dial 1:800 ECMO!
ExtraCorporeal Membrane Oxygenation

for patients with severe cardiac or respiratory failure

- potentially reversible
- refractory to maximal conventional Rx

is a modified heart-lung machine

- pump, oxygenator, cannulae, tubing

vein to artery (VA): cardiac support

vein to vein (VV): respiratory support
ECMO looks pretty simple...
rationale for ECMO retrieval.

patients who need ECMO may not be safely transportable to a hospital that can provide it.
First ECMO retrieval in NSW...

- Newcastle, Easter 2007
- 24 year-old, streptococcal pneumonia
- Attempted conventional retrieval unsuccessful
- 6 person ECMO team sent from RPAH, medical retrieval team departed scene before they arrived...
Tamworth, a few months later...

34 yo. male farmer: community acquired pneumonia

ventilated for 3/7:

100% O₂, PCV 30/17, Vₜ 500ml, prone, L) pleural effusion drained..

- pH 7.02 (6.88-7.12)
- pO₂ 47 (27-56mmHg)
- pCO₂ 119 (97-175mmHg)  average / 12 hours
OMG!
Long distance ECMO road retrieval: Tamworth to Sydney Towne
transportation problems..

- patient + medical perfusionist returned by road (> 5 hours..)
- surgeon and perfusion technician returned by commercial flight..
- total retrieval duration ~ 20hours..
developing an ECMO retrieval program:

• who should you go and get?

• who will go and get them?

• where will the patients go?

• what equipment do you need?

• how will the ECMO team and patient be transported?

• who will coordinate the retrieval?

• how will it be funded?
who will we go get?

developing indications for ECMO referral..

2006:

ECMO “working party” formed to develop indications for ECMO referral

senior clinicians from:

Royal Prince Alfred / St Vincents / Prince of Wales / Royal North Shore / Liverpool / St George / Westmead / Newcastle / Nepean / Alfred (Melbourne):
NSW INDICATIONS FOR ECMO REFERRAL

Non-cardiogenic respiratory failure
Potentially reversible
(Pneumothorax / large pleural effusion drained, trial of diuresis)

Cardiogenic shock of any aetiology
Potentially reversible
OR candidate for destination therapy
Refractory to maximal medical Rx
OR: Fulminant myocarditis*
requiring inotropes or IABP at any time

Optimal ventilation
(including PEEP >10cmH2O)
Consider PCV or CMV:
VT < 8ml /kg (ideal body weight),
prone ventilation,
recruitment manoeuvre

PaO2 / FiO2 < 80mmHg
or pH < 7.25
for > 2 hours

Contact on-call ECMO Centre via MRU:
1800 650 004

* left heart failure + aseptic febrile illness < 2 weeks,
marked troponin elevation, abnormal ECG
and / or arrhythmia

Absolute contraindications to all forms of ECMO
* Significant pre-existing co-morbidity, such as irreversible neurological condition, Child-Pugh B or worse cirrhosis (ascites, hepatic encephalopathy or recent variceal haemorrhage), active malignancy with predicted limited survival.

Absolute contraindications to veno-venous ECMO (for respiratory failure)
* Severe pulmonary hypertension (mPAP > 50mmHg)
* Severe right or left heart failure (EF < 25%)

Absolute contraindications to veno-arterial ECMO (for cardiac failure)
* Severe aortic valve regurgitation
who will go get them?

**ECMO team:**

cardiac surgeon + medical perfusionist

 +/- perfusion technician

**Retrieval team:**

retrieval doctor + paramedic or flight nurse
where will the patients go?

January 2008

RPAH and St. Vincent’s Hospital agree to share referrals for ECMO support, providing an ECMO team to the referring hospital.
November 2007:

NSW Ambulance Service established a working party to address the logistical / equipment issues for ECMO retrieval

representatives:

- road, helicopter, fixed wing ambulance
- aeromedical engineering
- Ambulance Medical Retrieval Unit
- ECMO specialists
2009: delivery of Cardiohelp ECMO pumps
Cardiohelp pump secured on to front cabinet of Mercedes Sprinter ambulance
~ 2000 km
March 2009:

NSW Department of Health provided capital funding for ECMO retrieval and committed to fund 10 ECMO retrievals / year
Swine flu warning as deaths increase

Wanted: robots to enter combat zone

The Sydney Morning Herald

Tuesday July 14, 2009

HOW HEALTHY IS YOUR CHILD’S FOOD?

Good Living Liftout

CROSS TO BEAR
The burden of the highest honour

Paul Daley • Page 11

Swine flu warning as deaths increase

Elective surgery in doubt

Kate Benson

HEALTH experts fear the state’s swine flu death toll could soar with six young, healthy people in Sydney fighting for their lives on last-resort cardiac bypass machines because their lungs are too damaged or diseased for regular mechanical ventilation.

The surge in the number of people with swine flu leading to life-saving treatment has forced NSW Health to consider closing elective surgery at some big hospitals to allow staff to direct resources.

Dr Herkes said extracorporeal membrane oxygenation, or ECMO, was considered a last-resort treatment, but staff were "throwing everything" at the patients because they were young and relatively healthy.

Patients in respiratory distress are given anticoagulants by machine, and their blood is drained through tubing in their femoral or jugular veins. It is oxygenated outside the body, allowing the lungs to recover.

The Minister for Defence Personnel, Materiel and Science, Greg Combet, called for the development of prototypes of the next generation of robots – fully autonomous “smart” machines that can operate in fires, floods, biological hazards and chemical spills and help detect and defuse unexploded ordnance. The announcement was part of the Multi-Autonomous Ground-robotic International Challenge, jointly sponsored by the Australian and US military and launched in Melbourne yesterday. Photo: John Noudstra

Father’s day over spa

David Rankin, the son who said “it’s time to hit the bottle after being such a good boy” for years, has sent his father a bottle of wine and a pair of hand warmers as a gift for Father’s Day. "I hope he doesn’t mind," he said. "I take care of all the cooking and now I’m reminded of all the help he’s given me over the years."

O’Farrell backflip on league

Ping-pong children

Smh.com.au SEND YOUR NEWS AND VIDEOS TO 0424 SMS SMH

First published 1831 No. 53,999. $1.40

England should be afraid... very afraid

Peter Reoebuck on the Ashes • Page 12

INSIDE

Push to allow gay marriage

THE Rudd Government has been given a push to allow gay couples to marry, or at least gain access to a system of registered civil unions, to amend Labor’s push to amend Labor’s marriage law to allow gay couples to be married in this year’s national conference.

Cheney ‘gave CIA’ on al-Qaeda

THE US President, Barack Obama, is under growing pressure to investigate claims that the former president Dick Cheney warned the CIA not to disclose a top-secret plan to kill al-Qaeda operatives.

Smh.com.au SEND YOUR NEWS AND VIDEOS TO 0424 SMS SMH

First published 1831 No. 53,999. $1.40

England should be afraid... very afraid

Peter Reoebuck on the Ashes • Page 12

INSIDE

Push to allow gay marriage

THE Rudd Government has been given a push to allow gay couples to marry, or at least gain access to a system of registered civil unions, to amend Labor’s push to amend Labor’s marriage law to allow gay couples to be married in this year’s national conference.

Cheney ‘gave CIA’ on al-Qaeda

THE US President, Barack Obama, is under growing pressure to investigate claims that the former president Dick Cheney warned the CIA not to disclose a top-secret plan to kill al-Qaeda operatives.

Smh.com.au SEND YOUR NEWS AND VIDEOS TO 0424 SMS SMH

First published 1831 No. 53,999. $1.40

England should be afraid... very afraid

Peter Reoebuck on the Ashes • Page 12

INSIDE

Push to allow gay marriage

THE Rudd Government has been given a push to allow gay couples to marry, or at least gain access to a system of registered civil unions, to amend Labor’s push to amend Labor’s marriage law to allow gay couples to be married in this year’s national conference.

Cheney ‘gave CIA’ on al-Qaeda

THE US President, Barack Obama, is under growing pressure to investigate claims that the former president Dick Cheney warned the CIA not to disclose a top-secret plan to kill al-Qaeda operatives.
NSW ECMO Retrieval Service

May - November 2009...

25 ECMO retrievals:

16 outside Sydney
9 in Sydney
Winter 2009: 15 ANZ hospitals

68 H1N1 ECMO cases:

38 retrieved on ECMO (56%)
54 survived (79%)
### First 50 Cases: NSW ECMO Retrieval Service 2007-2010

<table>
<thead>
<tr>
<th>Indication</th>
<th>Survival to Discharge</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>respiratory (veno-venous)</td>
<td>39/46</td>
<td>85</td>
</tr>
<tr>
<td>cardiac (veno-arterial)</td>
<td>3/4</td>
<td>75</td>
</tr>
<tr>
<td>all</td>
<td>42/50</td>
<td>84</td>
</tr>
</tbody>
</table>

- NSW: 43
- interstate: 3
- international: 4
- died prior to ECMO: 2
ECMO retrieval in NSW

- indications for ECMO referral promulgated
- fully integrated into ambulance and medical retrieval network
- road / helicopter / fixed wing capability
- compliant with OH and S / CASA regulations
- ECMO database

X
January 2009:
*First aeromedical ECMO retrieval in NSW*

*Mater Hospital, Brisbane to RPAH, Sydney*

17 year-old female, community-acquired pneumonia

ventilated for 2 weeks, recurrent air leaks on HFOV.
Hospital course..

*RPAH:*
- no recovery of lung function
- 3 thoracotomies
- massive transfusion

*SVH:*
- lung transplant
- even more massive transfusion.. (3 take-backs)
- severe right heart failure

Total time on ECMO: **52 days**