Australian Resuscitation Outcomes Consortium (Aus-ROC)

A NHMRC Centre of Research Excellence (CRE) in Clinical Research, #1029983

Presented by Prof Judith Finn (RN, PhD)
Director of Aus-ROC
on behalf of the Aus-ROC Investigators
Leading Causes of Death in United States

Extrapolated from www.cdc.gov and Nichol JAMA 2008

<table>
<thead>
<tr>
<th>Condition</th>
<th>Annual Number of Deaths</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cancer</td>
<td>3000000</td>
</tr>
<tr>
<td>Heart Disease ex OHCA</td>
<td>600000</td>
</tr>
<tr>
<td>OHCA</td>
<td>500000</td>
</tr>
<tr>
<td>Stroke</td>
<td>300000</td>
</tr>
<tr>
<td>Chronic Respiratory</td>
<td>200000</td>
</tr>
<tr>
<td>Injury</td>
<td>100000</td>
</tr>
<tr>
<td>Alzheimer</td>
<td>80000</td>
</tr>
<tr>
<td>Diabetes</td>
<td>60000</td>
</tr>
<tr>
<td>Influenza and Pneumonia</td>
<td>50000</td>
</tr>
<tr>
<td>Renal</td>
<td>40000</td>
</tr>
<tr>
<td>Septicemia</td>
<td>30000</td>
</tr>
</tbody>
</table>
‘OHCA claims the lives of an estimated 310,000 Americans each year, a loss of life equivalent to that caused by a 9/11 World Trade Center attack on the United States every 3 days.’

‘The funding commitment by the NIH and industry is not commensurate with the impact of cardiac arrest on the public’s health or the likelihood that significant improvements in survival are within our grasp.’
### Table 2. Number of Research Projects Funded by the National Heart, Lung, and Blood Institute From 1985 to 2009

<table>
<thead>
<tr>
<th>Terms Searched</th>
<th>Funded Studies, n</th>
<th>Deaths per Year, n</th>
<th>Funded Studies per 10,000 Deaths per Year, n</th>
</tr>
</thead>
<tbody>
<tr>
<td>Myocardial infarction</td>
<td>6886</td>
<td>157,000</td>
<td>439</td>
</tr>
<tr>
<td>Stroke</td>
<td>4403</td>
<td>150,000</td>
<td>294</td>
</tr>
<tr>
<td>Heart failure</td>
<td>9919</td>
<td>284,000</td>
<td>349</td>
</tr>
<tr>
<td>Heart arrest and resuscitation</td>
<td>257</td>
<td>310,000</td>
<td>8</td>
</tr>
</tbody>
</table>
• In the 10 years since 2003, the NHMRC has provided more than A$795 million for Cardiovascular Disease research.

• Annualized increase of 8% over the decade, from A$43 million in 2003 to A$108 million in 2012

NHMRC funding for “cardiac arrest” projects as a % of CVD research

- Funds awarded annually to projects related to ‘cardiac arrest’ have similarly increased, from A$819,00 in 2003 to A$2,986,927 in 2012;
- BUT the overall percentage of the cardiovascular research funds allocated to cardiac arrest projects hovered around 1-2% until 2012, when it rose to 2.9%

Out-of-hospital cardiac arrest (OHCA)

• Is a major public health problem with a high case fatality (>90%)
• Survival outcomes have not improved, despite decreasing incidence of coronary artery disease and 50 years since the advent of cardiopulmonary resuscitation (CPR)
• We need to do something different if we want to see changes in OHCA survival outcomes...
NH&MRC CRE application 2011

Chief Investigators

• Prof Peter Cameron
  Monash DEPM

• Prof Ian Jacobs
  UWA/SJA(WA)

• A/Prof Stephen Bernard
  Monash DEPM

• Prof Judith Finn
  UWA/ Monash DEPM

• Dr Karen Smith
  AV / Monash DEPM

• Prof Peter Thompson
  UWA / SCGH

• Prof Andrew Tonkin
  Monash DEPM

Associate Investigators

• Prof Hugh Grantham
  Flinders Uni / SAAS

• A/Prof Peter Morley
  Melbourne Uni /RMH

• A/Prof Tony Walker
  AV

• Prof Antonio Celenza
  UWA EM / SCGH

• Dr Teresa Williams
  UWA EM

• Prof Andrew Forbes
  Monash DEPM

• Prof Graham Nichol
  Uni of Washington / ROC

• Prof Gavin Perkins
  Warwick Uni
NHMRC funding objectives for CREs:

• support the conduct and development of innovative, high quality, collaborative research;
• ensure effective translation of research into health policy and / or practice;
• foster and build capacity in the health and medical research workforce; and
• provide opportunities to expand and improve collaborations between research teams.
Australian Resuscitation Outcomes Consortium (Aus-ROC)

• Centre of Research Excellence (CRE), funded by the National Health & Medical Research Council (NHMRC) for 5 years (2012-2016).

• Collaborative venture (initially) between Investigators from three Australian Universities: Monash University (Vic); The University of Western Australia (WA); and Flinders University (SA) AND three State Ambulance Services: Ambulance Victoria; St John Ambulance Service (WA) and the South Australian Ambulance Service.

• National & International collaborators
Aus-ROC CRE funding 
$2.5mill over 5 years

• Postdoctoral Fellows
  – 2 Vic; 1 WA; 1 SA
• PhD students
  – 2 Vic; 2 WA; 1 SA
• Part-time Director
• Part-time Executive Officer
• Direct research costs
• No specific project funding**
Aus-ROC Mission

• The mission of Aus-ROC is to improve outcomes in patients with out-of-hospital cardiopulmonary arrest.

• Aus-ROC is modelled on the highly successful North American (United States and Canada) Resuscitation Outcomes Consortium.

https://roc.uwctc.org
Resuscitation Outcomes Consortium

ROC is a clinical trial network focusing on research in the area of pre-hospital cardiopulmonary arrest and severe traumatic injury.

Mission

The mission of the Resuscitation Consortium is to provide infrastructure and project support for clinical trials and other outcome-oriented research in the areas of cardiopulmonary arrest and severe traumatic injury that will rapidly lead to evidence-based change in clinical practice. The focus on pre-hospital and early hospitalization interventions recognizes the critical importance of this time frame and early congruence between the emergency cardiac and trauma populations. ROC Investigators will conduct collaborative trials of variable size and duration (equally directed towards the cardiac and trauma populations), leveraging the combined power of the member institutions and promoting the rapid translation of promising scientific and clinical advances for the public good.
Participants

Participating Sites

Regional Clinical Centers
- Dallas/Fort Worth Center for Resuscitation Research
- The Milwaukee Resuscitation Research Center
- Ottawa Ontario RCC
- British Columbia RCC
- Pittsburgh Resuscitation Network
- Oregon Health & Sciences University - Portland Resuscitation Outcomes Consortium
- Seattle-King County Center for Resuscitation Research at the University of Washington
- Alabama Resuscitation Center
- Toronto Regional RESusCitation REsearch out of hospital NETwork
- UCSD/San Diego Resuscitation Research Center

Satellite Centers
- Memphis Resuscitation Research Center
- San Francisco Clinical Center
- Cincinnati Clinical Center
- Houston Clinical Center
- Houston Clinical Coordinating Center
- Houston Data Coordinating Center
- Toronto Sunnybrook Clinical Center
- Baltimore Clinical Center
- Tucson Clinical Center
- Los Angeles Clinical Center
Aus-ROC compared to ROC

• Among the 10 sites in the North American ROC, the total catchment population is **21.4 million**, involving some **94 EMS services**.

• Across the 3 sites for Aus-ROC the total catchment population is half that of ROC at **9.49 million** (Vic=5.5m; SA=1.6m; WA=2.2m), and will (initially) involve **three EMS systems** (Ambulance Victoria, South Australia Ambulance Service and St John Ambulance (Western Australia))
Aus-ROC specific aims

- undertake large **multi-centre clinical trials** *(initially)* across three jurisdictions.
- establish an Australia-wide (&NZ) OHCA ‘epistry’ (epidemiologic registry) to monitor and report on the population-based effects of changes in pre-hospital resuscitation policy and practice.
- examine **system-based strategies** to improve the efficiency and effectiveness of pre-hospital emergency care for OHCA in urban and rural environments.
- **build capacity** in pre-hospital emergency care research across Australia through graduate research and post-doctoral training.
Aus-ROC Research Fellows
+ PhD scholars

Post-doctoral Research Fellows

- Dr Janet Bray  Monash Uni
- Dr Lahn Straney  Monash Uni
- Dr Tiew-Hwa (Katherine) Teng  UWA
- Dr Cindy Hein  Flinders Uni

PhD Scholars

- Kylie Dyson  Monash Uni
- Dr Shelley Kirkbright  UWA
- TBA  Monash Uni
- TBA  Curtin Uni
- TBA  Flinders Uni
Consumer representation

Mr Brian Stafford (Perth)
Health Consumers’ Council WA Inc

Mr Jeff Waters (Melbourne)
Journalist for the ABC's News Division
Cardiac arrest survivor

Ms Louise Owen (Lennox Head NSW)
Owner – Hearst and Minds Education
Cardiac arrest survivor
2013 Spark of Life Free paper sessions
Aus-ROC Investigators / Research Fellows / or Students

Session 3: Out of Hospital Chair: Fin Macneil

1400-1415 Issues in establishing the refractory out-of-hospital cardiac arrest treated with mechanical CPR, Hypothermia, Ecmo and Early Reperfusion (CHEER) study – Authors: D Stub, S Bernard, V Pellegrino, K Smith, Tony Walker, M Stephenson, J Shendylake, L Hockings, S Duffy, J Shaw, P Cameron, D Smit, D Kaye

1415-1430 Air versus oxygen in myocardial infarction (AVOID) study: Trial methods & Experience from Initial randomisations – Authors: K Smith, D Stub, Z Nehme, J Bray, M Stephenson, S Bernard and the AVOID Steering Committee

1430-1445 Exploring gender differences and the “Oestrogen Effect” in an Australian out-of-hospital cardiac arrest population – Authors: JE Bray, D Stub; S Bernard and K Smith on behalf of the VACAR steering committee

1445-1500 Evaluating the impact of air pollution on the incidence of out-of-hospital cardiac arrest (OHCA) in the Perth metropolitan region: 2000-2010 – Authors: Lahn Straney, Alexandra Bremner, Andrew Tonkin, Martine Dennekamp, Ian Jacobs, Judith Finn

1500-1515 Trends in incidence of out-of-hospital cardiac arrest in Perth, Western Australia, 1996-2010 – Authors: S Di Palma, JE Bray, I Jacobs, J Finn

1515-1530 Early termination of EMS resuscitation from out-of-hospital cardiac arrest in Victoria, Australia – Authors: Z Nehme, E Andrew, S Bernard, K Smith
2013 Spark of Life Free paper sessions
Aus-ROC Investigators / Research Fellows or Students

Session 2: First Aid  Chair: John Pearn
1400-1415 The precordial thump for first-line treatment of EMS witnessed out-of-hospital cardiac arrest in Melbourne, Australia – Authors: Z Nehme, E Andrew, J Bray, S Bernard, K Smith
1415-1430 Drowning related out-of-hospital cardiac arrests: characteristics and outcomes – Authors: K Dyson, A Morgans, J Bray, B Matthews, K Smith
1430-1445 Pool fencing – can Australia go much further? – Authors: Richard C Franklin, Amy Peden, Kerrianne Watt, Peter Leggat
1445-1500 Accuracy of the Heartstart Automatic External Defibrillator in Identifying the Initial Shockable Rhythm - M Boyle, A Morton
1515-1530 Challenges and opportunities in CPR and First Aid Training – Authors: Richard C Franklin, John H Pearn, Kerrianne Watt, Amy Peden, Peter Leggat, Peter Aitken
1500-1515 The Impact of Defibrillation by Members of the public on cardiac arrest survival in Victoria M Ljovic, S Bernard, Z Nehme, T Walker and K Smith on behalf of the Victorian Ambulance Cardiac Arrest Registry Steering Committee
Spark of Life Free paper sessions
Aus-ROC Investigators / Research Fellows or Students

Session 1: In Hospital Chair: Natalie Hood

1400-1415 The impact of out-of-hospital cardiac arrest on the quality of life of adult survivors – Authors: M Lijovic, S Bernard and K Smith, on behalf of the Victorian Ambulance Cardiac Arrest Registry Steering Committee

1415-1430 Arterial Carbon Dioxide tension and survival to discharge home after non-traumatic cardiac Arrest: An observational Cohort Study – Authors: G M Eastwood, A G Schneider, R Bellomo, M Bailey, M Lipcsey, D Pilcher, P Young, P Stow, J Santamaria, E Stachowski, S Suzuki, C Warzinski, J Pilcher

1430-1445 Is attempted resuscitation of traumatic cardiac arrest worthwhile? Authors: L McIntosh, S Raven, J Quinn, D Bunting, S Rashford, M Reade

1445-1500 A tale of an extraordinary survival from a cardiac arrest: A team effort – Authors: C Hein, H Grantham, D Teubner

1500-1515 Recognition and response to the clinical deteriorating patient - Author: C Gale

1515-1530 An educational scaffold to achieve ongoing quality CPR performance: an example program to improve survival rates across one County in California – Authors: Angelo Salvucci, MD, FACEP, Eric Chappell, Ph.D
Framework for developing a programme of research in resuscitation.
Proposed Program of Research
Focus on 4 key areas

1. Reducing the time to definitive care
   - medical dispatch
   - Public Access Defibrillation

2. Intra-arrest clinical intervention research
   - clinical trials eg ‘RINSE’

3. Post-resuscitation Care
   - in-hospital management

4. Cardiac Arrest Outcomes Research
   - cardiac arrest ‘epistry’
Aus-ROC Epistry Aims

1. Establish a comprehensive ongoing data infrastructure to facilitate the design, implementation and interpretation of Aus-ROC trials.

2. Define the incidence and outcome of out-of-hospital cardiac arrest, including quality of life after hospital discharge.

3. Describe the relationships between resuscitation performance and EMS structure, adjusting for episode-specific factors.

4. Evaluate the relationships between outcome and patient, EMS, regional, and periodic factors.

### Table 4. Incidence and Outcome of EMS-Treated Out-of-Hospital Cardiac Arrest

<table>
<thead>
<tr>
<th></th>
<th>Alabama (n = 267)</th>
<th>Dallas (n = 1265)</th>
<th>Iowa (n = 565)</th>
<th>Milwaukee (n = 801)</th>
<th>Ottawa (n = 1836)</th>
<th>Pittsburgh (n = 575)</th>
<th>Portland (n = 793)</th>
<th>Seattle (n = 1170)</th>
<th>Toronto (n = 2992)</th>
<th>Vancouver (n = 1634)</th>
<th>Overall (n = 11898)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted incidence rate per 100,000</td>
<td>40.3</td>
<td>82.9</td>
<td>51.3</td>
<td>86.7</td>
<td>45.1</td>
<td>51.1</td>
<td>47.0</td>
<td>74.4</td>
<td>57.0</td>
<td>52.8</td>
<td>56.0</td>
</tr>
<tr>
<td>Adjusted mortality rate per 100,000</td>
<td>36.9</td>
<td>77.2</td>
<td>44.4</td>
<td>78.0</td>
<td>42.3</td>
<td>47.1</td>
<td>41.0</td>
<td>62.3</td>
<td>53.6</td>
<td>46.9</td>
<td>50.9</td>
</tr>
<tr>
<td>Case-fatality rate, %</td>
<td>91.7</td>
<td>92.6</td>
<td>86.9</td>
<td>90.1</td>
<td>93.5</td>
<td>92.3</td>
<td>86.8</td>
<td>83.5</td>
<td>93.8</td>
<td>88.5</td>
<td>90.7</td>
</tr>
<tr>
<td>Survival to discharge, %</td>
<td>3.0</td>
<td>4.5</td>
<td>11.0</td>
<td>9.7</td>
<td>5.3</td>
<td>7.0</td>
<td>10.6</td>
<td>16.3</td>
<td>5.5</td>
<td>9.7</td>
<td>7.9</td>
</tr>
<tr>
<td>Vital status data missing, %</td>
<td>5.3</td>
<td>2.9</td>
<td>2.1</td>
<td>0.1</td>
<td>1.2</td>
<td>0.7</td>
<td>2.5</td>
<td>0.2</td>
<td>0.7</td>
<td>1.7</td>
<td>1.4</td>
</tr>
</tbody>
</table>

Abbreviation: EMS, emergency medical services.

*All rates were unequal across sites at \( P < 0.001 \).*

### Table 5. Incidence and Outcome of Ventricular Fibrillation

<table>
<thead>
<tr>
<th></th>
<th>Alabama (n = 65)</th>
<th>Dallas (n = 195)</th>
<th>Iowa (n = 135)</th>
<th>Milwaukee (n = 165)</th>
<th>Ottawa (n = 429)</th>
<th>Pittsburgh (n = 102)</th>
<th>Portland (n = 249)</th>
<th>Seattle (n = 297)</th>
<th>Toronto (n = 614)</th>
<th>Vancouver (n = 478)</th>
<th>Overall (n = 2729)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted incidence rate per 100,000</td>
<td>9.9</td>
<td>12.8</td>
<td>12.4</td>
<td>18.7</td>
<td>10.4</td>
<td>9.3</td>
<td>15.1</td>
<td>19.0</td>
<td>11.4</td>
<td>15.2</td>
<td>12.8</td>
</tr>
<tr>
<td>Adjusted mortality rate per 100,000</td>
<td>8.8</td>
<td>10.7</td>
<td>8.9</td>
<td>13.7</td>
<td>8.6</td>
<td>7.2</td>
<td>11.3</td>
<td>11.5</td>
<td>9.5</td>
<td>10.9</td>
<td>9.8</td>
</tr>
<tr>
<td>Case-fatality rate, %</td>
<td>89.2</td>
<td>82.7</td>
<td>72.9</td>
<td>74.0</td>
<td>83.1</td>
<td>77.5</td>
<td>73.9</td>
<td>59.8</td>
<td>83.0</td>
<td>71.7</td>
<td>76.5</td>
</tr>
<tr>
<td>Survival to discharge, %</td>
<td>7.7</td>
<td>9.5</td>
<td>22.7</td>
<td>26.0</td>
<td>14.8</td>
<td>21.5</td>
<td>22.5</td>
<td>39.9</td>
<td>15.7</td>
<td>25.0</td>
<td>21.0</td>
</tr>
<tr>
<td>Vital status data missing, %</td>
<td>3.1</td>
<td>7.9</td>
<td>4.4</td>
<td>0</td>
<td>2.1</td>
<td>1.0</td>
<td>3.6</td>
<td>0.3</td>
<td>1.3</td>
<td>3.3</td>
<td>2.5</td>
</tr>
</tbody>
</table>

*All rates were unequal across sites at \( P < 0.001 \).*
Differences in survival in OHCA..

• Different definitions ie different numerators and denominators
• Different case-mix eg age, pathophysiology
• Better prehospital and inhospital (post-resuscitation) clinical care
• Better organisation of local emergency medical services
Aus-ROC ‘Epistry’

‘You can’t manage what you don’t measure’

Bring together core data elements from the cardiac arrest registries of:

• Ambulance Victoria (Vic)
• St John Ambulance (WA)
• South Australian Ambulance Service (SA)

• St John Ambulance (NT)
• ACT Ambulance Service
• Wellington Free Ambulance (NZ)
• St John Ambulance (NZ)
Aus-ROC Epistry – extension to existing State OHCA registries

• CPR quality (Q-CPR)
• In-hospital management
  – Emergency department data
  – Intensive care unit data
• Long-term outcomes
  – Morbidity
  – Mortality
• Effect of comorbidity on survival outcomes
• Quality of Life
Kaplan Meir Survival Curve
for all OHCA survivors Perth 1996-2010 (n=457)

During study period
n=143 (31%) died

Median survival
11.77 years

Mean survival
9.6 ± sd=0.3 years
95% CI 9.0 to 10.3 years
Aus-ROC Epistry
Issues that required consideration

- Data ownership
  - recognition of potential sensitivities
- Data harmonisation across all three States
  - core data items; data definitions; outcomes
- Governance Structures
  - Ethics: overarching Monash HREC approval;
  - data transfer / data security
- Data access
  - who / how
The ‘RINSE’ Study
Paramedic Cooling During CPR using a Rapid Infusion of Cold Normal Saline: A Randomized Trial (#1010613)
The NHMRC RINSE Study Investigators

NH&MRC grant Chief Investigators
• A/Prof Steve Bernard  Ambulance Victoria/Monash University
• Prof Peter Cameron  Monash University
• Prof Ian Jacobs  St John Ambulance (WA)/University of WA
• Dr Karen Smith  Ambulance Victoria/Monash University
• Prof Judith Finn  University of WA/ St John Ambulance (WA)

NH&MRC grant Associate Investigators
• Dr Conor Deasy  Monash University
• Dr Linton Harriss  Victoria Ambulance
• Mr Kevin Masci  Victoria Ambulance
• Ms Janet Bray  Victoria Ambulance
• Dr Hugh Grantham  Flinders Uni / SAAS
WA ‘RINSE’ Protocol

For ALL out-of-hospital cardiac arrest patients
- Commence standard SJA-WA advanced cardiac life support protocol
  - commence CPR
  - defibrillate shockable (VF/VT) cardiac rhythm.
- Measure temperature using tympanic probe
- If temp ≥= 34.5 ºC and patient meets all of the other inclusion / exclusion criteria – as listed on the front of the envelope, then OPEN ENVELOPE
- ALLOCATE PATIENT to either cold saline (PARAMEDIC COOLING) or usual care (USUAL CARE), as indicated on the ‘postcard’ inside the envelope.
After arrival at the Emergency Department, all patients receive standard care.
Aus-ROC – Year 1 *Establish*

- Logo and website (updating – with twitter)
- Governance
  - Aus-ROC Governance document
  - Steering Committee (Chair Peter Cameron)
  - Management Committee (Chair Judith Finn)
  - Epistry Management Committee (Chair Ian Jacobs)
  - RINSE Management Committee (Chair Steve Bernard)
- Journal Club
- Post-doctoral Fellows
- PhD Scholarships
- Consumer representatives
# The five years of Aus-ROC (my view)

<table>
<thead>
<tr>
<th>Year</th>
<th>Phase</th>
<th>Descriptors</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2012</td>
<td>Establish Staff, students, profile, processes</td>
</tr>
<tr>
<td>2</td>
<td>2013</td>
<td>Build Programme of research</td>
</tr>
<tr>
<td>3</td>
<td>2014</td>
<td>Expand Partnerships – national &amp; international</td>
</tr>
<tr>
<td>4</td>
<td>2015</td>
<td>Evolve New funding sources / priorities</td>
</tr>
<tr>
<td>5</td>
<td>2016</td>
<td>Transition The new Aus-ROC post CRE funding</td>
</tr>
</tbody>
</table>
In Summary

• Aus-ROC aims to **build capacity** in resuscitation research and **foster collaboration** between academia and industry from across Australia (and beyond), with the over-arching goal of **improving patient outcomes** from OHCA.

• OHCA is a **major public health issue** that requires a concerted **interdisciplinary collaborative** effort across the health system with clinicians, researchers and service providers **working together**.
Louise Owen and daughter – the ‘big picture’

- A ‘typical’ School day as a teacher in Grafton in 1990
- 30 years old mother of one (Grace)
- 26 weeks pregnant
- Sudden Cardiac Arrest
- Alarm raised by students + CPR performed by colleagues
- Defibrillation by Ambulance Officers 8 minutes later
- Transferred to Brisbane Hospital
- Katy born by Caesarian section – 13 weeks premature – but healthy
- Louise continues to be a strong advocate for resuscitation practice, training and research

Photo from [www.surgeons.org/surgical_news](http://www.surgeons.org/surgical_news)
Australian Resuscitation Outcomes Consortium (Aus-ROC)

A NHMRC Centre of Research Excellence in Clinical Research

www.ausroc.org.au
Thank you for your attention. Feel free to contact me

judith.finn@uwa.edu.au OR judith.finn@monash.edu

Perth

Melbourne