NSW HEALTH Working as a Team

Safety Advocate

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The American Heart Association recommends …

… that an adult bag-mask device should have the following features:

- A non-jam inlet valve system allowing maximum oxygen inlet flow of 30l/min
- Either no pressure relief valve or, if a pressure relief valve is present the pressure relief valve must be capable of being closed
- Standard 15mm/22mm fittings
- An oxygen reservoir to allow delivery of high concentrations of oxygen
- A non rebreathing outlet valve which cannot be obstructed by foreign material
- Ability to function satisfactorily under common environmental conditions and extremes of temperature

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Safe application of self-inflating bag/mask devices

Between May 2003 and February 2004, NSW Health has been notified of five instances of patient misadventure due to incorrectly assembled self-inflating bag-mask devices. A small working party was established to review the literature for best practice, address the issues identified and make recommendations for the NSW Health system.

The bag-mask device is used to deliver positive-pressure ventilation to patients in a variety of settings and for a variety of reasons. The device is comprised of a self-inflating bag and a non-rebreathing valve attached to a facemask or in some applications an endotracheal tube. There is facility to have oxygen inflow and an oxygen reservoir to enable delivery of high oxygen concentrations. The most common self-inflating bag used in NSW is the Laerdal.

This complex piece of equipment requires considerable education and practice for effective use. Such practice is hard to maintain if the skills are used infrequently. For this reason the literature recommends that when the ability to practice the technique and use of the equipment is limited, two operators should undertake this procedure.[1] Moreover, it has been demonstrated that in the absence of regular opportunity to maintain skills in effective use of resuscitation equipment mouth to mask ventilation is more effective than bag-mask devices and can be managed by one operator.

Review of findings

NSW Health is continuing to progress a review of these devices and their safe application. Preliminary findings have highlighted that the following may be contributory factors in these incidents:

- **Incorrect assembly.** It has been noted that the unit can be assembled with valves turned inside out thus obstructing flow. Further the device can be assembled with some critical pieces not included.
- **Lack of education on appropriate functional testing procedures.** A comprehensive flow diagram demonstrating functional checking procedures identifies that in order to test every aspect of the equipment a four-step process is involved. Lack of knowledge and poor understanding of the full range of functional testing required could potentially contribute to equipment failure. Resuscitation review committees could mitigate this to some extent although would not necessarily negate other contributory factors.
- **Potential problems with non centralised CSSD protocols**. In regard to bag-mask devices it has been found that while there are consistent practices relating to decontamination, there is no consistency across the public health system in relation as to whether this occurs centrally at area health service CSSD or at local facility level. This increases risk of failure due to low activity and difficulty in maintenance of skills (reassembly, drying of parts etc).
- **Inappropriate application.** Review of current guidelines from The Australian Resuscitation Council[2], the UK[3] and European Resuscitation Councils[4], The American Heart Association[1] and other literature delineates requirements for basic and advanced life support and the equipment and skill required in each context.
- **Workforce issues:** Maintenance of the users' knowledge and competence in the correct testing and application of the system is extremely difficult to monitor in the current climate of a constrained and increasingly casual workforce.

Furthermore it was identified that where the occasions of use are rare maintenance of required skills is even more problematic. In this situation the literature supports that where an advanced life support team is called to an emergency, it would be reasonable to use basic life support equipment for resuscitation purposes until the emergency team arrived with the more sophisticated equipment and the skills to use it.

Preliminary recommendations from NSW Health

The following are preliminary recommendations from NSW Health for the safe application of self-inflating bag-mask devices:

1. It is recommended that where the equipment is in use a laminated testing procedure chart be attached
2. Orientation processes and annual CPR accreditation should include assessment of the understanding and skills relating to the testing process.
3. It is strongly advised that where the volume of activity is low but a self-inflating bag-mask resuscitation device is required, the use of disposable systems would be a sound risk management strategy.
4. Decontamination of the device and all its parts should be undertaken in a centralised CSSD setting. Staff within these departments must be given in-service to attain and maintain an appropriate level of knowledge and skill in the cleaning and reassembly of the system.
5. Competencies relating to decontamination and reassembly of this complex type of equipment must be developed.
6. Resuscitation review committees should be identified, at a minimum, at Area Health Service level and should follow the guidelines set out by the UK Resuscitation Council.
7. The resuscitation review committee should be responsible for all aspects of the resuscitation service.
8. Each facility should have at last one resuscitation training officer (RTO) who is responsible for training in resuscitation. The UK Resuscitation Council recommendation is for one designated (RTO) per 300 acute beds.
9. All staff should have training (at least annually) appropriate to their level and role (basic versus advanced life support).
10. Clear policy and procedures for notification of the cardiac arrest team should exist.
11. Standard national and international guidelines[2,3,4,5] should be followed.
12. Appropriate resuscitation equipment should be available for clinical use and training.
13. Resuscitation procedures should be regularly reviewed.
14. Checking of resuscitation equipment should be attended to by appropriately skilled personnel and undertaken at times that ensure equipment that is identified as faulty, is easily replaced at the time of discovery.
15. Adequate resources should be available to support activities relating to resuscitation education and review.

In addition to the above, it is recommended that Area Health Services look at the options of disposable versus non-disposable products from a cost perspective. Following a review and risk assessment across the organisation, St Vincent's Hospital in Sydney has replaced their reusable bags with a disposable system. Their review considered the appropriateness for use of the self-inflating device versus other products particularly in areas of low activity or areas where another product (such as open tailed anaesthetic bags or mouth-to-mask breathing devices) could be used just as effectively and safely.

References

1. Guidelines 2000 for Cardiopulmonary Resuscitation and Emergency Cardiovascular Care: International Consensus on Science.
2. The Australian Resuscitation Council http://www.resus.org.au/
3. UK Resuscitation Council Cardiopulmonary Resuscitation Guidance for clinical practice and training in Primary Care http://www.resus.org.uk
4. European Resuscitation Council http://www.erc.edu/
5. Jevon, P. 2002 Nursing Standard Volume 16(33) pp41-44