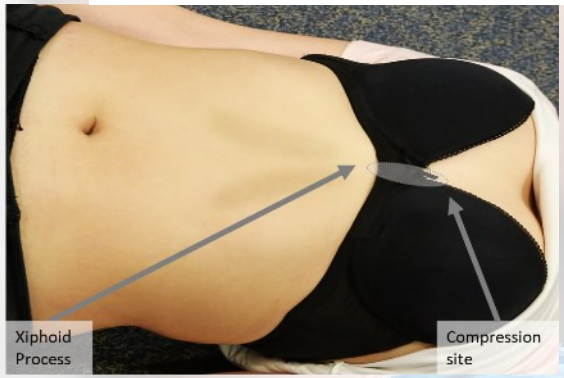


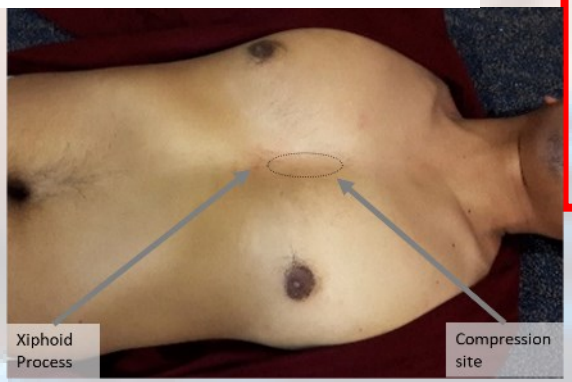
CPR and AED Use

5. Start Chest Compression



Push hard and fast at the centre of the chest.
If unsure, follow 995 SCDF specialist's guidance.





D Check for **Danger**

R Check **Responsiveness**

S **Shout** "Help!"
Call 995 for SCDF and follow dispatcher's instruction **OR** activate the emergency response system (for in-facility/in-hospital cardiac arrest)

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- ✓ If there is another person around, ask him/her to get the **AED**.
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- ➢ Flammable gases nearby

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Continue CPR until:
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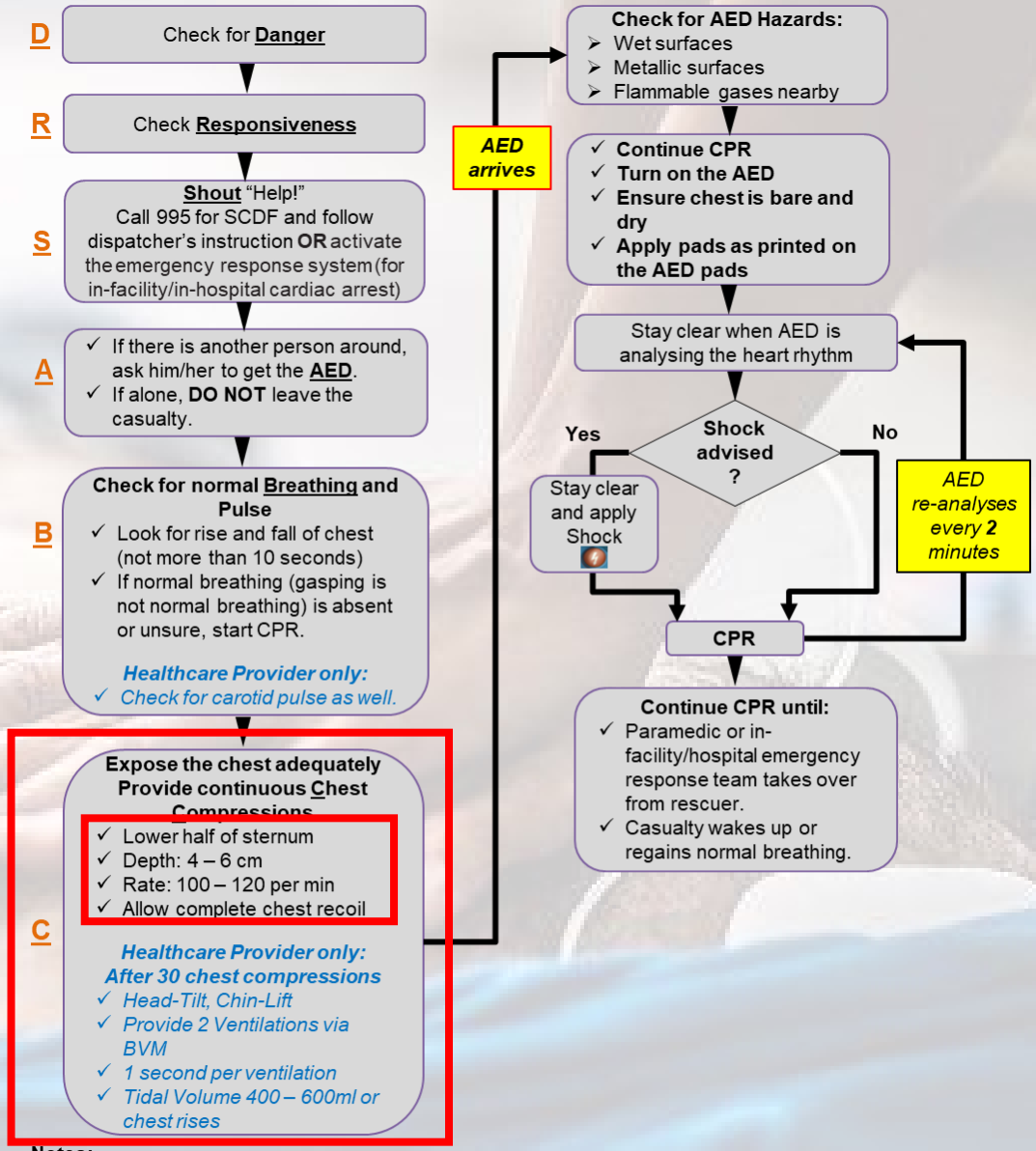
- ✓ Casualty wakes up or regains normal breathing.

Notes:
1. If you are a single rescuer and feeling tired, you may take a rest of not more than 10 seconds (preferably after 100 continuous compressions).
2. For Healthcare Provider only: If no BVM is available and you are unable or unwilling to do mouth-to-mouth ventilations, perform continuous chest compressions.

CPR and AED Use

- Perform head-tilt-chin-lift and provide two ventilations (via BVM, one second per breath, tidal volume 400–600 mL or just enough to produce chest rise) after every 30 chest compressions.
- If BVM is not available, and the healthcare provider is trained, able and willing to provide MTM ventilation, he or she may proceed with MTM ventilations.
- Otherwise, **perform continuous chest compressions at a rate of 100-120 per minute**.
- If tired, the rescuer may take up to ten seconds of rest every 100 chest compressions.



Notes:

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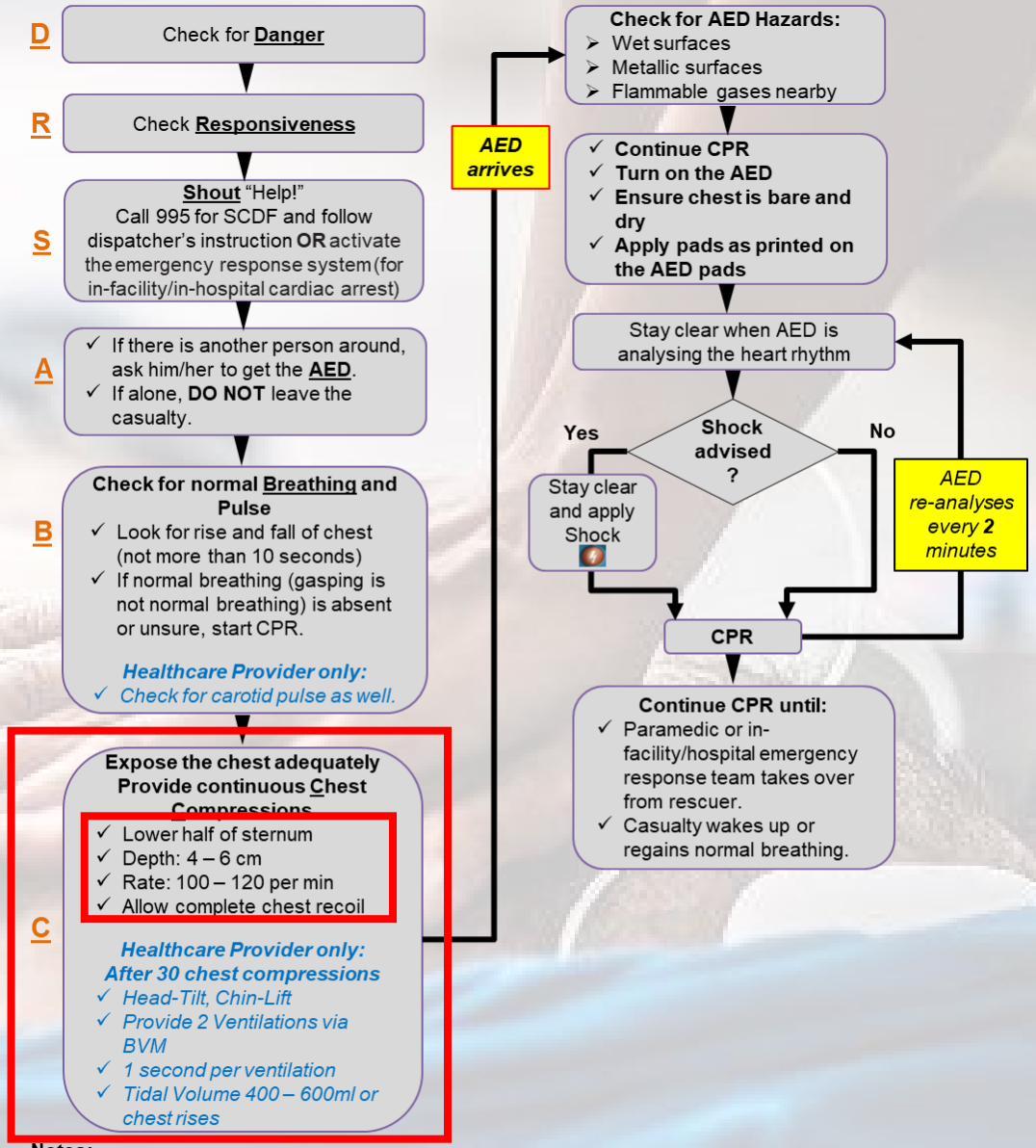
2. For Healthcare Provider only: If no BVM is available and you are unable or unwilling to do mouth-to-mouth ventilations, perform continuous chest compressions.

CPR and AED Use

- BVM ventilations to be administered **at the side of the casualty** to minimise interruptions to chest compressions **during single-rescuer CPR**.

Picture cropped and edited from Nasiri et al. A comparison between over-the-head and lateral cardiopulmonary resuscitation with a single rescuer by bag-valve mask. Saudi J Anaesth. 2014 Jan-Mar; 8(1): 30–37



Notes:

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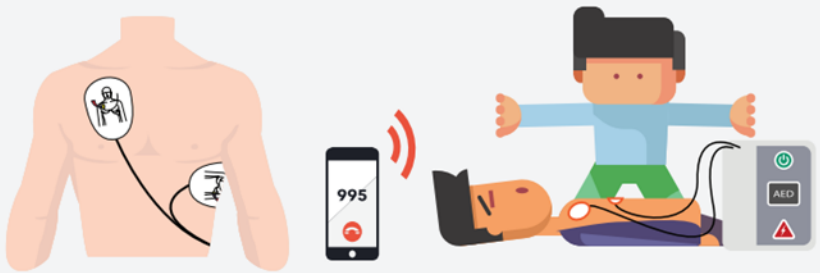
2. For Healthcare Provider only: If no BVM is available and you are unable or unwilling to do mouth-to-mouth ventilations, perform continuous chest compressions.

CPR and AED Use

6. Use the AED



Turn it on, attach the AED pads and follow AED instructions until SCDF officers arrive.

D Check for **Danger**

R Check **Responsiveness**

S **Shout** "Help!"
Call 995 for SCDF and follow dispatcher's instruction **OR** activate the emergency response system (for in-facility/in-hospital cardiac arrest)

A
- ✓ If there is another person around, ask him/her to get the **AED**.
- ✓ If alone, **DO NOT** leave the casualty.

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- ✓ Look for rise and fall of chest (not more than 10 seconds)
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- ✓ *Provide 2 Ventilations via BVM*
- ✓ *1 second per ventilation*
- ✓ *Tidal Volume 400 – 600ml or chest rises*

Check for AED Hazards:
- ➢ Wet surfaces
- ➢ Metallic surfaces
- ➢ Flammable gases nearby

- ✓ **Continue CPR**
- ✓ **Turn on the AED**
- ✓ **Ensure chest is bare and dry**
- ✓ **Apply pads as printed on the AED pads**

Stay clear when AED is analysing the heart rhythm

Shock advised ?

Yes → Stay clear and apply Shock

No → *AED re-analyses every **2** minutes*

AED arrives

CPR

Continue CPR until:
- ✓ Paramedic or in-facility/hospital emergency response team takes over from rescuer.
- ✓ Casualty wakes up or regains normal breathing.

Notes:
1. If you are a single rescuer and feeling tired, you may take a rest of not more than 10 seconds (preferably after 100 continuous compressions).
2. For Healthcare Provider only: If no BVM is available and you are unable or unwilling to do mouth-to-mouth ventilations, perform continuous chest compressions.

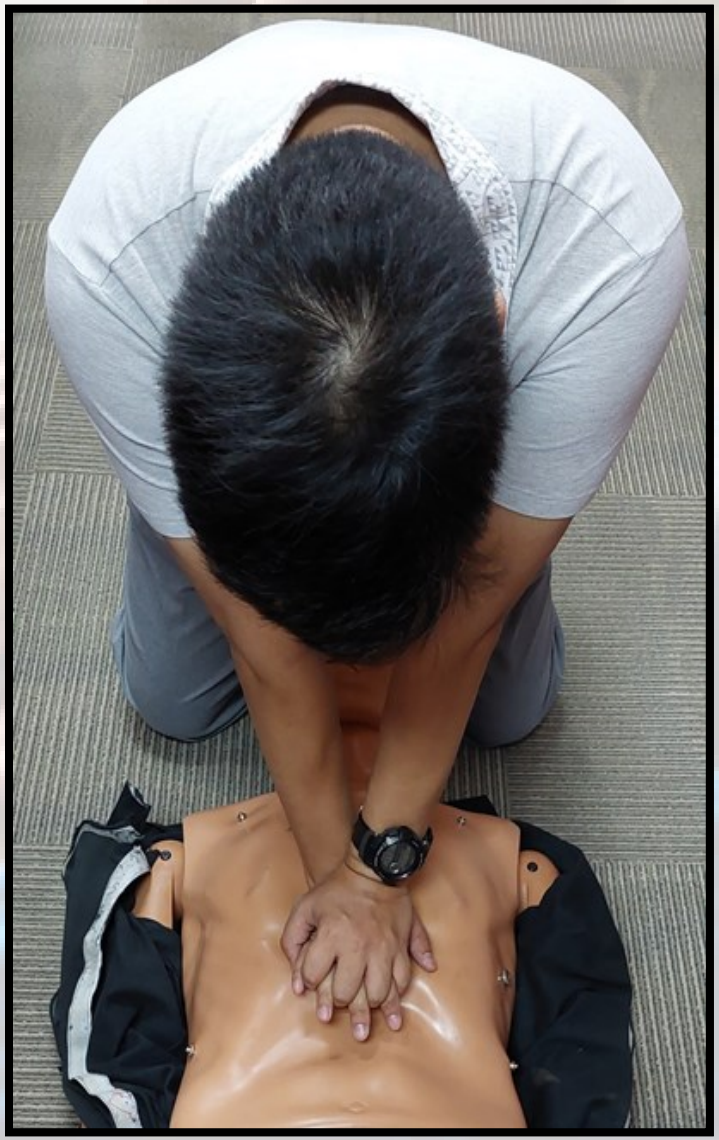
CPR summary for cardiac arrests		Adult and Adolescent >12 yrs	Child (1-12yrs)	Infant (< 1yr)
D	Check for danger	Ensure rescue scene is safe.		
R	Check for responsiveness	Tap the casualty' shoulders to get a response.		Tap the casualty' shoulders and the infant's feet to get a response.
S	Shout for help	Shout for help and call ambulance 995 and put on speaker phone mode and follow dispatcher's instructions **and/or** activate in-facility/in-hospital emergency response system.		
A	Get an AED*	Send someone to get an AED if there is one within a 60-second walking distance. If you are the lone rescuer, do not leave the casualty.		
B	Check for Breathing (Recognition of Cardiac Arrest)	Look for normal breathing (If not breathing, gasping / agonal breathing) – Proceed to step C		
		Pulse check performed by Healthcare Providers: no definite pulse within 10s – Proceed to step C (Adult/Child: Carotid)		Pulse check performed by Healthcare Providers: no definite pulse within 10s or pulse rate <60/min – Proceed to step C (Infant: Brachial)
C	Compression landmarks	Lower half of sternum		Lower half of sternum (1 finger's breadth immediately below inter-mammary line)
	Compression method	Heel of 1 hand with other hand on top		2 thumb encircling hands (or ring and middle fingers for lay rescuers)
	Compression depth (Push hard with Full recoil)	4 to 6 cm	4 to 5 cm	3 to 4cm
	Compression rate	100-120/min		
Compression-ventilation ratio - Rescuers who are trained, willing and able to provide MTM† ventilations		30:2 (1 or ≥2 rescuers) 1 second per ventilation – observe for chest rise		
- Healthcare Providers (using BVM‡)		30:2 (1 or 2 rescuers)	30:2 (1 rescuer), 15:2 (≥2 rescuers)	
- Untrained, unable or unwilling to perform ventilations		Continuous high-quality chest compressions		
Rescue Breathing		1 ventilation every 5 seconds (12/min)	1 ventilation every 3 seconds (20/min)	1 ventilation per 2 seconds (30/min)
Use of AED		Use adult defibrillation pads	Under 25kg, use child defibrillation pads if available	Manual defibrillators preferred but if unavailable, use child pads

**AED: Automated External Defibrillator*

†MTM: Mouth-To-Mouth

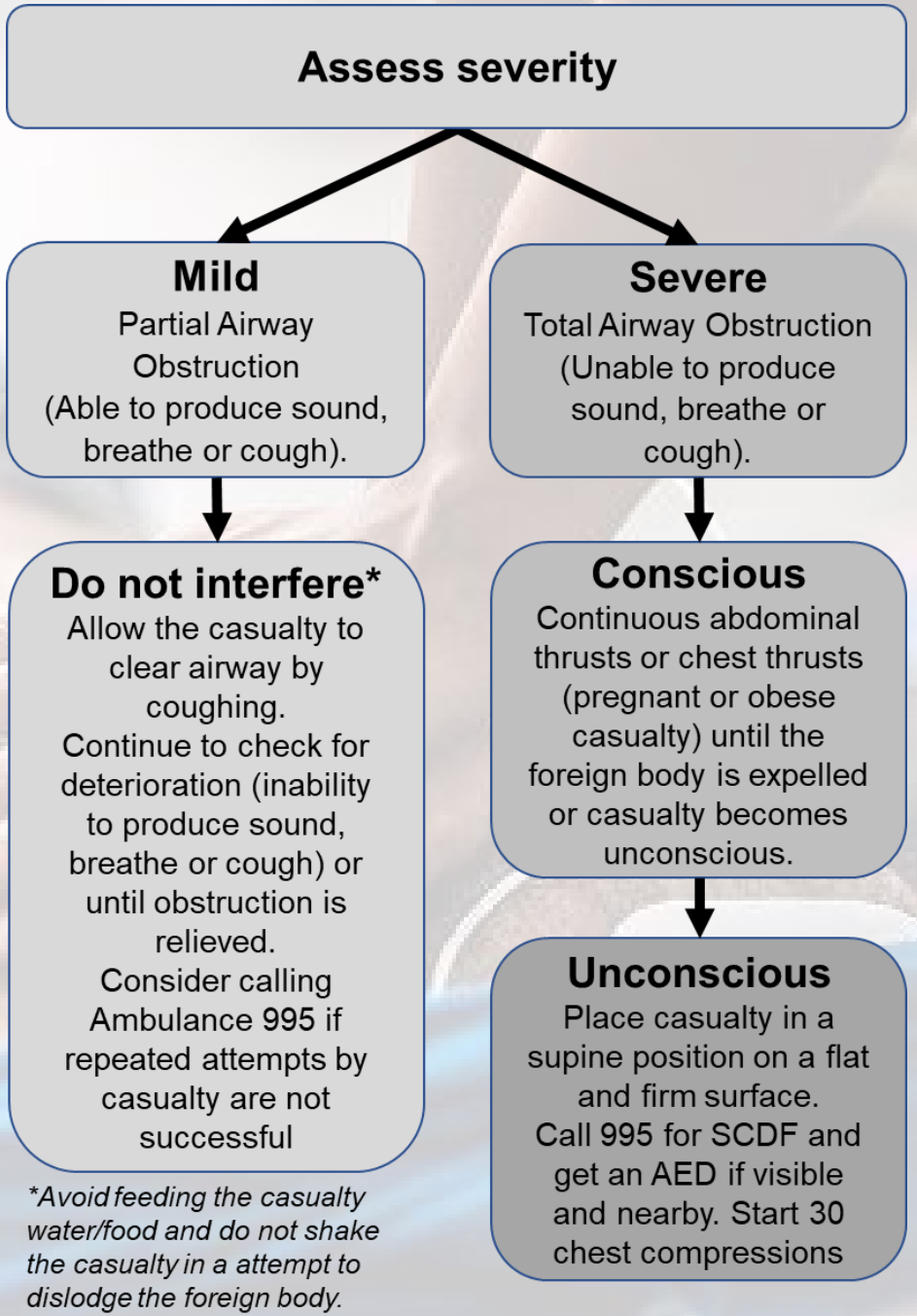
‡BVM: Bag Valve Mask

CPR in Special Settings



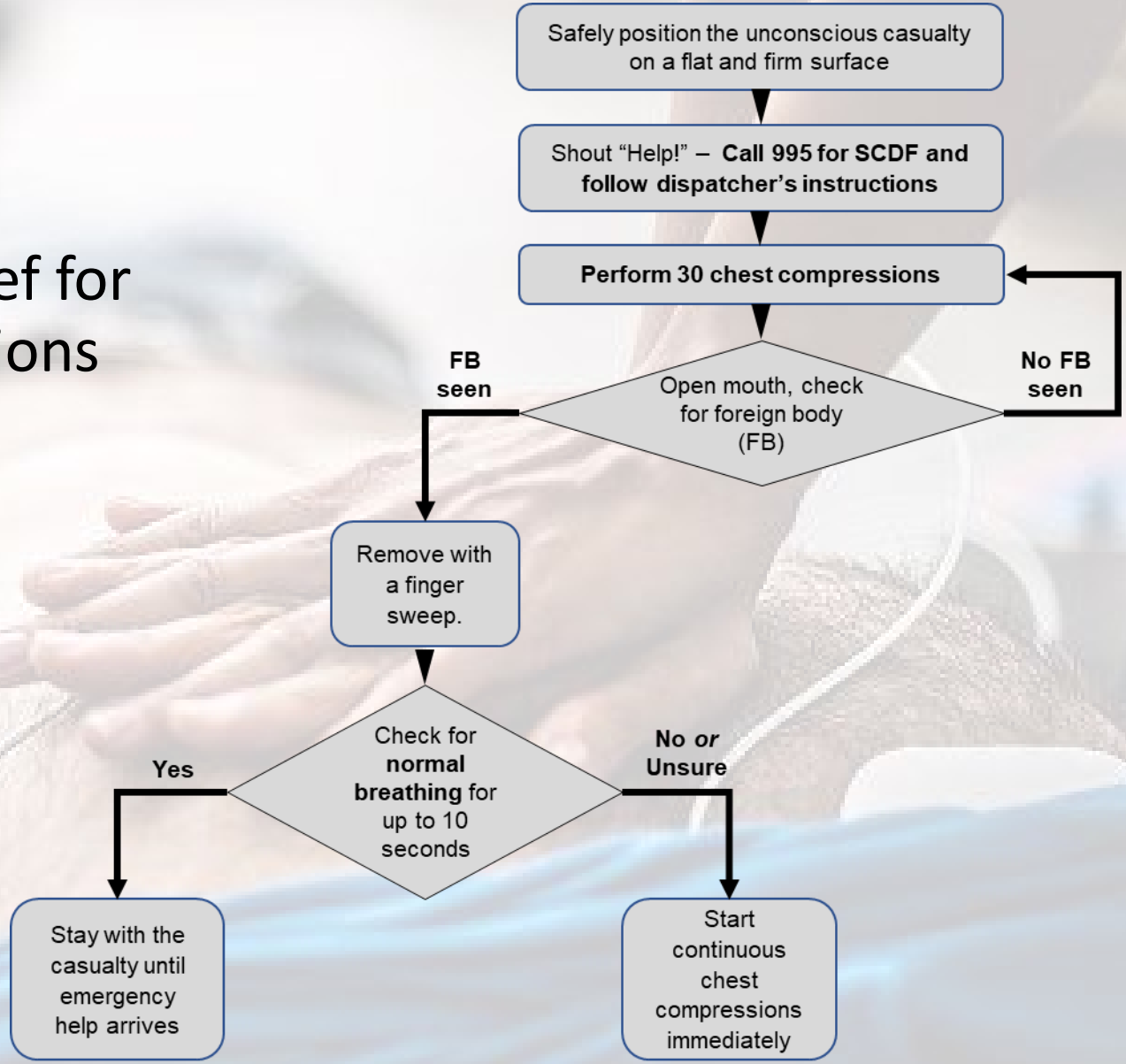
Foreign Body Airway Obstruction (FBAO)

- **Previously:** perform **5** abdominal thrusts or **5** chest thrusts (pregnant or obese casualty) and continue until foreign body is expelled or casualty becomes unconscious.
- **Revised:** perform **continuous** abdominal thrusts or chest thrusts (pregnant or obese casualty) and continue until foreign body is expelled or casualty becomes unconscious.



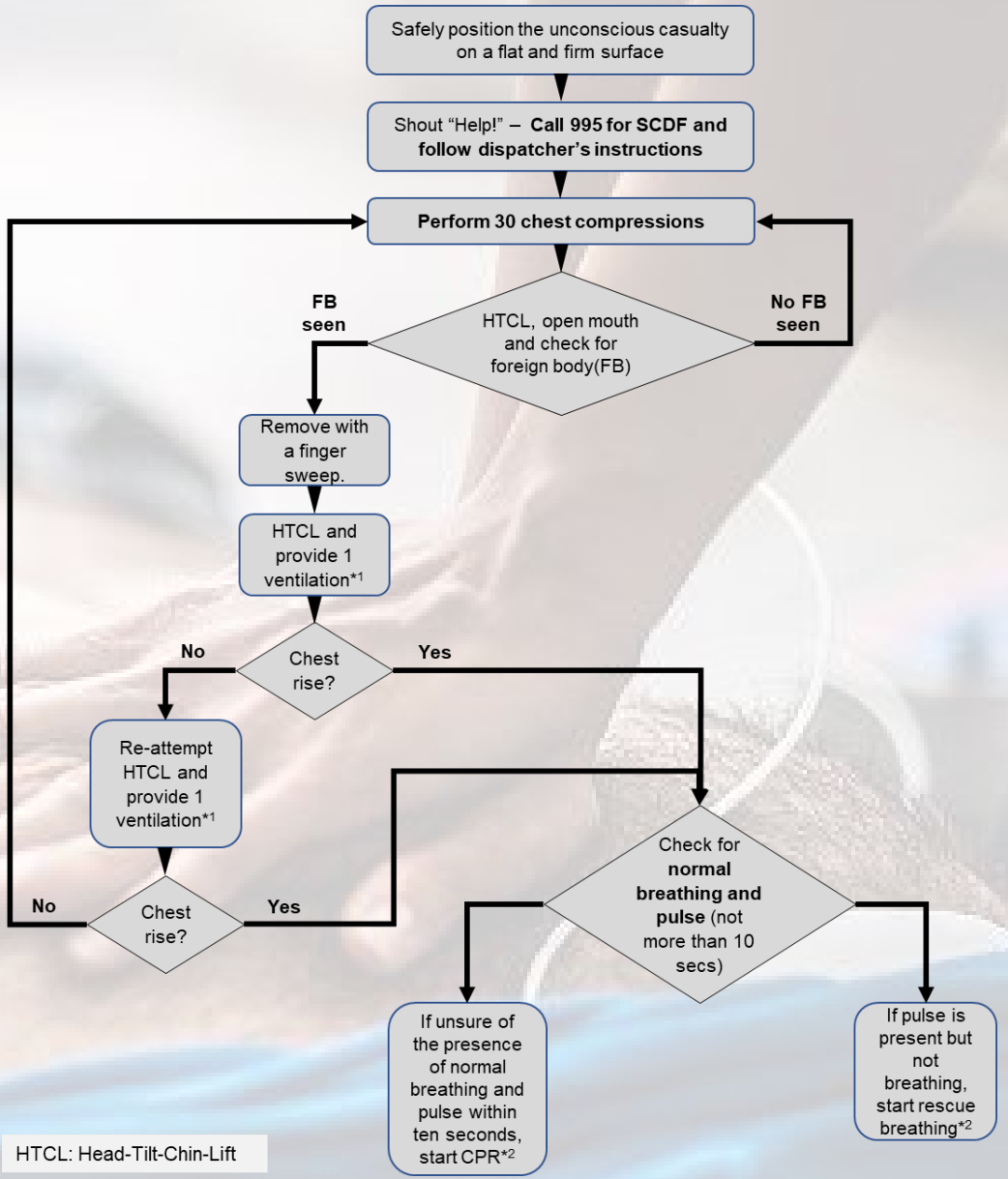
Foreign Body Airway Obstruction (FBAO)

- **New:** Unconscious FBAO relief for lay-rescuers without ventilations



Foreign Body Airway Obstruction (FBAO)

- **Revised:** Unconscious FBAO relief for healthcare providers with ventilations



Note:

1) For Healthcare Providers, provide ventilations via a Bag-Valve-Mask (BVM). If there is no BVM available and you are unable or unwilling to do mouth-to-mouth ventilations for any reason, check for normal breathing and pulse for not more than 10 seconds.
2) If no BVM is available and you are unable or unwilling to do mouth-to-mouth ventilations, perform continuous chest compressions. If you are a single rescuer and feeling tired, you may take a rest of not more than 10 seconds (preferably after 100 compressions).

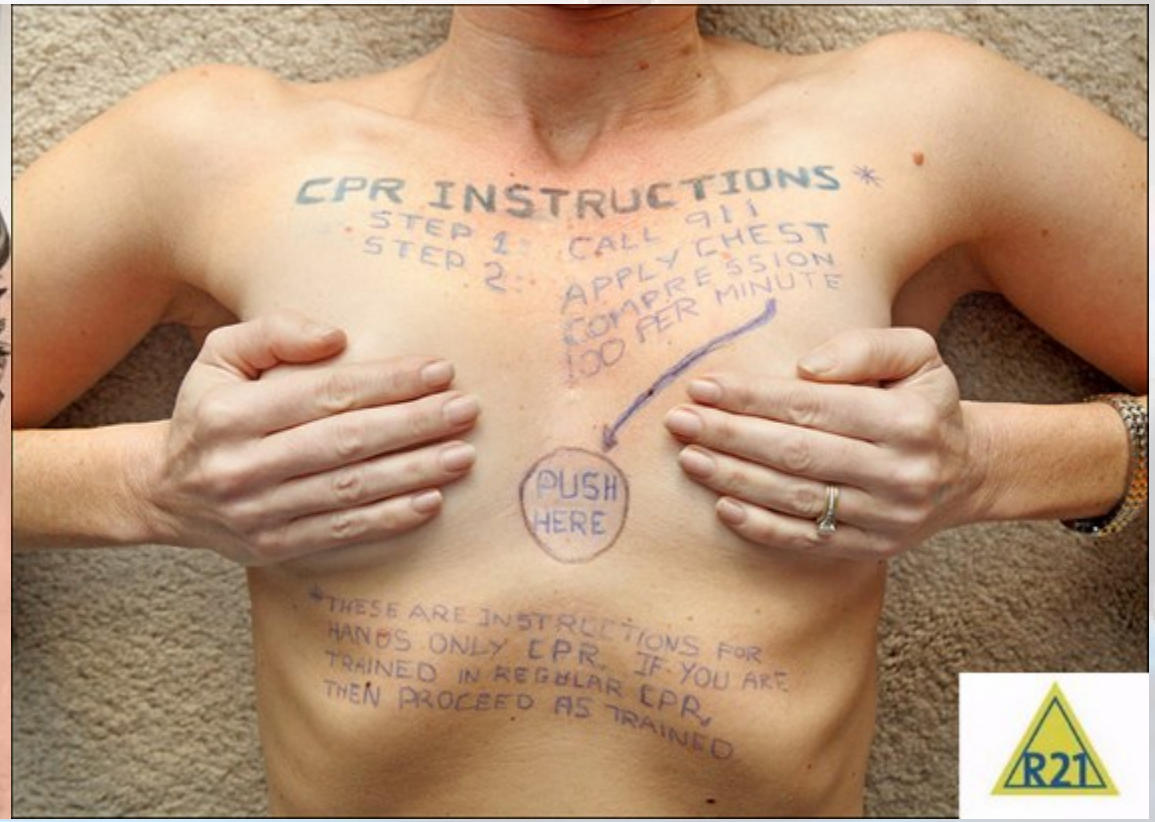
Recovery Position is no longer recommended

- **Revised:** SRFAC ***no longer recommends placing of cardiac arrest casualties with Return of Spontaneous Circulation (ROSC)*** in the recovery position due to concerns that it ***may hinder the detection of subsequent cardiac arrest*** prior to the arrival of the Emergency Medical Services (EMS). Recovery position ***should be reserved for unresponsive casualties with spontaneous breathing, who are affected by conditions that are non-cardiac arrest in nature***, such as stroke, hypoglycaemia or fainting. Recovery position will be covered in First Aid.

Singapore BCLS+AED Guidelines 2021

- No major changes to how CPR is performed or how AED is used.
- Minor revisions to the algorithm for Foreign Body Airway Obstruction (FBAO).
- Recovery Position no longer recommended for Sudden Cardiac Arrest (SCA) casualties with Return of Spontaneous Circulation (ROSC) in an out-of-hospital context.
- The current guidelines continue to emphasize:
  a) Casualty with gasping (no normal breathing) should be treated as in cardiac arrest.
  b) Importance of calling 995 early. SCDF dispatchers can guide the caller in recognizing cardiac arrest as well as give instructions for chest compression. SCDF dispatchers will activate volunteer lay-rescuers in the vicinity to bring a nearby AED to the scene and/or help with the CPR.
  c) Importance of high-quality CPR. In OHCA, the engagement of the community is vital. Hands-only CPR can improve the take-up rate, quality, retention of chest compression skill among the lay rescuers.

Knowledge Gap




Thank you for your attention
Stay safe and stay healthy