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## Review Paper

# Post resuscitation management of cardiac arrest patients in the critical care environment: A retrospective audit of compliance with evidence based guidelines

A. Milonas<sup>a,\*</sup>,  
A. Hutchinson<sup>a,b</sup>,  
D. Charlesworth<sup>c</sup>,  
A. Doric<sup>c</sup>,  
J. Green<sup>a</sup>,  
J. Considine<sup>b,c</sup>

<sup>a</sup> Northern Health, Epping, 185 Cooper St., Epping, 3076, Victoria, Australia

<sup>b</sup> Deakin University, School of Nursing and Midwifery/Centre for Quality and Patient Safety Research, Geelong, Australia

<sup>c</sup> Eastern Health, Nelson Road, Box Hill, 3128, Victoria, Australia

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## ABSTRACT

**Background:** There is a clear relationship between evidence-based post resuscitation care and survival and functional status at hospital discharge. The Australian Resuscitation Council (ARC) recommends protocol driven care to enhance chance of survival following cardiac arrest. Healthcare providers have an obligation to ensure protocol driven post resuscitation care is timely and evidence based.

**Objectives:** The aim of this study was to examine adherence to best practice guidelines for post resuscitation care in the first 24 h from Return of Spontaneous Circulation for patients admitted to the intensive care unit from the emergency department having suffered out of hospital or emergency department cardiac arrest and survived initial resuscitation.

**Method:** A retrospective audit of medical records of patients who met the criteria for survivors of cardiac arrest was conducted at two health services in Melbourne, Australia. Criteria audited were: primary cardiac arrest characteristics, oxygenation & ventilation management, cardiovascular care, neurological care and patient outcomes.

**Findings:** The four major findings were: (i) use of fraction of inspired oxygen (F<sub>I</sub>O<sub>2</sub>) of 1.0 and hyperoxia was common during the first 24 h of post resuscitation management, (ii) there was variability in cardiac care, with timely 12 lead Electrocardiograph and majority of patients achieving systolic blood pressure (SBP) greater than 100 mmHg, but delays in transfer to cardiac catheterisation laboratory, (iii) neurological care was suboptimal with a high incidence of hyperglycaemia and failure to provide therapeutic hypothermia in almost 50% of patients and (iv) there was an association between in-hospital mortality and specific elements of post resuscitation care during the first 24 h of hospital admission.

**Conclusion:** Evidence-based context-specific guidelines for post resuscitation care that span the whole patient journey are needed. Reliance on national guidelines does not necessarily translate to evidence based care at a local level, so strategies to ensure effective guideline implementation are urgently required.

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\* Corresponding author. Present address: Austin Health, 145 Studley Road, P.O. Box 5555, Heidelberg, Victoria 3084, Australia.

E-mail addresses: [annabel.milonas@austin.org.au](mailto:annabel.milonas@austin.org.au) (A. Milonas), [a.hutchinson@deakin.edu.au](mailto:a.hutchinson@deakin.edu.au) (A. Hutchinson), [drdavidcharlesworth@gmail.com](mailto:drdavidcharlesworth@gmail.com) (D. Charlesworth), [andrea.doric@easternhealth.org.au](mailto:andrea.doric@easternhealth.org.au) (A. Doric), [john.green@nh.org.au](mailto:john.green@nh.org.au) (J. Green), [julie.considine@deakin.edu.au](mailto:julie.considine@deakin.edu.au) (J. Considine).

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## 1. Introduction

There is a clear relationship between evidence-based post resuscitation care and survival to, and functional status at hospital discharge.<sup>1,2</sup> Further, it is clear that resuscitation should not stop

**Table 1**  
Factors associated with post arrest syndrome and major elements of management.

Post arrest syndrome	Major elements of management
Prevention of secondary brain injury <sup>5–11</sup>	<ul style="list-style-type: none"> <li>• Targeted temperature management</li> <li>• Blood pressure control</li> <li>• Airway protection and ventilation</li> <li>• Oxygenation</li> <li>• Seizure control</li> </ul>
Prevention of myocardial dysfunction <sup>9,12,13</sup>	<ul style="list-style-type: none"> <li>• Blood pressure control – intravenous fluids, inotropic support</li> <li>• Intra-aortic balloon pump</li> <li>• Extra corporeal membrane oxygenation</li> </ul>
Management of the systemic response to reperfusion <sup>2,14–16</sup>	<ul style="list-style-type: none"> <li>• Blood pressure control/vasopressors</li> <li>• Temperature control</li> <li>• Glucose control</li> <li>• Early administration of antibiotics if evidence of infection</li> </ul>
Management of issues related to the cause of cardiac arrest <sup>2,17</sup>	<ul style="list-style-type: none"> <li>• Early reperfusion with Percutaneous Coronary Intervention (PCI) or fibrinolysis</li> <li>• Management of traumatic injury</li> <li>• Antidote therapy</li> </ul>

after Return of Spontaneous Circulation and that post resuscitation care should be considered part of the resuscitation process.<sup>2</sup> Post cardiac arrest syndrome is a unique and complex combination of the following pathophysiological processes: (1) brain injury, (2) myocardial dysfunction, (3) systemic response to reperfusion and (4) residual issues related to the cause of cardiac arrest.<sup>3</sup> There is a growing body of evidence that shows that post cardiac arrest syndrome has a significant impact on mortality and morbidity.<sup>4</sup> Protocols for the standardised management of patients following resuscitation including: targeted temperature management (TTM), previously known as therapeutic hypothermia, glycaemic control, controlled ventilation and oxygenation, controlled haemodynamic support, prognostication consideration and timeliness of interventions have been found to improve patient outcomes: a summary is provided in Table 1.<sup>1,5,6</sup> However, there are a number of barriers to implementation of optimal post resuscitation care in practice including high resource requirements and coordination of care between multiple providers.<sup>4</sup> For the purpose of this paper, post resuscitation care refers to the care provided following Return of Spontaneous Circulation.

At the time of the study, the Australian Resuscitation Council<sup>18,19</sup> recommended the following key elements of post resuscitation care:

- Systolic blood pressure (SBP) greater than 100 mmHg with the administration of vasopressors and or intravenous fluids if required.
- Intubation and ventilation guided by appropriate monitoring to maintain an oxygen saturation of 94–98% and normocarbia.
- Blood glucose level: frequent monitoring of blood glucose level (BGL) and treatment of hyperglycaemia greater than 10 mmol/L and avoiding hypoglycaemia.
- Administration of antiarrhythmic medications if required.
- Induction of therapeutic hypothermia (now TTM) and following rewarming avoiding hyperthermia.
- Consideration of use of anticonvulsant medications.
- Immediate angiography and/or early Percutaneous Coronary Intervention (PCI) in patients with ST Elevation Acute Myocardial Infarction (STEMI) or new Left Bundle Branch Block (LBBB) on Electrocardiograph (ECG) following Return of Spontaneous Circulation (ROSC).

- Management of resuscitation related injuries.

While there is a clear evidence base for post resuscitation care, the quality of delivery post resuscitation care in Australian hospitals is poorly understood. Studies of single approaches such as TTM and angiography have shown positive results,<sup>10</sup> however, these studies fail to encompass the complexity of implementing multi-component interventions in practice. The International Liaison Committee on Resuscitation (ILCOR)<sup>20</sup> identified a number of critical knowledge gaps related to post cardiac arrest syndrome including epidemiology, pathophysiology, therapeutic interventions, prognosis and barriers. In addition, the Australian and New Zealand Committee on Resuscitation (ANZCOR) has made clear statements about the need for a consistent and evidence based approach to post resuscitation care.<sup>2</sup>

Observations of current clinical practice in Emergency Departments (ED) and Intensive Care Units (ICU) suggest variability in the delivery of post resuscitation care, however objective assessments of the degree of variation are lacking. Currently there are no published Australian studies of post-resuscitation care that span the both ED and ICU management of patients following cardiac arrest.

### 1.1. Aims

The aim of this study was to examine the first 24 h of post resuscitation care for patients admitted to the ICU from the ED and to compare the care received with guideline recommended care. For the purposes of this paper, post resuscitation care commenced at the time of Return of Spontaneous Circulation. It should be noted that at the time the following guideline was in place: the ARC Guideline 11.7: Post Resuscitation Therapy in Adult Advanced Life Support.<sup>18</sup> The researchers recognise that there is now an updated version of this guideline published since the conclusion of this study.<sup>2</sup>

## 2. Materials and methods

### 2.1. Design

A retrospective, descriptive, exploratory approach was used. The study was approved by the Human Research and Ethics Committees at both study sites.

### 2.2. Setting

The retrospective audit was conducted at two major health services in Melbourne, Australia. Site A was a 400 bed acute care hospital that manages approximately 30 cardiac arrest survivors per year in their ED who are subsequently admitted to the ICU. Site B was a 385 bed acute care hospital that manages approximately 50 cardiac arrest survivors per year through their ED who subsequently get admitted to the ICU. Both hospitals offered all clinical services except neurosurgery and cardiothoracic surgery. At the time, both organisations practiced TTM according to the ARC guideline with a target temperature of 32–24 °C for 12–24 h<sup>19</sup> after cardiac arrest.

### 2.3. Sample

Adult patients (aged 18 years or over) who suffered a cardiac arrest (either out of hospital or in the ED), who required ED management and survived to be admitted to the ICU from 1 January 2010 to 31 December 2013 were eligible for inclusion. Patients who died in the ED, had a limitation of medical treatment order completed in the ED or ICU, or admitted to the ICU with the intent of organ donation were excluded. There were 116 patients at Hospital A and 195

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