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Cardiac arrest trolleys should contain all the equipment necessary to deal with an adult cardiac arrest. Nurses must be familiar with and know how to use their contents

RESUSCITATION TROLLEY CONTENTS: PART 1 OF 2

Cardiac arrest equipment to support airway

Learning points...

- Why cardiac arrest trolley contents should be standardised
- Equipment required to support airway and breathing
- When contents should and should not be used

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Each hospital should have standardised cardiac arrest trolleys equipped with all the instruments and medication needed to deal with an acute adult cardiac arrest. Nurses must know the contents of these trolleys and how to use them to fulfil their common role as first responder. This first article in a two-part series looks at equipment to aid airway management and breathing; part two will focus on circulation.

The Royal College of Anaesthetists, Royal College of Physicians of London, Intensive Care Society and Resuscitation Council (UK) (2013) have made recommendations on the resuscitation equipment and medications that should be immediately available for the management of an adult cardiac arrest. These equipment and medications are normally stored in a cardiac arrest trolley, the contents of which should be standardised throughout a hospital (Resuscitation Council (UK), 2013).

Nurses must be familiar with the contents of the cardiac arrest trolley. This will help them to support the cardiac arrest team by, for example, being able to locate items of emergency equipment quickly. In many instances, nurses will also be acting in the capacity of "first responder" during the initial stages of a cardiac arrest and will need to be familiar with the contents of the cardiac arrest trolley and their use to fulfil this role safely and effectively.

The aim of this article is to help nurses and student nurses understand the contents of the cardiac arrest trolley, including when and how the equipment is used.

Resuscitation equipment

The contents of the cardiac arrest trolley's resuscitation equipment should be decided by the local resuscitation committee. This will depend upon the:

- Anticipated workload in terms of the nature of work and the throughput of patients;
- Availability of equipment from nearby departments where certain equipment may be shared between areas, which could include the location of automated external defibrillators (AEDs);
- Specialised local requirements such as trauma resuscitation and paediatrics (Nolan and Soar, 2013).

The Resuscitation Council UK (2013) has made recommendations on the minimum resuscitation equipment and medications that should be available to manage an adult cardiac arrest. All items should be latex free to protect people with latex allergies and all intravenous equipment should be luer locking to ensure compatibility.

The resuscitation equipment should be stored on a standard cardiac arrest trolley (Fig 1). This should be spacious, sturdy, accessible and mobile. Every hospital trolley should be identically stocked to avoid confusion. A defibrillator (with paediatric paddles) should also be available on the trolley.

5 practice points

1. The contents of cardiac arrest trolleys should be standardised in each hospital
2. Nurses should ensure they are familiar with the contents of the trolley and how they are used
3. Nurses often have to take on the role of first responder in the initial stages of a cardiac arrest
4. Some equipment on the trolley should be available in different sizes to accommodate a range of patients
5. A patient's level of consciousness will determine which instruments should be used

Although piped or wall oxygen and suction should always be used when available, portable suction devices and oxygen should still be at hand, either on or adjacent to the cardiac arrest trolley, as cardiac arrests do not always occur at the bedside.

Other items to which the cardiac arrest team should have immediate access include a stethoscope, electrocardiogram machine, blood-pressure measuring device, pulse oximeter and capnometer.

It should be noted equipment such as stethoscopes present a cross-infection risk (Longtin et al, 2014) and should be thoroughly disinfected after each patient use.

Airway and breathing

Suction

A portable suction device should be available as cardiac arrest can and does occur in areas where wall-mounted suction is not available. A rigid, oral suction device (the Yankaeur) (Fig 2) and a selection of flexible suction tubes for use with endotracheal suction must be available on the trolley.

Oropharyngeal airways

Simple airway devices such as oropharyngeal and nasopharyngeal airways can help maintain the airway in patients who are unconscious. The oropharyngeal (OP) airway, sometimes called a Guedel airway, is a curved plastic tube with a flanged end; these devices come in a range of colour-coded sizes from neonatal to adult (Fig 3).

The general consensus for estimating the correct size to use is to select an airway with a length corresponding to the vertical distance between the patient's incisors and the angle of the jaw (Resuscitation Council UK, 2011). Common adult sizes are 2, 3 and 4. It is important the OP airway is inserted correctly – commonly in the inverted position then rotated through 180° once past the soft palate. This helps to ensure the tongue is not pushed back during airway insertion.

Nasopharyngeal airways

Nasopharyngeal (NP) airways (Fig 4) can be used with patients who are not deeply unconscious but still have some level of airway obstruction or impairment, such as those with trismus (lockjaw) or maxillofacial trauma.

The size of these airways correlates to the internal diameter (in millimetres) of the tube and the length, which increases with the diameter size. Sizes of 6-7mm are suitable for most adults (Resuscitation Council UK, 2011).

Insertion should be undertaken with care after first ensuring the patient's nasal passage is patent and free from solid obstructions. The outside of the airway should be lubricated with a water-based lubricant to minimise the risk of trauma to the nasal mucosa. Caution should be taken when a basal skull fracture has been diagnosed or is suspected, as it is possible to insert the airway into the cranial vault in these circumstances.

Laryngeal mask airway device

The laryngeal mask airway (LMA) (Fig 5) is described as a supraglottic airway device, as it sits above the larynx offering some degree of airway protection during artificial ventilation. This device has gained prominence on the cardiac arrest trolley in recent years as it requires less skill and training than an endotracheal tube to insert. However, it is important that practitioners receive training and supervision before being deemed competent to use it.

The standard LMA consists of a large, wide-bore tube with an inflatable elliptical cuff at its distal end; standard sizes of 4 (correct for most adult females) and 5 (correct for most adult males) are commonly found on the trolley. A syringe of at least 20ml with a luer tip should be available for inflating the LMA device.

Endotracheal tubes

Endotracheal tubes (ETT, Fig 6) are widely considered to be the optimal device for airway management (Deakin et al, 2010). A correctly inserted ETT provides a seal, preventing foreign bodies or secretions from contaminating the airway, and enables ventilation directly to the trachea.

ETTs come in a variety of sizes: 6mm, 7mm and 8mm sizes should be suitable for most adults (Resuscitation Council, 2011).

Endotracheal intubation should only be attempted by fully trained, experienced practitioners as misplaced oesophageal placement has been associated with poor clinical outcome (Hasegawa et al, 2013).

The minimum equipment required for

FIG 1. **CARDIAC ARREST TROLLEY**

FIG 2. **RIGID ORAL SUCTION DEVICE**

FIG 3. **OROPHARYNGEAL AIRWAY**

FIG 4. **NASOPHARYNGEAL AIRWAY**

FIG 5. **LARYNGEAL MASK AIRWAY**

FIG 6. **ENDOTRACHEAL TUBE**

FIG 7. **TRACHEAL TUBE BOUGIE AND STYLET**

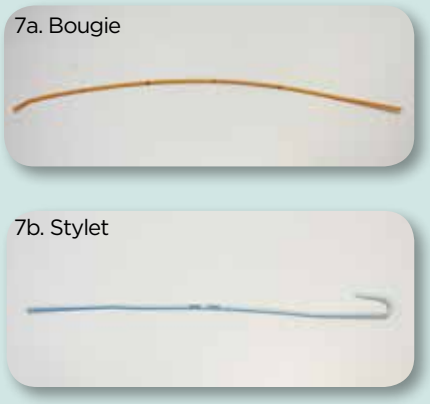

FIG 8. **CATHETER MOUNT**

ETT insertion includes:

- A laryngoscope, which has a light source and helps practitioners view the airway;
- A syringe for cuff inflation;
- Suction to clear secretions;
- Tape or bandage to secure the airway;
- A stethoscope and capnometer to confirm correct placement.

Tracheal tube stylet and bougie

When intubation is difficult – for example if there is swelling or laryngospasm, or when it is not possible to view the vocal cords to pass the endotracheal tube – a gum-elastic bougie (Fig 7a) may be used. This allows the practitioner to pass the tip of the device through the glottis into the trachea then "railroad" the endotracheal tube over the bougie. Alternatively, a stylet (Fig 7b) may be used inside the softer ETT before it is inserted to provide rigidity and stability.

In optimal circumstances, an assistant passes the ETT over the bougie and holds the end until the practitioner performing the intubation has successfully placed the ETT in the trachea. Once the ETT is in place, the bougie or stylet can be withdrawn through the tube and removed.

Flexible catheter mount

A catheter mount (Fig 8) is a flexible length of corrugated plastic with rigid connections at each end that connect to a range of airway devices such as a bag valve mask (BVM) or mechanical ventilator circuit. The catheter mount allows flexibility and movement between the airway device and ventilation equipment to minimise pressure and twisting or force on the patient's airway. Usually, the catheter mount will have a port to allow the passage of a flexible suction catheter into the patient's airway and a port to facilitate capnography.

Capnometer

Capnography is the measurement of carbon dioxide, which is an exhaled waste product of respiration. A capnometer (Fig 9) can measure the presence and, in some cases, the amount of carbon dioxide in exhaled air, thereby providing a useful indicator that an endotracheal device is in the correct position.

A basic colorimetric capnometer fits between the airway device and the ventilation equipment and provides a colour-change reference to show the presence of carbon dioxide in the airway; more sophisticated monitoring equipment can provide measurements of carbon-dioxide levels.

Laryngoscope

The laryngoscope (Fig 10) is used to facilitate endotracheal intubation and consists of a handle with a blade attached – either straight (Miller) or curved (Macintosh). The laryngoscope provides a physical means to view the glottis and vocal cords

FIG 9. **CAPNOMETER**

FIG 10. **LARYNGOSCOPE**

FIG 11. **MAGILLS FORCEPS**

using an attached illumination source to improve the picture for the operator.

There are models that can be sterilised, although those on trolleys are usually disposable and for single patient use.

Magills forceps

Magills forceps (Fig 11) are long-bladed, curved forceps that a practitioner can operate with one hand to remove foreign objects or assist with swabbing or endotracheal intubation. Traditionally, they were designed to be autoclaved and reused but disposable products are now common.

Self-inflating BVM

The BVM (Fig 12) is a handheld device used to provide positive pressure ventilation to patients who are apnoeic (not breathing) or breathing inadequately. The device can be used without attaching oxygen; however, it is most effective when attached to high-flow oxygen, which is delivered to the patient when the bag is squeezed.

The interface between the bag and patient is provided by a clear face mask; a range of masks should be on the cardiac arrest trolley to accommodate different sizes (Resuscitation Council UK, 2013). It is imperative the correct size mask is used so an effective seal against the patient's face is created, and the operator should ensure the patient's chest is rising adequately with the minimum of air escaping around the mask on every inflation of the BVM. The BVM can also be used to ventilate via an endotracheal tube or supraglottic airway device (with a catheter mount to provide flexibility).

Non-rebreathe oxygen mask

In the care of patients who are deteriorating or in a peri-arrest situation, the provision of supplementary high-flow oxygen may be indicated.

High-flow, high-concentration oxygen can be delivered through the interface of a non-rebreathe or "reservoir" mask (Fig 13). This device has an inflating oxygen reservoir, which should be filled before the mask

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Carolyn Johnstone › *p24*

is placed on the patient's face to allow for maximum filling of the reservoir. As the patient inhales, they draw on the high-flow oxygen; as they exhale, a simple flutter valve closes over the bag and opens at the side of the mask to allow the patient's exhaled breath to leave the mask – hence the term non-rebreathe. This device should be used if the patient is breathing independently.

Arterial blood gas syringes

During arrest and peri-arrest situations, measurement and analysis of arterial blood gases can help to determine a diagnosis and forms part of the assessment of ventilatory function and acid-base balance. The arterial blood gas syringe and needle (Fig 14) are used by a competent practitioner to perform an arterial puncture of the radial or femoral artery to collect a sample of arterial blood for analysis.

Conclusion

It is important that nurses are familiar with equipment designed to support ventilation when a patient is deteriorating or has had a cardiac arrest.

Part 2 of this series, which will be published next week, will look at equipment to support circulation and procedures for checking the cardiac arrest trolley. **NT**

References

Deakin CD et al (2010) European Resuscitation Council Guidelines for Resuscitation 2010 Section 4. Adult advanced life support: *Resuscitation;* 81: 1305-1352. tinyurl.com/resus-deakin

Hasegawa K et al (2013) Association of pre-hospital advanced airway management with neurologic outcome and survival in patients with out-of-hospital cardiac arrest. *Journal of the American Medical Association;* 309: 3, 257-266.

Longtin Y et al (2014) Contamination of stethoscopes and physicians' hands after a physical examination. *Mayo Clinic Proceedings;* 89: 3, 291-299.

Nolan, G, Soar, J (2013) Guidelines for the Provision of Anaesthetic Services 2013

Resuscitation Council UK (2013) Minimum *Equipment and Drug Lists for Cardiopulmonary Resuscitation.* tinyurl.com/equip-cardiac

Resuscitation Council UK (2011) *Advanced Life Support.* tinyurl.com/ALS-sixth-edition

Royal College of Anaesthetists, Royal College of Physicians of London, Intensive Care Society and Resuscitation Council (UK) (2013) *Quality Standards for Cardiopulmonary Resuscitation Practice and Training.* London: Resuscitation Council UK.

FIG 12. **BAG VALVE MASK**

FIG 13. **NON-REBREATHE OXYGEN MASK**

FIG 14. **ARTERIAL BLOOD GAS SYRINGE**