ECMO na OAiIT – fanaberia czy konieczność ?

ECMO in ICU a fancy toy or a necessity?

AW Sosnowski

Heart Link ECMO Center

Glenfiled Hospital Leicester

Extra-Corporeal Membrane Oxygenation

ECMO

A technique of extra-corporeal life support which uses heart-lung bypass techniques for days or weeks to support heart or lung function in the Intensive Care Unit.

What is ECMO – Extra Corporeal Membrane Oxygenation ?

1. Extra Corporeal Life Support – ECLS
2. Extra Corporeal Lung Assist – ECLA
3. Extra Corporeal CO2 Removal – ECCO2R
4. Cardiopulmonary Support – CPS
5. Extra Corporeal Cardiopulmonary Resuscitation - ECCPR

ECMO

What is required

4. Equipment

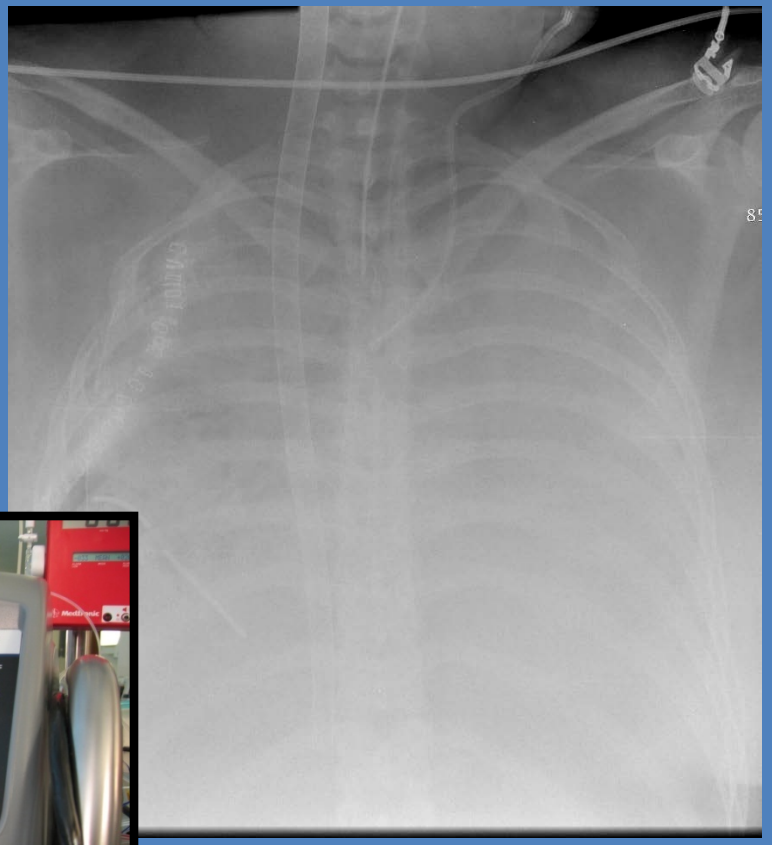
- Percuteneous ECMO canulae

- Roller or cetrifugal pumps

- Membrane oxygenator

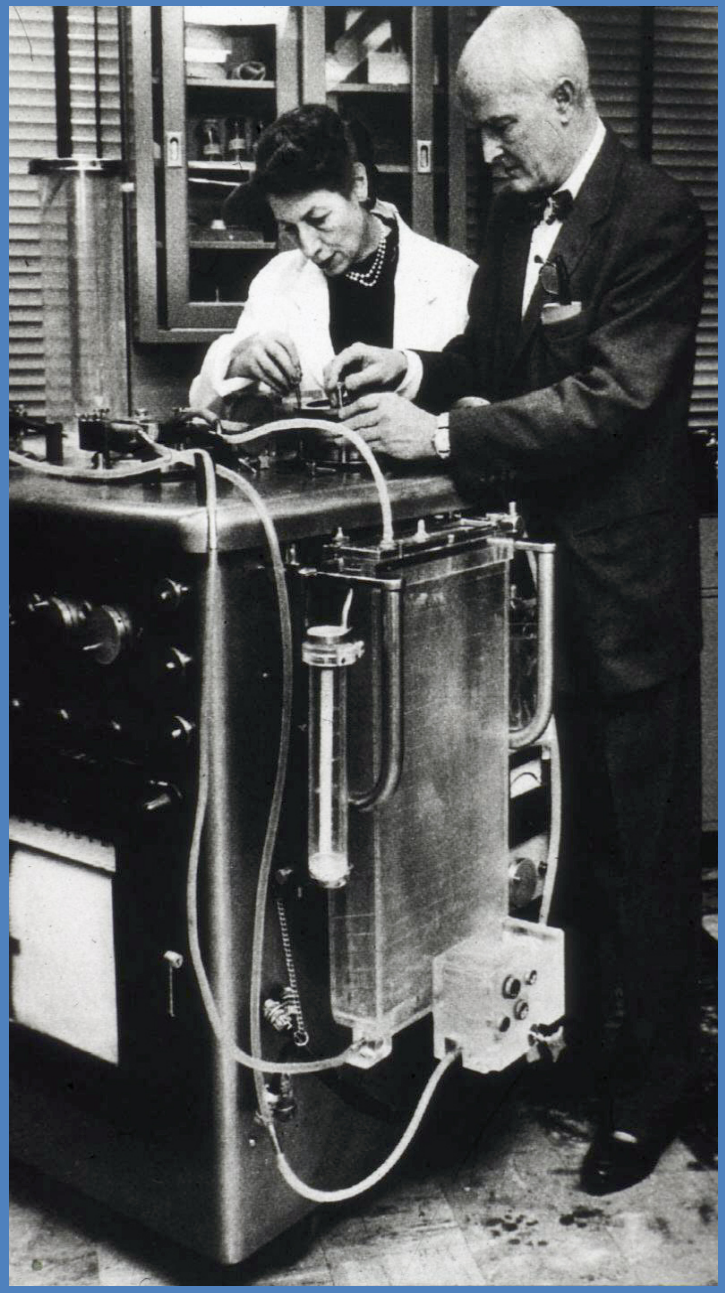
- Heat exchanger

- ECMO circuit



Disadvantages of mechanical ventilation

- high PO2 – oxytrauma
- high pressure - barotrauma



Dr & Mrs Gibbon with their CPB machine

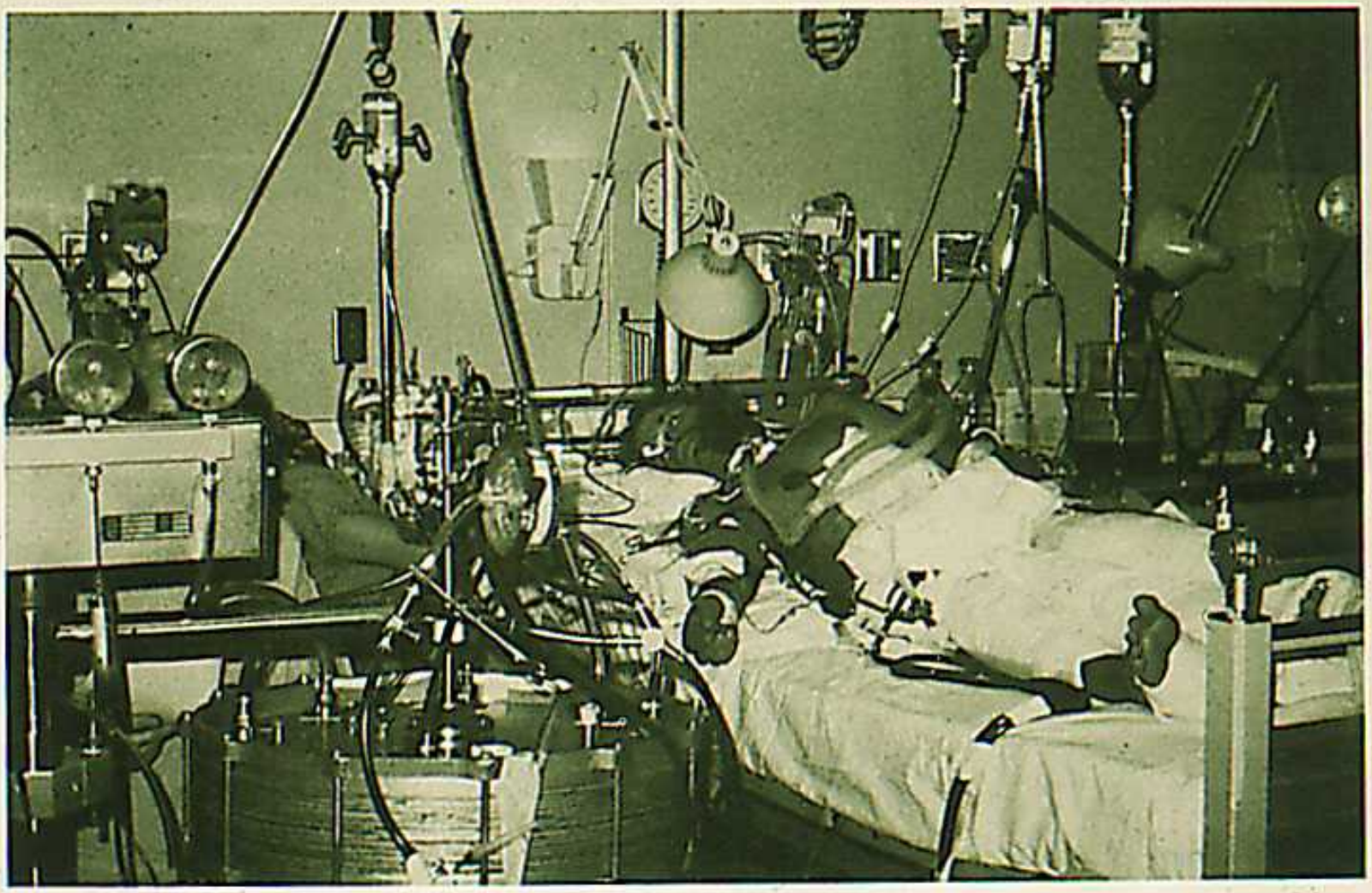


FIGURE 3.4 The first successful extracorporeal life support patient, treated by J. Donald Hill using the Bramson oxygenator (foreground), Santa Barbara, 1971.

The death of ECMO

Zapol et al JAMA 242:2193-96,1979

- NIH study mid 70's
- National multicentre trial
- 90 patients (42 ECMO vs 48 conventional care)
- Entry criteria PaO_2 < 50 mmHg on 100% FiO_2
- Conventional and ECMO group death rate near 90%
- RIP ECMO :- Nice idea shame about the deaths

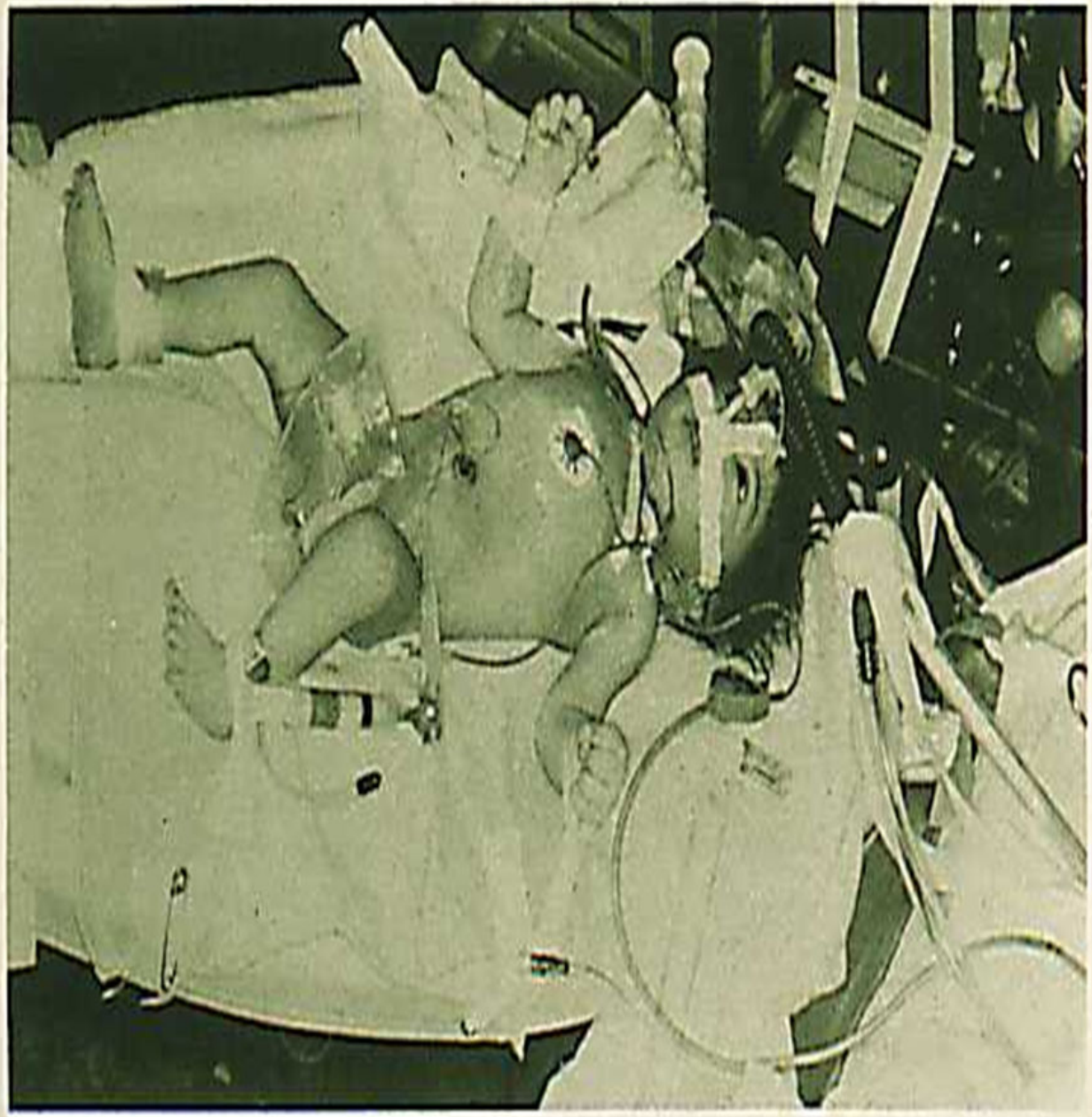


FIGURE 3.6 The first successful neonatal ECMO patient (Esperanza), treated by Bartlett and Gazzaniga at Orange County Medical Center. (A) The patient on ECMO (May 1975) and (B) at age one.

History of ECMO

- 1984 Bartlett Trial
- 1986 Gattinoni ECCOR Series
- 1988 ELSO Database
- 1989 O'Rourke Trial

BMJ 10-1990

SATURDAY 11 AUGUST 1990

BRITISH MEDICAL JOURNAL NO 6747 VOLUME 301

UK Collaborative Neonatal ECMO Trial

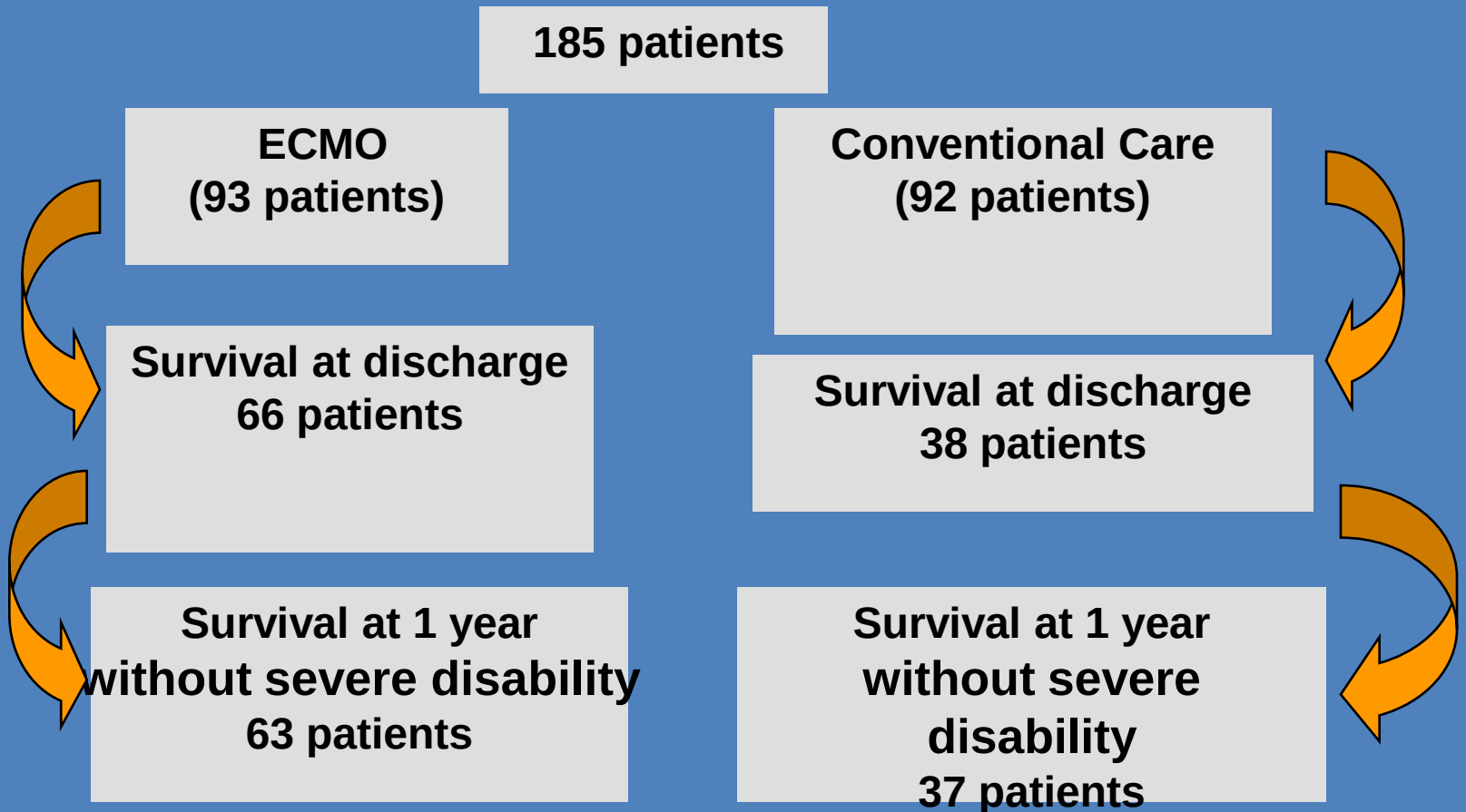
- 1992- Heart Link ECMO centre in Leicester exhausted charitable funding
- Prime Minister's question time
- Meeting with Government's Chief Scientist at DOH
- Trial Steering Committee formed with the Oxford Perinatal Trials Service
- Protocol agreed and funded

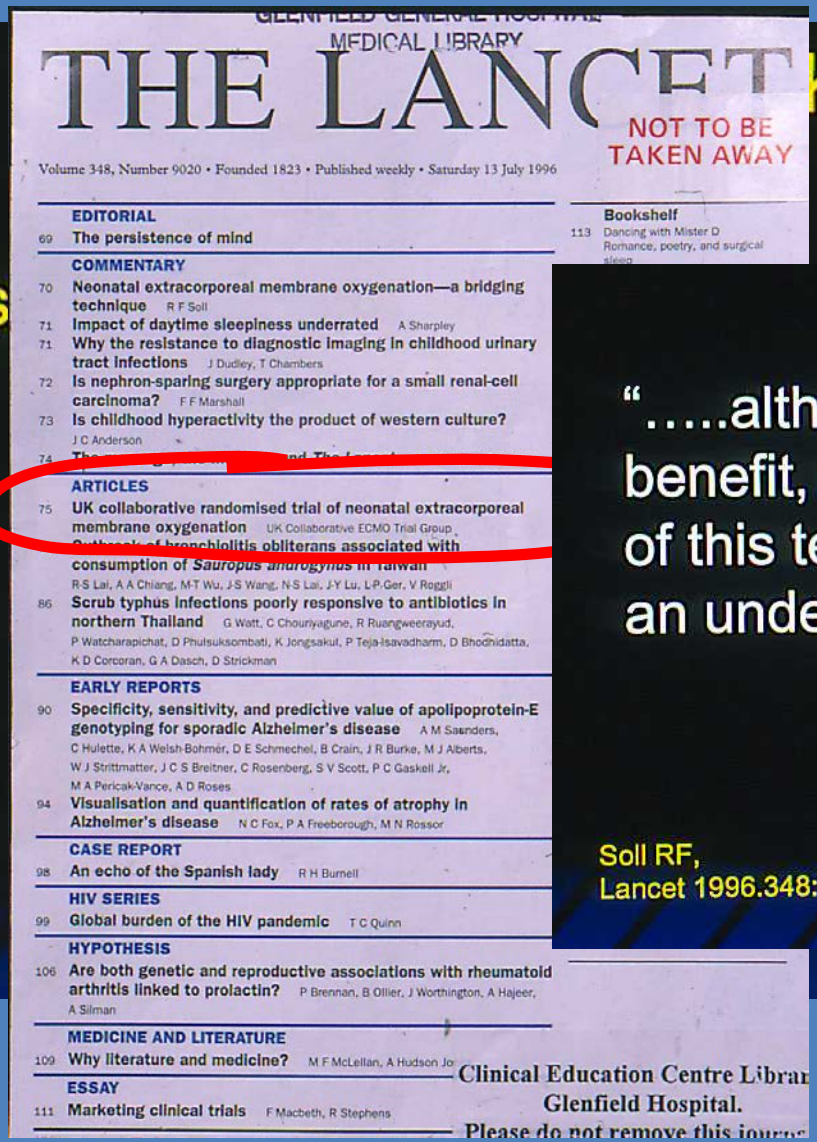
UK Collaborative Trial 1992-1995

- fully randomised trial of ECMO vs conventional therapy for neonatal respiratory failure
- primary end point; death or severe disability at 1 year
- survival to hospital discharge
- pre-school assessment at 4-5 years

Neonatal ECMO
UK COLLABORATIVE TRIAL

Prospective randomised trial, 1992-95
Second report





THE LANCET

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Glas

K.

"…..although ECMO is of benefit, ultimately the use of this technique is considered an undesirable outcome."

Soll RF,
Lancet 1996.348:70.

Results – General health

	ECMO		Conventional	
	60	%	35	%
Asthma	25	**42**	27	**77**
Bronchodilators	14	**23**	22	**63**
Home oxygen	0		1	**3**

For those who do not think that ECMO works !

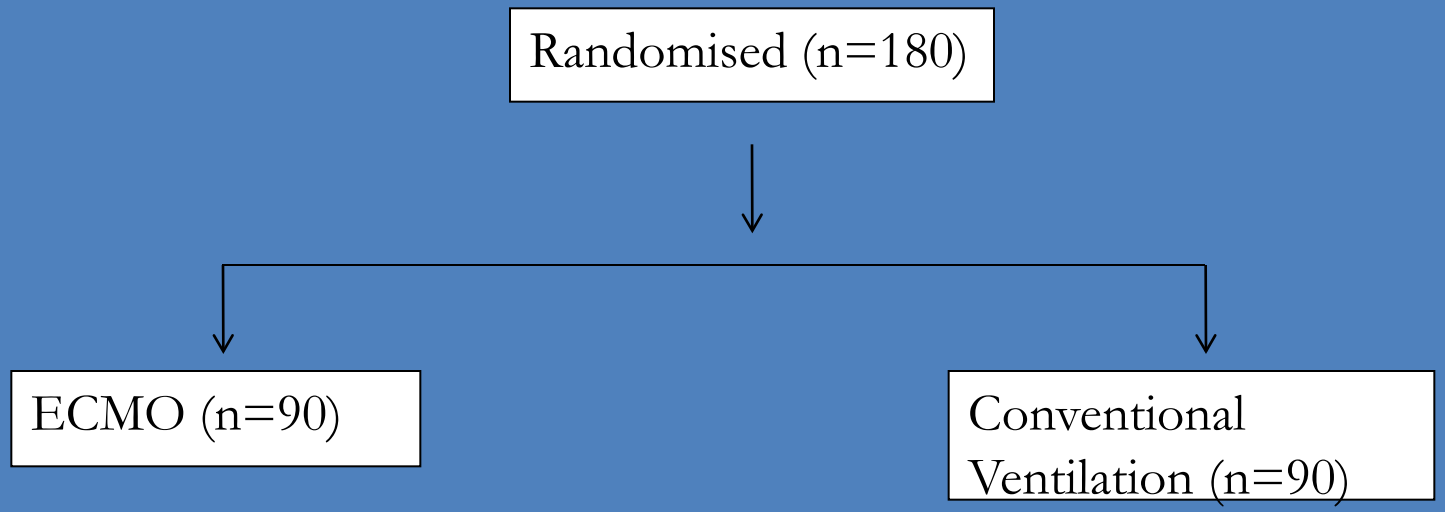
Conclusion from the past

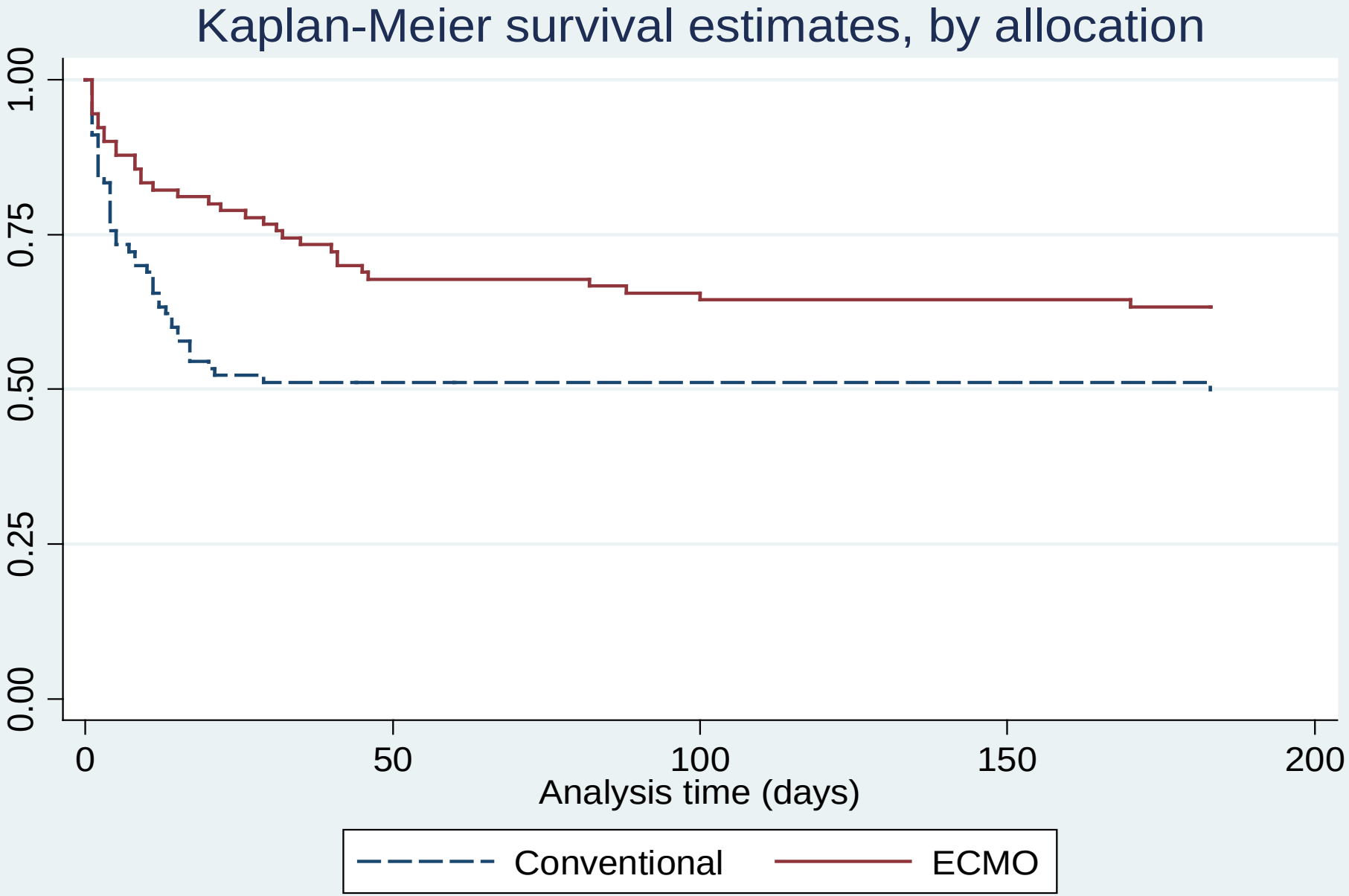
- Still a randomised control trial was required looking at ECMO in the current era
- Measure against improved ITU management post ARDS
- Years spent planning trial
- **Team that successfully proved neonatal ECMO works driving force behind the trial** (heart link ECMO centre Glenfiled Hospital Leicester)

Conventional Ventilation or ECMO for Severe Adult Respiratory Failure

CESAR TRIAL

- Recruitment July 2001 to August 2006
- Enquiries about 766 potentially eligible patients from148 centres
- 180 of these patients (90 in each arm) randomised from 68 centres




Kaplan-Meier survival estimates, by allocation
1.00
0.75
0.50
0.25
0.00
0
50
100
150
200
Analysis time (days)
Conventional
ECMO

Stratified analyses

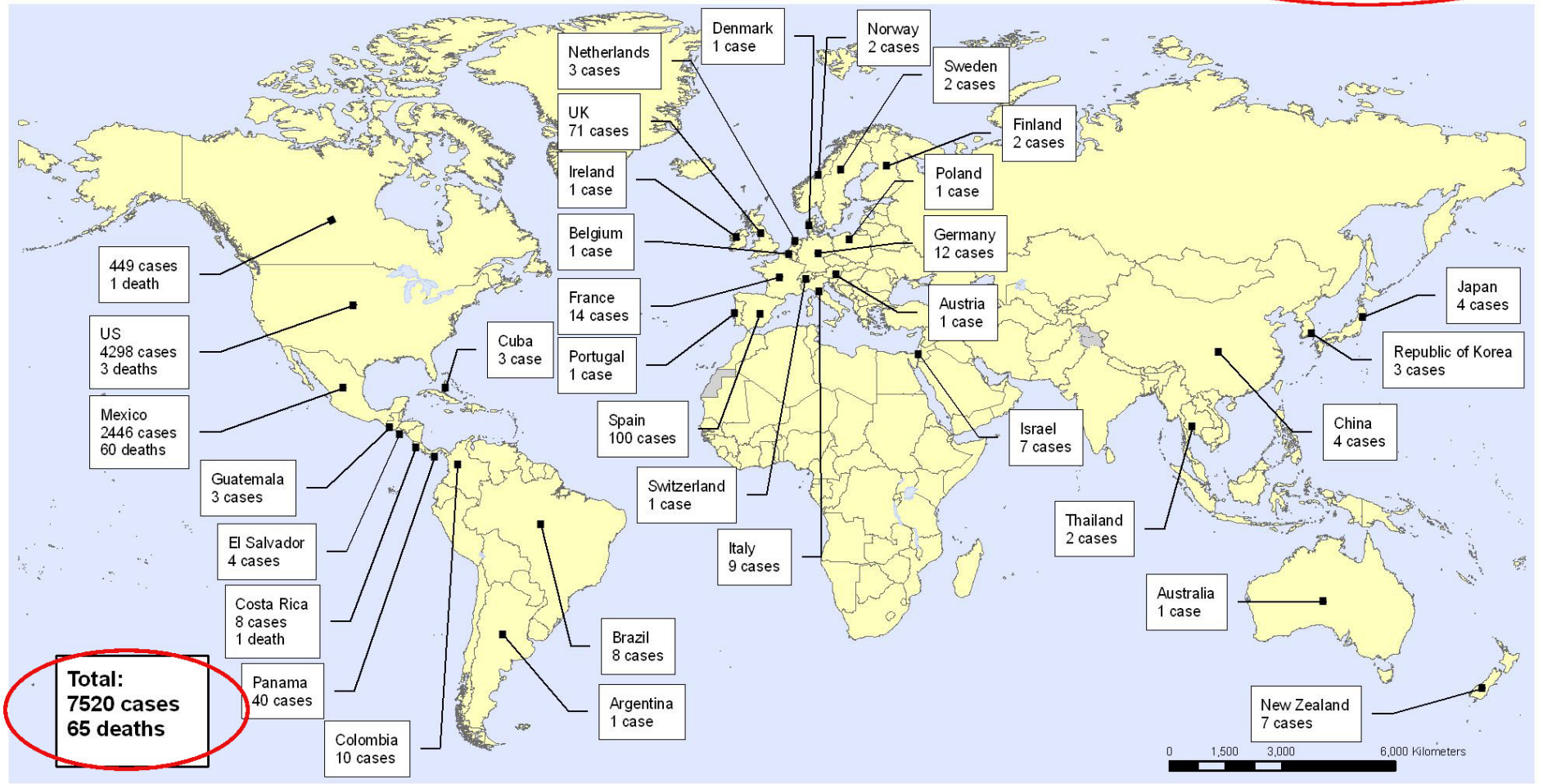
- Benefit of ECMO seen regardless of :
  - Hospital of trial entry (CTC/RH)
  - Age (18-30/31-45/46-65)
  - Hypoxic/hypercarbic
  - Duration of high pressure ventilation/high Fi02 (≤48/>48 hours)
  - Primary diagnosis at trial entry (pneumonia/other ARDS/trauma/other)
  - No. of organs failed (1-2/≥3)

CESAR-Conclusions

- ECMO increases survival for adult patients with severe but potentially reversible respiratory failure
- 1 extra survivor for every 6 patients treated

New Influenza A (H1N1),
Number of laboratory confirmed cases and deaths as reported to WHO

Status as of 15 May 2009 06:00 GMT



Total:
7520 cases
65 deaths

The boundaries and names shown and the designations used on this map do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

World Health Organization

Map produced: 15 May 2009 06:00 GMT

ECLS Registry Report

International Summary

July, 2015

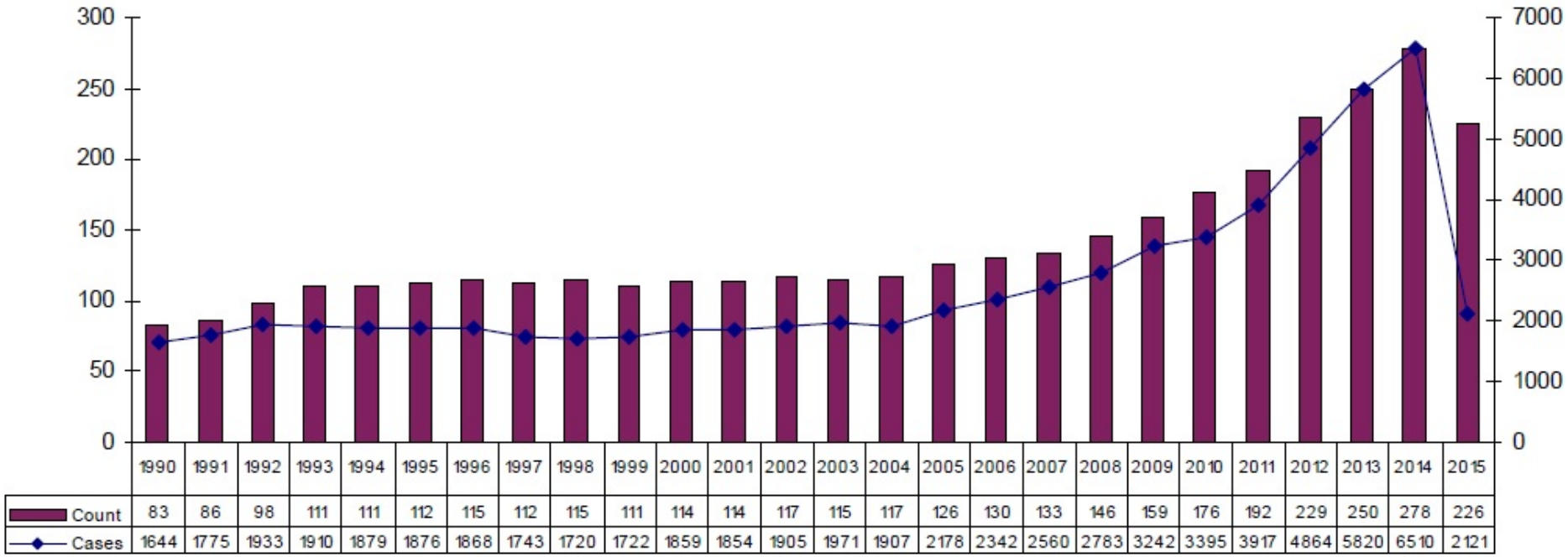
Extracorporeal Life Support Organization
2800 Plymouth Road
Building 300, Room 303
Ann Arbor, MI 48109

Overall Outcomes

	Total Patients	*Survived ECLS*		*Survived to DC or Transfer*	
Total	69,114	49,063	71%	40,764	59%

Centers

Centers by Year



	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Count	83	86	98	111	111	112	115	112	115	111	114	114	117	115	117	126	130	133	146	159	176	192	229	250	278	226
Cases	1644	1775	1933	1910	1879	1876	1868	1743	1720	1722	1859	1854	1905	1971	1907	2178	2342	2560	2783	3242	3395	3917	4864	5820	6510	2121

Why should we develop ECMO program ?

ECMO has got established role as a treatment in a severe respiratory failure in all patients, from neonatal to adults.

There is increased activity with ECMO as an adjunct to surgery for congenital heart disease and as a cardiac support in acute heart failure.
Increased use as a support in complex thoracic/vascular/oncology surgery

Circuits have become more user friendly with the development of the low resistance oxygenators and long term centrifugal pumping systems.

ECMO remains a challenging evolving support technique and is an important and obligatory adjunct to modern Intensive Care and Operating Theatre.