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Australia and New Zealand Horizon Scanning Network

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National Horizon Scanning Unit
Horizon scanning prioritising summary

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AutoPulse™ Resuscitation System: Automatic chest compressor for patients in cardiac arrest.

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PRIORITISING SUMMARY

REGISTER ID: **000095**

NAME OF TECHNOLOGY: **AUTOPULSE™ RESUSCITATION SYSTEM**

PURPOSE AND TARGET GROUP: **AUTOMATIC CHEST COMPRESSOR FOR PATIENTS IN CARDIAC ARREST**

STAGE OF DEVELOPMENT (IN AUSTRALIA AND /OR NEW ZEALAND):

- ☒ Yet to emerge
- ☐ Experimental
- ☐ Investigational
- ☐ Nearly established
- ☐ Established
- ☐ Established *but* changed indication or modification of technique
- ☐ Should be taken out of use

AUSTRALIAN THERAPEUTIC GOODS ADMINISTRATION APPROVAL

- ☐ Yes — ARTG number
- ☒ No
- ☐ Not applicable

The American Food and Drug Association approved an earlier model of the AutoPulse™ in 2002. AutoPulse™ is commercially available in the United States.

INTERNATIONAL UTILISATION:

COUNTRY	LEVEL OF USE		
	Trials Underway or Completed	Limited Use	Widely Diffused
Brazil	✓		
United States	✓		

IMPACT SUMMARY:

Revivant Corp. provides the AutoPulse™ Resuscitation System (Model 100), an automatic chest compressor used to provide cardiac compression when performing cardiopulmonary resuscitation (CPR) on adult patients in cardiac arrest.

BACKGROUND

The AutoPulse™ Resuscitation System is an automated, portable, battery-powered device that compresses the chest of an adult human. It is intended for use during basic life support- a single individual can provide expired air (or mouth-to-mouth) ventilation while AutoPulse™ provides chest compression. The AutoPulse™ is an electromechanical chest compression device that utilizes a load-distributing band to compress the anterior chest. TheAutoPulse™ automatically adjusts to the size and shape of each patient and achieves chest compression at a rate of eighty timnes per minute (Revivant 2004).

The AutoPulse™ consists of:

- a transportable platform containing a micro-processor-based control system, an electromechanical drive system and a user interface panel.
- A single patient use chest compression assembly that applies the pre-programmed compression to the patient's chest
- A rechargeable battery pack and charger.

The diagrams below show the AutoPulse™ device and how it would be placed on a patient.

Printed with permission, Revivant, source: http://revivant.com/pages/prod_info.html

CLINICAL NEED AND BURDEN OF DISEASE

Cardiac arrest is the sudden abrupt loss of heart function. The victim may or may not have been diagnosed with cardiovascular disease (e.g. suffered an acute myocardial infarction). In South Australia, the SA Ambulance Service attends approximately 170,000 cases each year and 15% of these involve patients with cardiac conditions (SA Ambulance Service, 2004). In Australia, the number of hospital separations for major arrhythmia and cardiac arrest (with and without severe or catastrophic complications) in 2001-2 was 5,186 (AIHW, 2004). The number of hospital separations for acute myocardial infarction in 2001-2 was 40,338 (AIHW, 2004).

DIFFUSION

The American Food and Drug Association approved an earlier model of the AutoPulse™ in 2002. AutoPulse™ is commercially available in the United States.

COMPARATORS

Manual chest compression is the traditional method used during CPR and thus is the obvious comparator. The aim of CPR is to artificially maintain blood flow to vital organs when the heart can no longer pump or pump effectively. The success of CPR depends on how effectively the chest wall surrounding the heart is compressed. Disadvantages of manual chest compression include "rescuer" fatigue and inadequate blood flow; manual CPR may only provide 10-20% of normal myocardial blood flow and 30 to 40% of normal blood flow to the brain (Hightower 1995, Ochoa et al 1998).

The AutoPulse allows one worker to concentrate on supplying oxygen while another can start assessing vital signs and giving treatment.

COST IMPACT

It was not possible to ascertain the cost of the AutoPulse™ in the sources examined. There would be an increase in cost associated with training personnel apart from the device itself and in replacing the single-use compression bandage.

EFFECTIVENESS AND SAFETY ISSUES

The only published study of the AutoPulse™ occurred in a hospital setting and described 16 terminally ill patients (level IV evidence) aged 68 ± 6 years who suffered sudden cardiac arrest. This study compared coronary perfusion pressure produced by using the AutoPulse™ with manual chest compressions (Timerman et al. 2003). All subjects were endotracheally intubated. Following a minimum of 10 minutes of failed advanced life support, fluid-filled catheters were introduced into the thoracic aorta and the right atrium, with placement confirmed by pressure waveforms and chest radiograph. Subjects then received alternating periods of manual and AutoPulse chest compressions for 90 seconds each. Chest compressions were administered at 100/min for manual, and 60/min for AutoPulse. Subjects received bag-valve ventilation (12/min) between compressions.

Coronary perfusion pressure was measured as the difference between the aortic and right atrial pressures during chest decompression. This study reported higher peak aortic pressures with the AutoPulse chest compressions when compared with manual chest compressions (150±8 vs 122±11 mmHg, $p < 0.05$, mean ± SEM), and higher coronary perfusion pressure (20±3 vs 15±3 mmHg, $p < 0.02$). The mean coronary perfusion pressure for AutoPulse™ was 33% higher than manual CPR (20 mmHg vs 15 mmHg, $p<.05$).

The AutoPulse™ is currently being assessed in a multicentre study led by the University of Washington (AutoPulse Assisted Prehospital Intervention Resuscitation (ASPIRE) Trial) (http://www.defrance.org/artman/publish/printer_671.shtml).

ETHICAL, CULTURAL OR RELIGIOUS CONSIDERATIONS

The usual ethical considerations regarding manual cardiopulmonary resuscitation (CPR) would apply in the use of automated chest compression in CPR.

CONCLUSION:

There is limited and low level evidence currently available for the AutoPulse™. In addition, patients should be defibrillated a soon as possible.

HEALTHPACT ACTION:

It is unlikely that the AutoPulse™ will have any significant policy or clinical impact on the Australian public health system, therefore it is recommended that this technology be archived.

SOURCES OF FURTHER INFORMATION:

AIHW (2004) *'National Hospital Morbidity Database'* [Internet] Available from: http://www.aihw.gov.au/hospitaldata/datacubes/index.html [Accessed May 14, 2004].

Hightower, D.,Thomas, S. H.et al (1995). 'Decay in quality of closed-chest compressions over time', *Ann Emerg Med*, 26 (3), 300-303.

Ochoa, F. J.,Ramalle-Gomara, E.et al (1998). 'The effect of rescuer fatigue on the quality of chest compressions', *Resuscitation,* 37 (3), 149-152.

Timerman S, Cardoso L F, Racute myocardial infarctionres J A, ,Halperin, H R. 2003. 'Improved Hemodynacute myocardial infarctioncs with a Novel Chest Compression Device during Treatment of In-hospital Cardiac Arrest.' Abstract presented at NAEMSP 2003 Annual Meeting. *Prehosp Emerg Care 7(1) 162*

SA Ambulance Service Statistics *'Emergency Ambulance cases by category'* [Internet] Available from: www.saambulance.com.au/ [Accessed May 13, 2004].

Wik, L. (2000). 'Automatic and manual mechanical external chest compression devices for cardiopulmonary resuscitation', *Resuscitation,* 47 (1), 7-25.

SEARCH CRITERIA TO BE USED:

Cardiopulmonary Resuscitation/ instrumentation/ methods
Cardiopulmonary Resuscitation/ methods/standards
Heart Massage/ methods