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Acuity nursing transition in the management of ECMO patient's.

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Introduction.

- What are ECMO and ECLS? Why we use this advanced therapy
- Look at what Nelson Mandela Children's Hospital are doing so far with their ECMO service
- Define what is acuity?
- Examine and compare acuity levels of ECMO patients from the around the world
- Look at the Extra-corporeal life support organizations standards on acuity and statistics to date

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Who I am.

- Registered nurse with the South African Nursing Council
- Registered nurse for children with the Nursing and Midwifery Council (UK registered)
- Completed RN child (2006)
- Completed Paediatric Intensive care course, BSc (2013)
- Extra-corporeal life support/Extra-corporeal membrane oxygenation specialist training (2013)
- From a nurse led ECMO centre *
- Previously Senior professional nurse for children within PICU in a regional tertiary paediatric specialist hospital in the UK
- Disclosure; no conflicting interests

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- ECLS/ECMO specialist training completed at a *“lead”* UK centre; Birmingham Children's Hospital

  Registered with Extra-corporeal life support organization (ELSO)

  Advanced form of training, critically manage child and circuit, alter flows and gases within a prescription. Access circuit, trained to respond to the major complications

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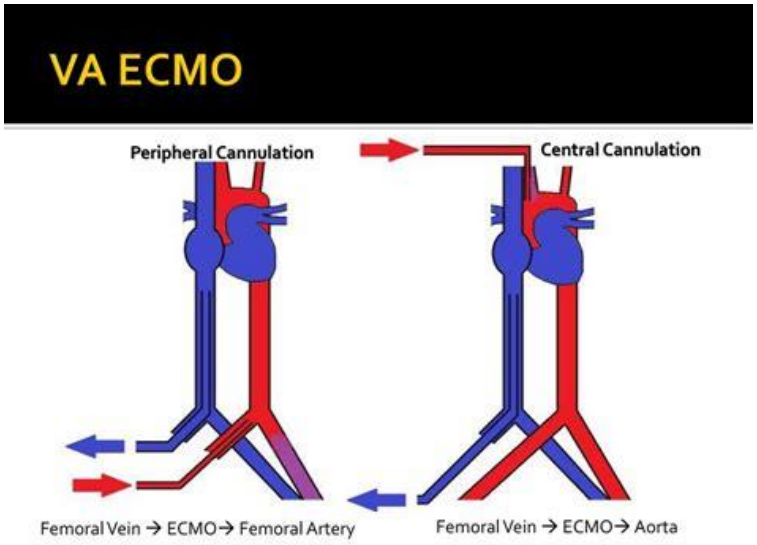
What is Extra-corporeal membrane oxygenation (ECMO) and Extra-corporeal life support (ECLS)?

- Terms now used interchangeably, definition of support now referred to by cannulation VV/VA, typically
- VV or veno-veno provides respiratory support, VA or veno-arterial provides cardiac and respiratory support
- Most advanced life support available
- Nelson Mandela Children's Hospital offers this service



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Indications for ECMO.

- Meconium aspiration
- PPHN
- Thoracic tumors
- Cardiac failure
- Cardiac Arrhythmia
- Bridge to cardiac transplant
- Sepsis
- Failure to separate from bypass
- Cardiac arrest- eCPR
- Viral pneumonias

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Nelson Mandela Children's Hospital ECMO service.

- NMCH have an ECMO service providing VV and VA support
- PICU professional nurses received advanced specialist training by John Hopkins Hospital*
- 13 children supported in the first 12 months
- Nova lung and Minilung
- Pre-dominantly VA ECMO
- So far in second of service year 5 children supported
- Indications are cardiac support TAPVD, ALCAPA, Viral, pneumonias.

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The members of the ECMO interdisciplinary team.

- Intensivist
- Cardiac Surgeon
- Perfusionist
- Cardiac theatre scrub team
- Cardiologist
- ECMO specialist (in the UK a nurse or perfusionist, can also be a RT/biomedical engineer in USA)
- PICU nurse +/- (Depending on staffing model in country)
- ECMO nurse coordinator
- Allied health professionals (Porters, Laboratory, and Haematology)

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What do we mean by acuity level?

"*Acuity can be defined as the measurement of the intensity of the nursing care required by a patient. An acuity-based staffing system regulates the number of nurses on a shift according to the patients' needs, and not according to raw patient numbers*"- American Sentinel (2014).

Is it important?

***Yes*,** it has been found there is a direct link to quality of care, mortality rate, infection, and pressure sores in poor nurse patient ratios (Kaushal *et al*, 2001).

Kaushal *et al*. (2001). Medication errors and adverse drug events in pediatric inpatients. The Journal of the American medical association.

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What is the United Kingdom's stance on acuity levels for the child on ECMO?

- **What is the Paediatric Intensive care Society (PICS) UK?**
- Founded 1987 as a multidisciplinary forum
- Sets **the** standards for Paediatric Intensive Care in the United Kingdom including those of staffing, education and training
- Agrees these standards with the Department of Health/NHS England
- PICS standards (2010) model of acuity in PICU
- PICS standards (2015) model for wte's per PICU bed
- Monitors these standards via PICAnet (data capturing system)

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Paediatric Intensive Care Society Standards, (2010). *Standards for the Care of critically ill children*, 4th Edition. London: Paediatric Intensive Care society. Paediatric Intensive Care Society Standards, (2015). *Quality Standards for the care of critically ill children*. London: Paediatric Intensive Care Society.

The Paediatric Intensive Care Society (PICS UK) levels of care and patient dependency (2010)

- Clinically based staffing model
- The child is reviewed and placed into a category of dependency according to their clinical need
- Levels are 1 through to 4
- This relates directly to staffing ratio required
- Level 1 high dependency staffing ratio of 0.5:1
- Level 2 ventilated 1:1
- Level 3 ventilated on inotropes/vasoactive medication, multi-organ failure 1.5:1
- Level 4 Child requiring ECMO/CVVH 2:1
- Child nursed in a cubicle automatically increases a level

Paediatric Intensive Care Society Standards, (2010). *Standards for the Care of critically ill children, 4th Edition.* London: Paediatric Intensive Care society.

The Pro's and Con's of PICS (2010) standards.

- It can link to the staffing skill level and enables well managed development
- If unit evaluates staff base line skills and categories- enables safe allocation (benefits to unit and personally)
- Link to competencies and education with a defined group of patient intensity
- Allows for the "*what ifs"*, not just the now
- ECMO patients nursed 2:1 (nurse role in ECMO, UK)
- Strict, encouraged to incidence report if non-compliant
- No flexibility, what happens if need exceeds model?

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What is the Australia doing about acuity levels for the child on ECMO?

- Melbourne Royal Children's Hospital 2:1 initially
- If stable on ECMO 1:1 with an ECMO float
- In another centre 2:1 for 48hrs and then until stable
- Based on acuity
- Perfusionist support
- Australian college of critical care nurses (ACCCN cited by College of Intensive Care Medicine) *"there should be greater than 1:1 available for children who require ECMO".*
- Flexible model

College of Intensive Care Medicine of Australia and New Zealand, (2011). *Minimum standards for Intensive Care Units*. CICM

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What is ELSO, and what do they say about ECMO patient acuity levels?

ELSO stands for the Extra-corporeal life support organization and is an "*International non-profit consortium of health care institutions dedicated to development and evaluation of novel therapies for support of failing organ systems*" -ELSO, (2019)

- They maintain a registry of ECMO of active registered centres, world wide
- Their data supports clinical research, provides regulation by publishing standards, and support registered centre's
- They provide educational, training programs and requirements for specialists

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What is ELSO, and what do they say about ECMO patient acuity levels?

- Provides staffing guidelines and education requirements across all professions required for involvement in ECMO service
- State that additional trained personal should be available **readily** for support
- *"There shall be an ECMO clinical specialist in addition to the ICU nurse or an ECMO trained nurse, to provide care throughout the course of ECMO*"

Extracorporeal Life Support Organization. (2014). *ELSO guidelines for ECMO centres.* V1.8

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South West Asia and Africa Chapter SWAAC.

- Sub-division of ELSO
- South Africa Joined in 2016
- Maybe we need to look towards SWAAC participants as our patients have similarities
- SWAAC conference 2020 is in Johannesburg

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Where does that leave us in regards to acuity?

- Specialist paediatric cardio-thoracic surgical centre's should have a supportive ECMO service for this patient indication
- Ethical dilemma is with-holding not offering?
- South Africa has trained 121 paediatric critical care nurses in Africa, numbers increasing but limited skills available on continent (should we be looking at countries with similar numbers)
- Risk assessment
- NMCH strives towards 2:1 acuity

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What are some of the potential recognised complications of ECMO?

- Air entrainment (massive)
- Motor head failure
- Bleeding (hemorrhage)
- Clot formation (circuit stops, or needs section removing)
- Oxygenator failing/failure
- Exploration of child's chest (tamponade, cannulas)
- Rupture of circuit

"*How many professionals from the ECMO interdisciplinary team do you think will be needed in a massive air entrainment?"*

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How many professionals!?!

- Air entrainment (massive) = **NINE**
- In the ideal APLS situation two professionals on the circuit, two rotating on CPR, two checking resuscitation medication, Intensivist leading, MO/registrar hand ventilating, “runner” calling cardiac surgeon, perfusion, cardiology to the bedside- if child is non-pulsatile and has no cardiac output.

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Acuity awareness and impact when starting an ECMO service.

- Do we need to plan a workforce for facilitating two children on ECMO? VA/VV ECMO and consideration to length of runs
- Internal collapse bed/supportive system-shift lead
- Where are we going to keep the awake children with cardiomyopathies/myocardial disease who are high risk of collapse and need a PICU bed?
- Impact on cardiac surgery (if perfusion have to assist running of service and risk of another high risk case, do we assess case by case?)
- If we have a third child who needs ECMO, transferring out where?

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ECMO VA/VV TO DATE (Data obtained from ELSO registry 2019)

- Neonatal age group has the best outcomes in VV ECMO
- Paediatric VV/VA over 50% (eCPR slightly less)
- 40,834 children survived to discharge (DC) or transfer

ECLS Registry Report

International Summary

January, 2019

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

Overall Outcomes

	Total Runs	Survived ECLS		Survived to DC or Transfer	
Neonatal					
Pulmonary	31,591	27,779	87%	23,119	73%
Cardiac	8,252	5,684	68%	3,529	42%
ECPR	1,864	1,315	70%	775	41%
Pediatric					
Pulmonary	9,487	6,797	71%	5,573	58%
Cardiac	11,377	8,155	71%	5,980	52%
ECPR	4,361	2,628	60%	1,858	42%
Adult					
Pulmonary	19,482	13,453	69%	11,565	59%
Cardiac	19,627	11,628	59%	8,381	42%
ECPR	6,190	2,580	41%	1,827	29%
Total	112,231	80,019	71%	62,607	55%

Extra-corporeal life support organization. (2019). *ECLS Registry Report, International summary.* ELSO.

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Conclusion.

- ELSO recommendations 2:1 acuity level and that staff should be readily available for ECMO
- PICS UK recommendations 2:1
- Australian college of critical care nurses 1:1 with staff also readily available
- Melbourne children's hospital 2:1 or 1:1 with a ECLS float
- Another centre in Australia 2:1 for 48 hours or until stable
- ELSO South west Asian and African chapter; SWAAC

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“Do you have any questions?”

Thank you for listening to, and for attending our inaugural paediatric practice and education nursing conference.

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