EMERGENCY

Boussignac Cardiac Arrest Resuscitation Device

VYGON

Value Life

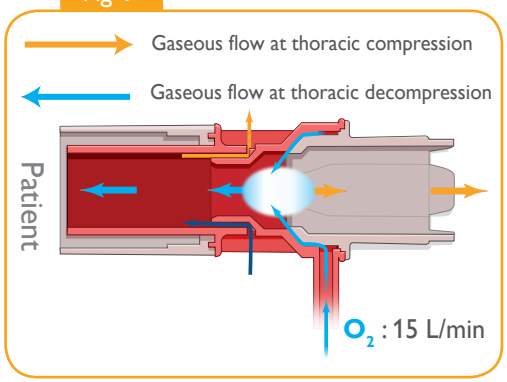
What is b-card?

b-**card** "Boussignac Cardiac Arrest Resuscitation Device" has been designed specifically for the treatment of cardiac arrest.
b-**card** works by facilitating Alveoli Ventilation via Continuous Chest Compression* (AV-CCC), improving haemodynamics and ventilation.
With b-**card** your hands become the ventilator so there is no need for BVM ventilation. As a consequence there is no requirement to stop chest compressions.
b-**card** can be used by a first responder via a face mask and Guedel airway, or by a clinical specialist via a supraglottic device or endotracheal tube.
b-**card** can be used irrespective of whether chest compressions are performed manually or mechanically (via automated mechanical chest compression device).

What is AV-CCC?

At a gas flow (Oxygen) of 15l/min, turbulence is created in b-**card**, which controls the exit and entry of gas from the respiratory tract and lungs. This control effect created via oxygen flow, generates static lung pressure (5 to 8cmH_2O) which is then transmitted to the airway and alveolar system.

Fig 1



Improved Ventilation

During chest compressions, this static lung pressure becomes dynamic and the gases in the alveoli are then circulated and exchanged, Functional Residual Capacity (FRC) is preserved, alveolar collapse is avoided and ventilation occurs.

Improved Haemodynamics

During the thoracic compression phase of chest compressions, b-**card** controls the exit of gas from the respiratory tract, thus optimising the transmission of energy from chest compressions to the circulatory system. This energy transmission creates greater** intra-thoracic pressure and thus improved haemodynamics. During the thoracic decompression phase of chest compressions, b-**card** controls the entry of gas to the respiratory tract thus generating greater** negative intra-thoracic pressure which improves venous return.

Physiology

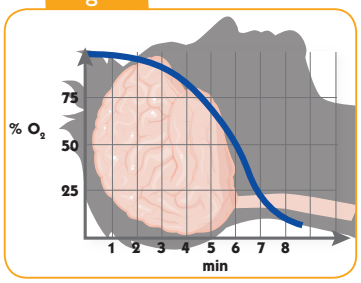
Normal Physiology:

During synchronized heart beat and respiration, the chambers of the heart contract and relax sequentially to move blood to the lungs for gaseous exchange and then back to the heart and around the body. During breathing, expiration is a passive process while inspiration is an active process by which air is drawn into the lungs via the creation of negative intra-thoracic pressure by the action of two sets of muscles: the diaphragm and the intercostal muscles [(1)]. This negative intra-thoracic pressure aids venous return to the right side of the heart. This action of priming the heart with blood is important in terms of the volume of blood that is then ejected from the left side.

* "chest compressions" are defined as the generally accepted term meaning both the thoracic compression and decompression phases of CPR.

**Compared to chest compressions with no control effect

Fig 2



Oxygenation becomes critical after 3 to 5 minutes of CPR without ventilation.

Physiology during untreated cardiac arrest:

When cardiac arrest occurs, the most common cardiac arrhythmia is ventricular fibrillation (VF). Due to the non-viable nature of VF, there is no cardiac output and haemodynamic. As a result: blood pressure is zero, there is no gaseous exchange in the lungs and the brain and the vital organs receive no life sustaining oxygen and nutrients. Brain death usually occurs after 3 to 5 minutes (this excludes very low body temperature scenarios such as cold water immersion/hypothermia). (See fig 2)

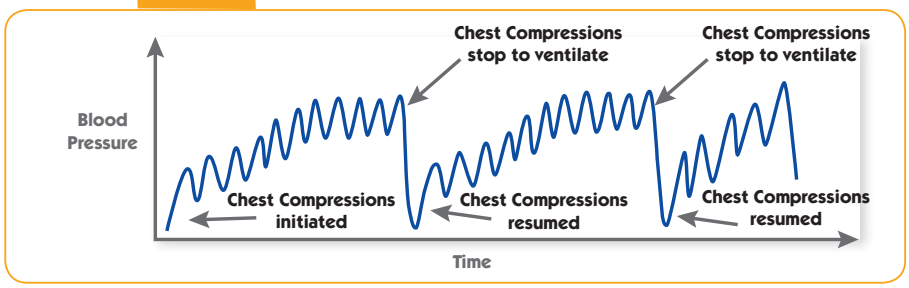
Physiology during CPR:

CPR improves the physiological status of the patient compared to untreated cardiac arrest, however, it is much less haemodynamically effective than the normal physiology.

A pause in the chest compressions causes the coronary perfusion pressure to fall substantially. On resuming compressions, there is some delay before the original coronary perfusion pressure is restored, thus chest compressions that are not interrupted for ventilation (or any reason) result in a substantially higher mean coronary perfusion pressure[2].

These periods of 'No Blood Flow' during ventilation phases, although transient, result in an absence of vital oxygen and nutrients reaching the brain. (See fig 3)

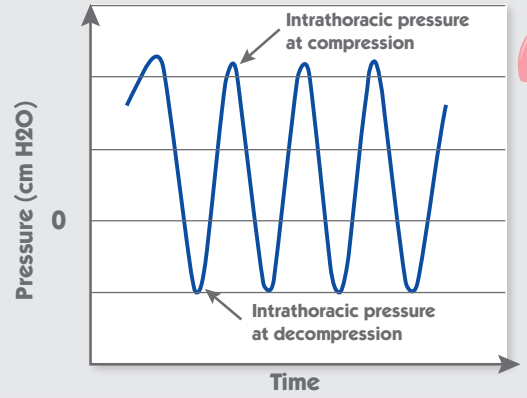
Fig 3



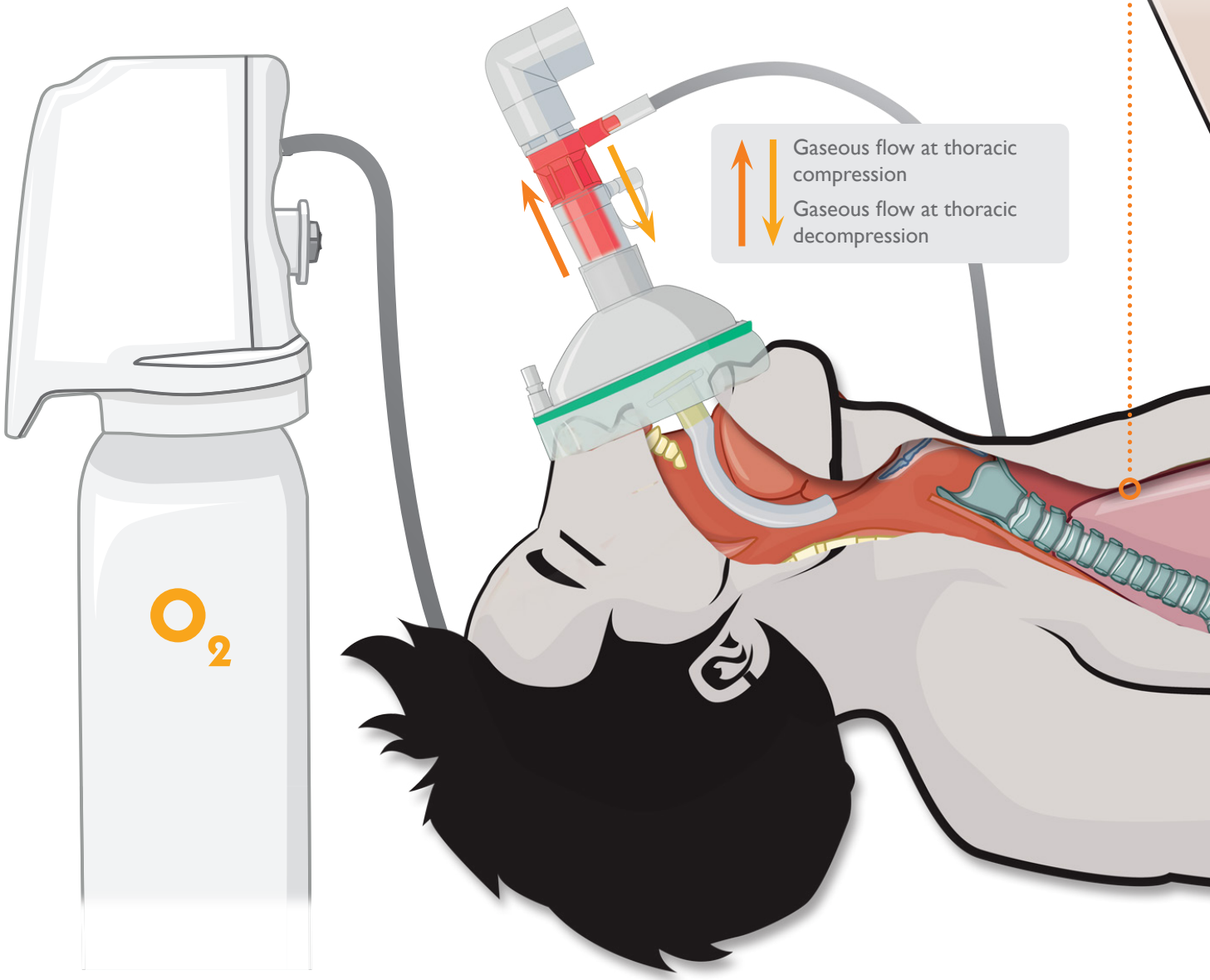
In addition to the periods of 'No Blood Flow' as described above, there are additional inefficiencies in terms of the physiological effects of current cardiac arrest management.

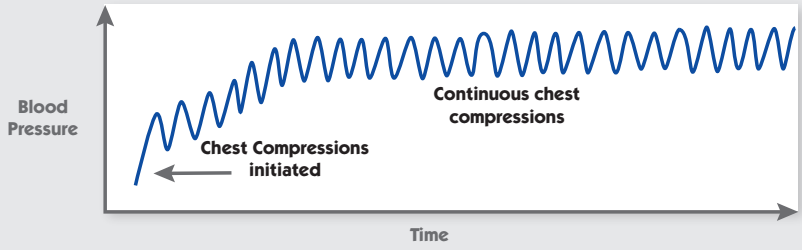
- An absence of negative intra-thoracic pressure during thoracic decompression results in very poor venous return [3,4]
- This poor venous return results in low heart blood priming which results in poor blood ejection from the left side of the heart during thoracic compression [5,7].
- Even when practising continuous chest compression CPR, there will come a point where ventilation is required. It is considered that there is enough systemic oxygen to perform continuous chest compression CPR for 3 to 5 minutes without ventilation (except hypoxic cardiac arrest, for which the immediate contribution of oxygen is necessary). At this point interrupting chest compressions to ventilate will result in a period of 'No Blood Flow' to the brain [6,8].
- Thoracic compression during standard CPR can crush the pulmonary parenchyma and reduce Functional Residual Capacity (FRC) which promotes alveolar collapse and significantly impairs gaseous exchange [9].
- Poor FRC can also increase the risk of rib and sternum damage during thoracic compression [9].

What are the benefits of b-card ?

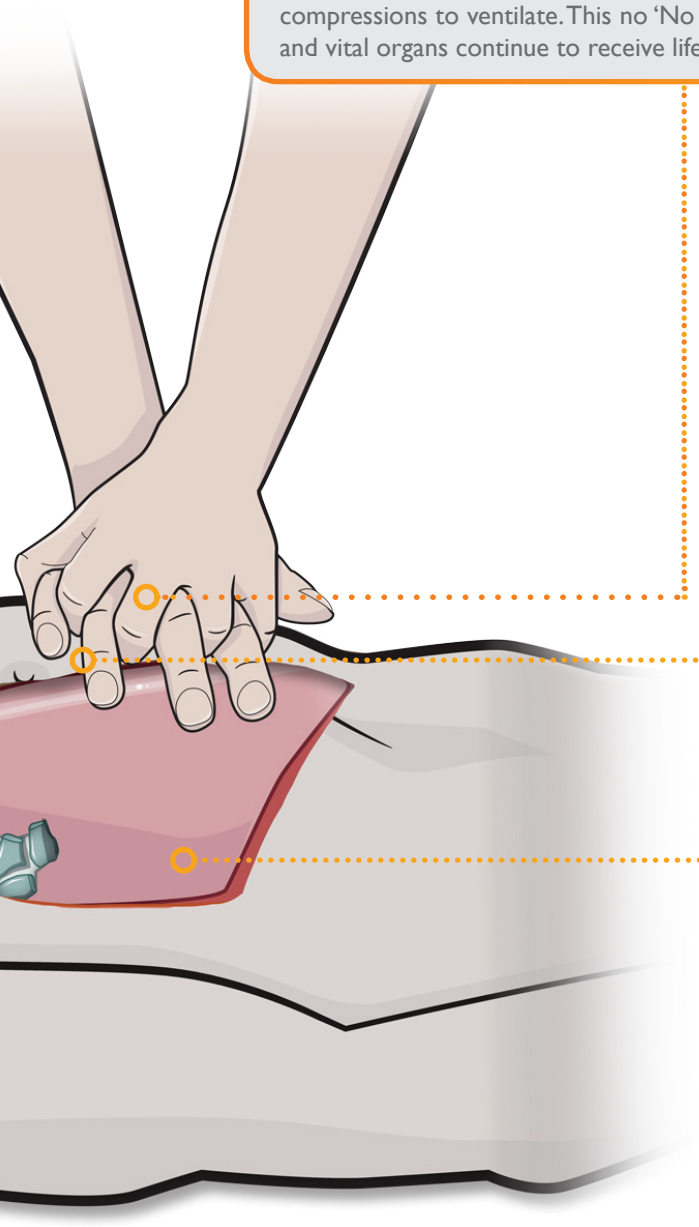


• b-card improves venous return to the heart by creating negative intra-thoracic pressure during thoracic decompression. This action of 'priming the pump' leads to improved blood ejection from the left side of the heart during thoracic compression.





• b-**card** maintains blood pressure by eliminating the need to stop chest compressions to ventilate. This no 'No Blood Flow' period means the brain and vital organs continue to receive life sustaining oxygen and nutrients.

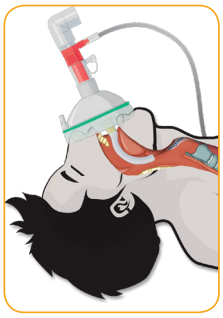


• b-**card** creates a 'pillow effect' which reduces the risk of rib and sternum fracture/ damage during thoracic compression.

• b-**card** preserves Functional Residual Capacity which reduces the risk of pulmonary parenchyma damage and alveolar collapse during thoracic compression and improves gaseous exchange.

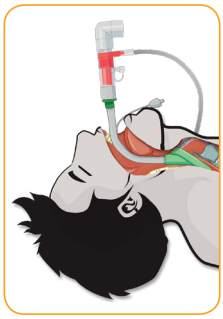
How to use b-card?

• Via a face mask



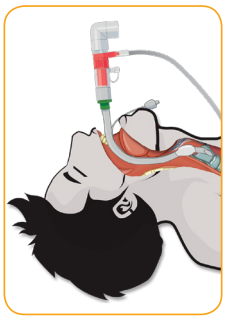
1. Start chest compression
2. Place/Insert a Guedel airway
3. Connect b-**card** to the face mask
4. Connect b-**card** to the oxygen supply
5. Open the oxygen flow to 15 l/minute
6. Put the mask on the patient without interrupting chest compression
7. Check that there is no mask leakage
8. Connect a capnograph to measure EtCO2 if necessary, either:
    a. via the extra connector port
    b. by in-line connection between the interface and the b-**card**

• Via a supraglottic device



1. Start chest compression
2. Place/insert supraglottic device
3. Connect b-**card** to the supraglottic device using the 15/22mm adapter
4. Connect b-**card** to the oxygen supply
5. Open the oxygen flow to 15 l/minute
6. Connect a capnograph to measure EtCO2 if necessary, either:
    a. via the extra connector port
    b. by in-line connection between the interface and the b-**card**

• Via an endotracheal tube



1. Connect b-**card** to the endotracheal tube using the 15/22mm adapter
2. Connect b-**card** to the oxygen supply
3. Open the oxygen flow to 15 l/minute
4. Start chest compression
5. Connect a capnograph to measure EtCO2 if necessary, either:
    a. via the extra connector port
    b. by in-line connection between the interface and the b-**card**

• In the case of return of spontaneous circulation (ROSC)

Apnoea:
Disconnect the system and either use manual ventilation with resuscitation bag, or connect a ventilator for intubated patients
Patient breathing spontaneously:
Simply disconnect the b-**card** from the device used
If arrest occurs again:

1. Stop mechanical or manual ventilation (disconnect the ventilator)
2. Open oxygen flow at 15 l/minute and reconnect the b-**card**
3. Recommence chest compression

Use the device with a flow rate of 15 l/minute only. b-card has been designed to function with an oxygen flow rate of 15 l/minute, regardless of the patient size or pre-existing medical conditions.

Ordering information

Designation	Code	Quantity
b-**card**	**6570.01**	**5/box**

References

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9. Bertrand C et al, Constant flow insufflation of oxygen as the sole mode of ventilation during out-of-hospital cardiac arrest. Intensive Care Med. 2006. 32 (6) P 843-51.

Cardiac arrest:
a new cutting edge treatment method from Vygon

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ANAESTHESIA EMERGENCY

For further information, please contact: questions@vygon.com

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