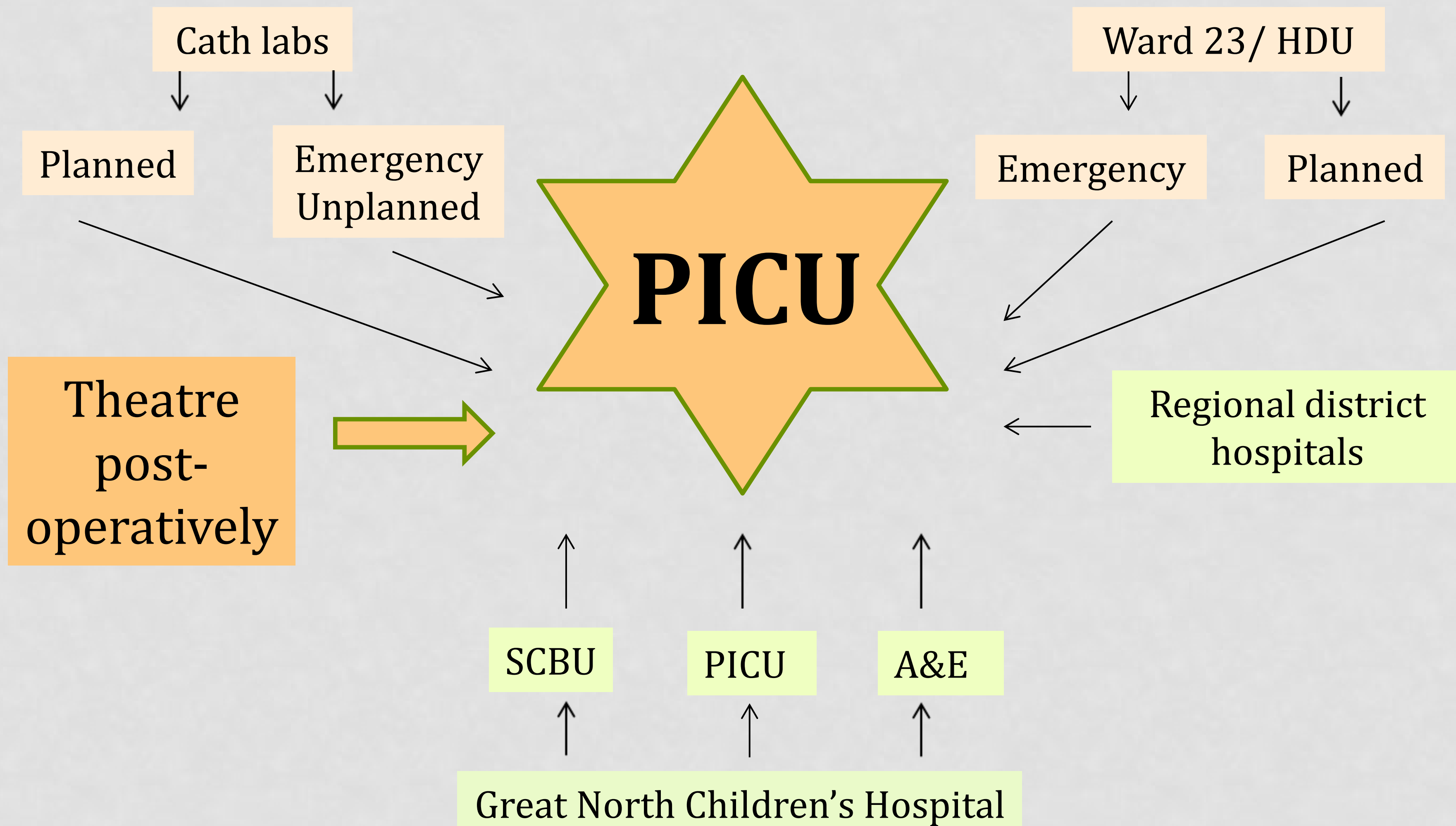
THE POST- OPERATIVE CARDIAC PATIENT

Paediatric Intensive Care

Sarah Lane, Congenital Heart Disease Clinical Educator (June 2020)

ADMISSION TO PICU



THE IMMEDIATE FIRST HOUR

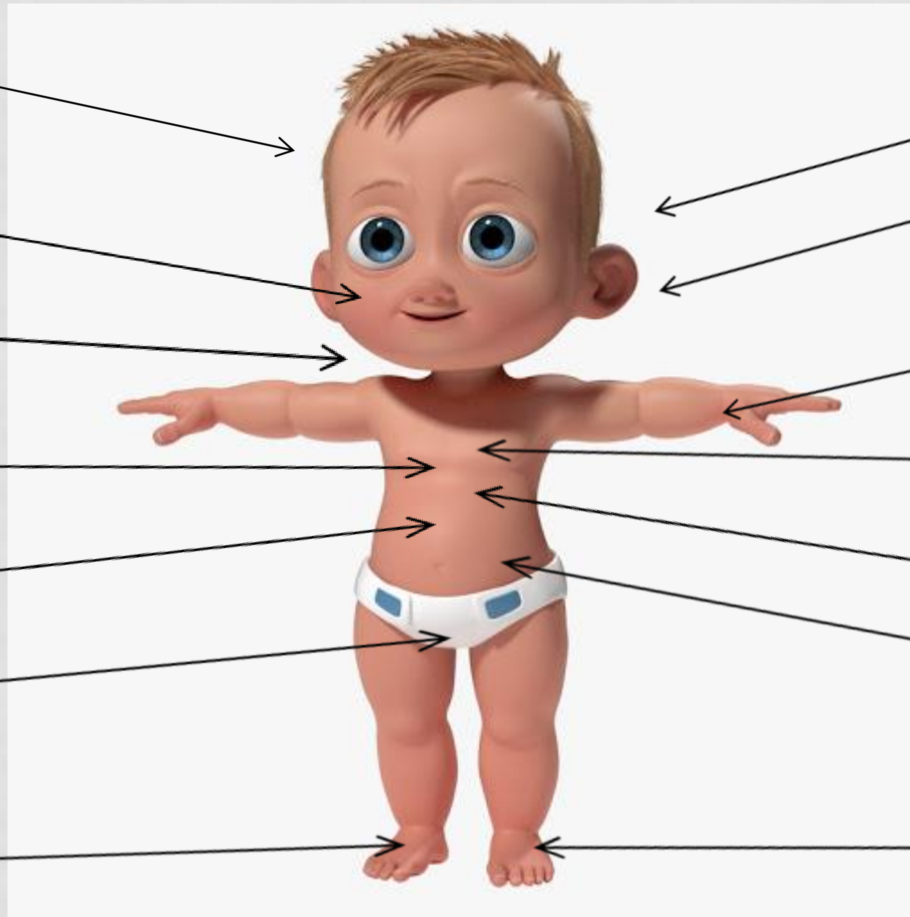
STABILISING!

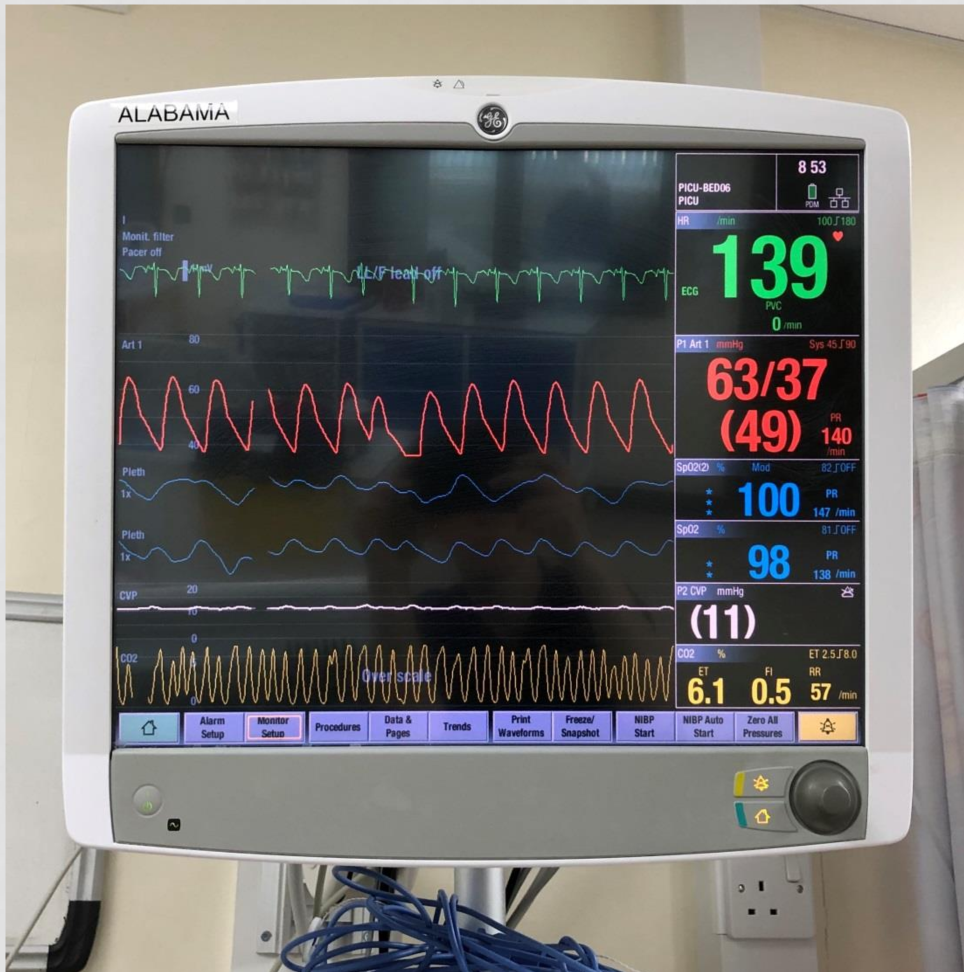
UPON ARRIVAL…

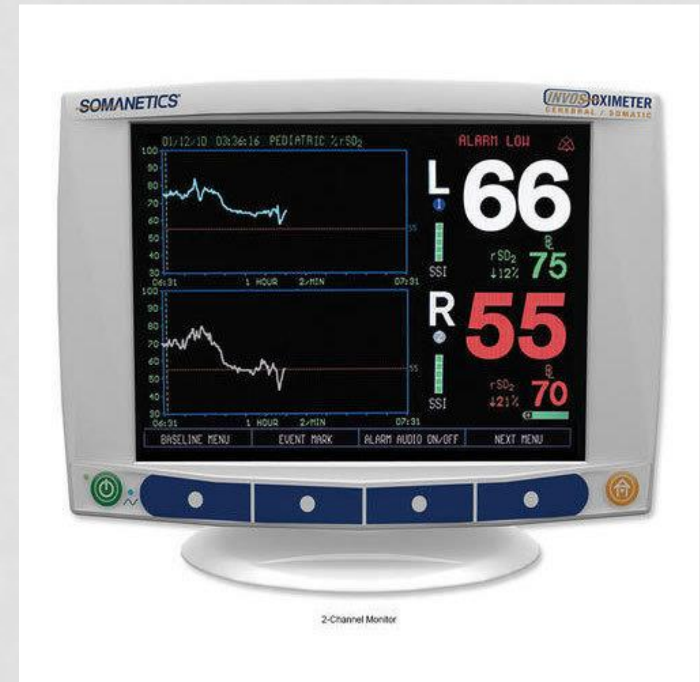
A-E ASSESSMENT OF THE PATIENT!

- ABG & VBG
- ACT if post- bypass
- FBC, U&E, LFTs, COAG screen
- CXR
- ECG
- Commence Morphine or Fentanyl infusion for pain relief
- If required IV sedation and/or muscle relaxant
- Commence maintenance fluids
- Administer Fluid bolus if signs of hypovolaemia
- Consider the administration of clotting products and RBC if required
- Commence additional inotropes if unstable
- Perform a neurological assessment and pupil check
- Perform patient personal care and pressure relief

THE IMMEDIATE POST- OP A-D ASSESSMENT







POST- OP PICU MONITORING

	12	13	14	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05	06	07	08	09	10	11
VENT FiO2		CT scan	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25
INSPIRED PRESS			25	25	25	25	25	25	25	25	25	25	25	25	25	25	25	25 24	24	24	24	24 22	22	22	22
PEEP / CPAP			*8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8
MAP			14	15	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	13	13	13	13
TIDAL Vol / Vmin (exp)			81/1.8	75 1.9	74 1.9	82 1.9	80 1.85	82	86 1.86	81 2.1	88 2.2	64 1.9	102 2.1	98 1.8	113 1.9	101 1.8	76 1.8	106 1.9	85 1.9	89 2.0	68 1.8	70 1.86	75 1.9	80 1.97	78 1.8
SET RATE			18	18	18	18	18	19	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18
ASB Press			16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+	16+
T.insp. / I:E Ratio			1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2	1:2
HUMID'R TEMP			36.5	36.7	36.9	[illegible]	[illegible]	37.1	37.9	36.6	37	37.1	37	36.9	37.2	37.2	37.2	37	37	36.9	36.9	36.8	36.9	37.1	37
iNO ppm NO																									
ppm NO_2																									
MET Hb																									
ETCO2			3.8	3.9	3.8	3.7	3.7	3.7	3.8	3.5	3.3	3.5	3.5	3.6	3.7	3.8	3.7	3.1	3.2	3.4	3.8	3.6	3.9	3.7	3.8

RESULTS

Art/Ven/Cap	14 (A)	14 (V)	18 (A)	22 Art	03 (Art)	06 Art	06 Ven	09 AA
pH	7.27	7.24	7.28	7.29	7.27	7.28	7.23	7.27
PCO_2	4.2	4.8	4.0	3.7	4.1	4.1	5.1	4.0
PO_2	14.6	6.8	14.1	19.1	16.1	16.7	6.5	16.7
HCO_3	16.4	15.9	16.1	15.9	16.1	16.5	16.0	15.8
BXS	-11.0	-11.1	-11.5	-11.6	-11.4	-10.9	-10.9	-11.8
SAT	99.2	80.1	99	100	99.4	100	76	99.6
Ca	1.07	1.11	1.10	1.16	1.16	1.15	1.15	1.21
Na	136	135	137	138	135	136	136	135
K	5.0	4.9	5.3	4.9	5.2	4.8	5.6	4.6
Gluc	3.9	3.8	3.9	4.2	5.0	5.2	5.4	5.2
HCT	31	30	28	27	24	23	24	22
LACT	2.7	2.6	2.8	2.3	2.2	2.3	2.7	2.6

ACT: 114 (15), 115 (19)

TEMPERATURE • Core • Peripheral (39–33) — warmer

	14	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05	06	07	08	09	10	11
Temperature		36.3	36.5	36.0	36.4	36.5	36.7	35.4	35.1	34	34.5	34.5	34.2	35	35.5	35.4	35.2	34.9	35	35.4	35.6	35.7	35.9
WARM TO	cool	knees	knees	knees	calves	calves	calves	calves	calves	calves	calves	calves	calves	calves	calves	calves	Ankles	Feet	Feet	FEET	FEET	TOES	TOES
PACING BOX mode	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD	DDD
rate	100	100	100	100	100	100	100	100	100	100	100 110	110	110	110	110	110	110	110	110	110	110	110	110
output	[illegible]																						
Sensing / pacing	[illegible]																						
battery	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

SYSTEMIC PRESSURE Syst ∨ Mean x Diast ∧ — Heart Rate •–• — Resps x – x — PULMONARY PRESSURE Syst ∨ Mean x Diast ∧ — Atrial Pressures R.A. •–• L.A. •–• — CT scan

Pain Tool Used

Pain Score

	14	14	15	16	17	18	19	20	21	22	23	24	01	02	03	04	05	06	07	08	09	10	11
OXIMETER SATURATIONS	98	96	95	99	97	97	98	100	100	100	100	100	100	100	100	100	100	100	98	92	92	94	99
CEREBRAL SATS L	93	90	90	90	89	89	87	85	85	89	87	88	64	84	84	83	83	86	87	87	86	86	84
CEREBRAL SATS R	90	86	86	86	83	83	82	84	93	88	92	86	87	83	83	82	83	82	82	82	81	79	78
SOMATIC SATS																							
PUPILS REACTION / SIZE L		3+				3+				+2					+2			+2				+2	
PUPILS REACTION / SIZE R		3+				3+				+2					+2			+2				+2	
ADRENALINE mcg/kg/min or /hr	2.96	2.96	2.96	2.96	2.96	2.96	2.96	2.96 0.1	2.96	2.96	2.96	2.96	2.96	2.96	2.96	2.96	2.96	2.96	2.96	2.96 0.1	2.96	2.96	2.96 [illegible]
NORADRENALINE	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66 0.09	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66	2.66 0.07	2.66	2.66	2.66 0.08
VASOPRESSIN	4.44	4.44	4.44	4.44	4.44	4.44	4.44	4.4 1.5	4.4	4.4	4.4 ↓	4.15 1.4	4.15	3.85 ↓1.3	3.85	3.85	3.85	3.85 ↑	4.15 1.4	4.15 1.4	4.15 ↑ 1.5	4.44	4.44
FENTANYL	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5 0.4
ACETYLCYSTINE						1.0	1.0	1.0 1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0 1.0	1.0	1.0	1.0 [illegible]
HEPARIN								0.5 12.5	0.5	0.5	0.5	0.5 ↑	0.6	//			0.5	0.5 ↑	0.7	0.7	0.7	0.7	0.7

FAMILY CENTRED CARE

The parents and family will first be notified when they are leaving the operating theatre for PICU

They will be met by a member of the PICU team or the cardiac specialist nurses and taken to a family room on PICU

The family are always informed that it will take some time before they are able to visit the unit

Once the patient handover is complete the allocated nurse and surgeon will update the family before returning to the PICU

When the patient is safe and stable on PICU the family are welcome to visit

PICU VISITING POLICY

First 24 hours	Two named visitors only No siblings (unless discussed prior to PICU admission)
> 24 hours **Only 2 visitors to a bed at one time**	Family, siblings and friends able to visit but always advised to keep visiting to a minimum 24 hour open visiting for NOK Other visitors will not be permitted without the presence of the NOK They must inform the beside nurse if visitors will arrive without them PICU will be closed to all but essential personnel if an invasive procedure is being performed on any patient

PICU and ward 23 operate a telephone password system. No information will be given without the password set by the NOK.
This includes other healthcare workers- you may be asked to provide your contact details so the nurse can identify who you are and call you back

PICU VISITING POLICY

… COVID 19 RESTRICTIONS:

- **2 allocated visitors**
- **Only 1 visitor at the bed space at 1 time**
- **No siblings**

PATIENT SPECIFIC AND ALL EXTENUATING CIRCUMSTANCES WILL BE DISCUSSED WITH THE IN CHARGE AND MEDICAL TEAM

A WEEK ON PICU

STABILITY AND WEANING CARDIORESPIRATORY SUPPORT

A- AIRWAY

Care of the ET tube:

- Security of the ET Tube
- Tube position
- Patient positioning
- Minimum 4 hourly ET suction
- Pressure area care
- Cuff pressures
- Tube leak
- Dexamethasone

B- BREATHING

Titration of ventilation

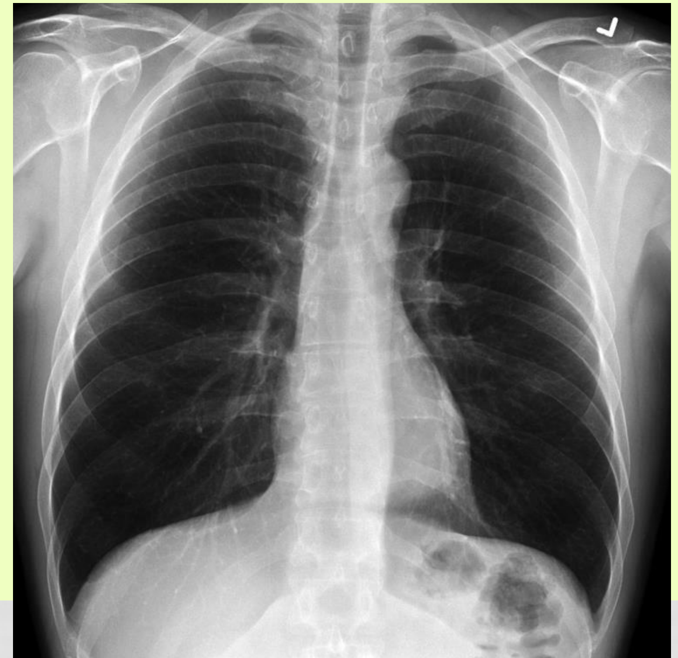
BIPAP → CPAP → VAPOTHERM/NIV → 02

Respiratory considerations:

- **Cardiopulmonary**
- **Anatomical**
- **Pulmonary hypertension- Nitric!**

Routine Care:

- **Suctioning**
- **Physiotherapy**
- **Infection**



C- CIRCULATION

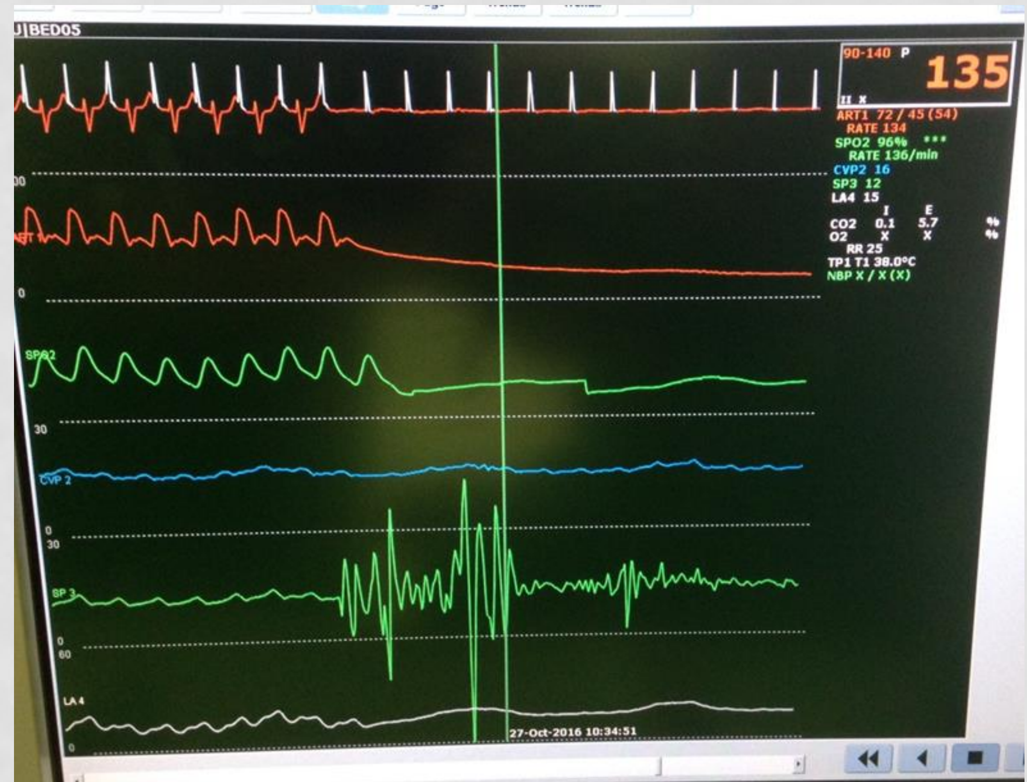
- Titration and weaning of inotropes
- Milrinone will often continue to be infused for a longer period
- Low Cardiac Output Syndrome (LCOS)
- Systemic Inflammatory Response Syndrome (SIRS)
- Multi- organ dysfunction
- Coagulopathy and bleeding
- Anti-coagulation

PACING

A significant number of patients will have external pacing wires in situ

It is important that the team are aware of the patient's underlying rhythm

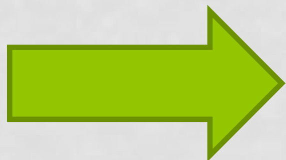
Some patients are completely dependent on external pacing!



FLUID MANAGEMENT

Input:

- IV Infusions
- IVABs and other medications
- IV maintenance fluids
- Feeds
- Invasive monitoring flushes
- Fluid resus boluses
- Blood products



Output:

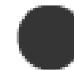
- Urine
- Bowel management
- PD/ CVVHD dialysis
- Gastric losses
- Chest drainage
- Wound/ swabs

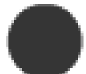
D- DISABILITY

- **IV pain relief**
- **IV or oral sedation**
- **Muscle relaxants**

Regular post- operative Neurological assessments!

Patients are at risk due to:
Coagulopathy
Poor heart function
Anatomical defects
Cardiac shunts
Hypoxia
Invasive lines
Anti-coagulation



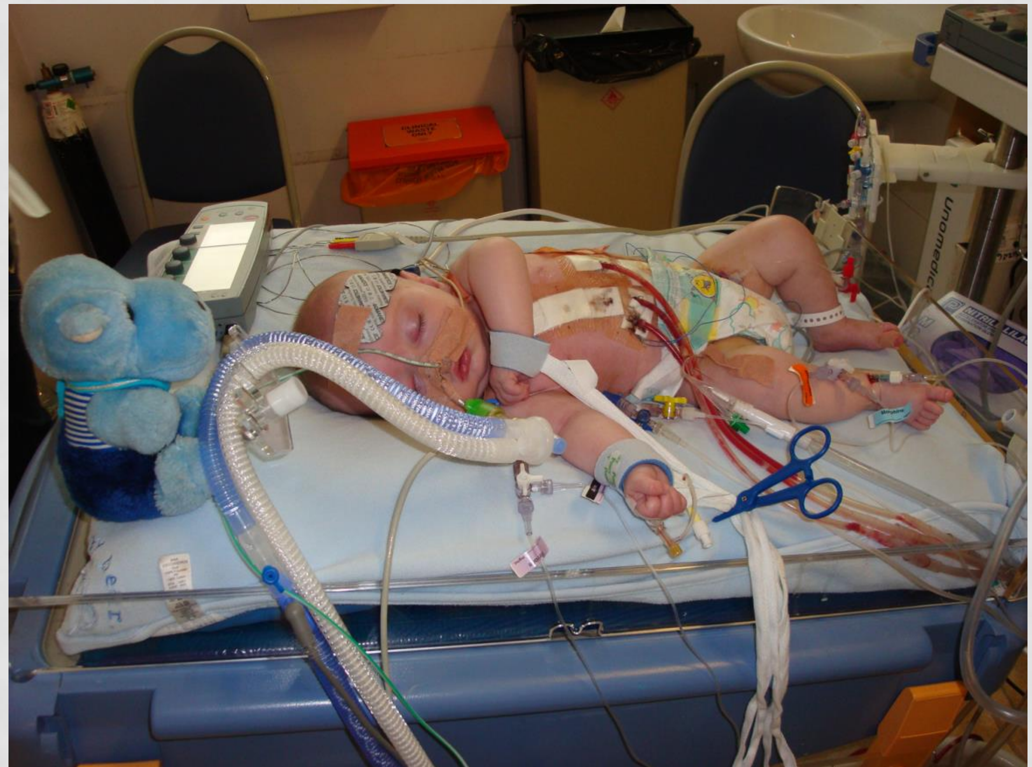


E- EXPOSURE

Assessment of wounds:
- Sternal
- Invasive lines
- Chest drain sites
- Pacing wire sites

General appearance:
- Mottling
- Cyanosis
- Pale/ grey

Touch:
- Cool
- Clammy



THE PROLONGED PICU ADMISSION

STABALISING TO SUPPORT TO DISCHARGE

THE PROLONGED PICU ADMISSION

This can be for many varying reasons:

- Poor heart function
- Patient specific complex physiology
- multi- organ failure
- On- going respiratory support
- Sepsis
- Low patient weight and poor ‘reserve’

FAILURE TO 'WEAN'

Post operatively some patients require prolonged respiratory support due to:

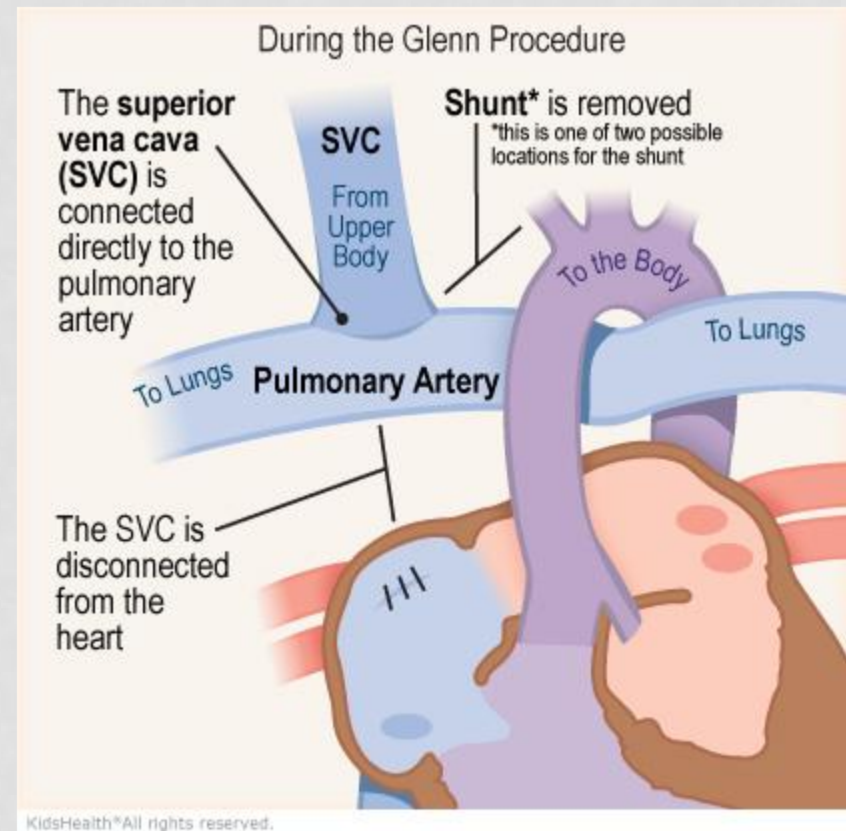
- Poor heart function
- Cardiac defect physiology
- Fatigue
- Neurological issues
- Airway anatomy

A number of these patients will require a tracheostomy to aid ventilation

PATIENT PHYSIOLOGY

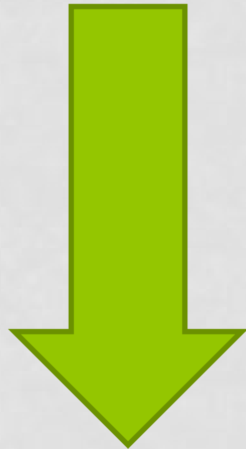
Any imbalance of the natural cardiorespiratory pressures can compromise the success of the patient's post- operative cardiac circulation

These patients may require prolonged mechanical and medical support and for some additional surgical intervention may be necessary



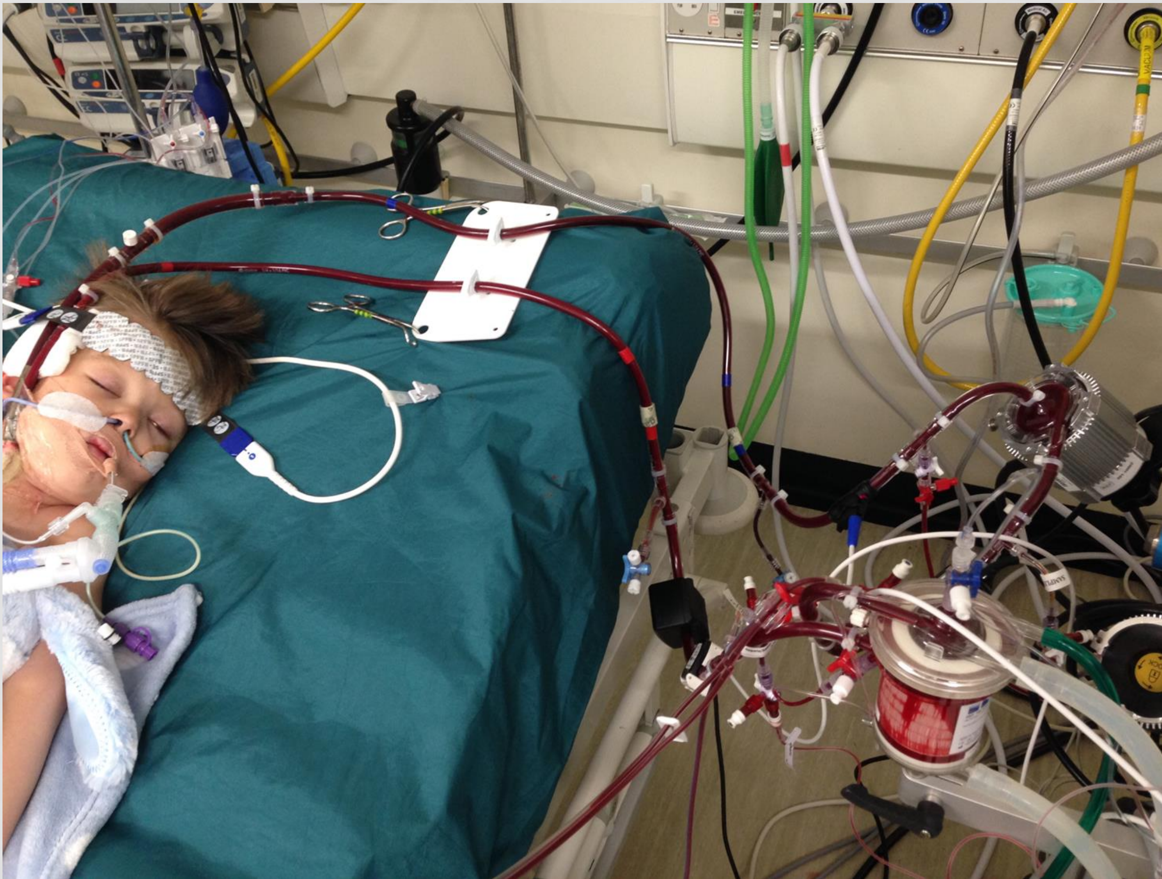
MULTI- ORGAN FAILURE

- Obstructive anomalies
- Heart Failure and LCOS
- Hypoxia
- Infarcts



- **Renal failure**
- **Necrotising Enterocolitis (NEC)**

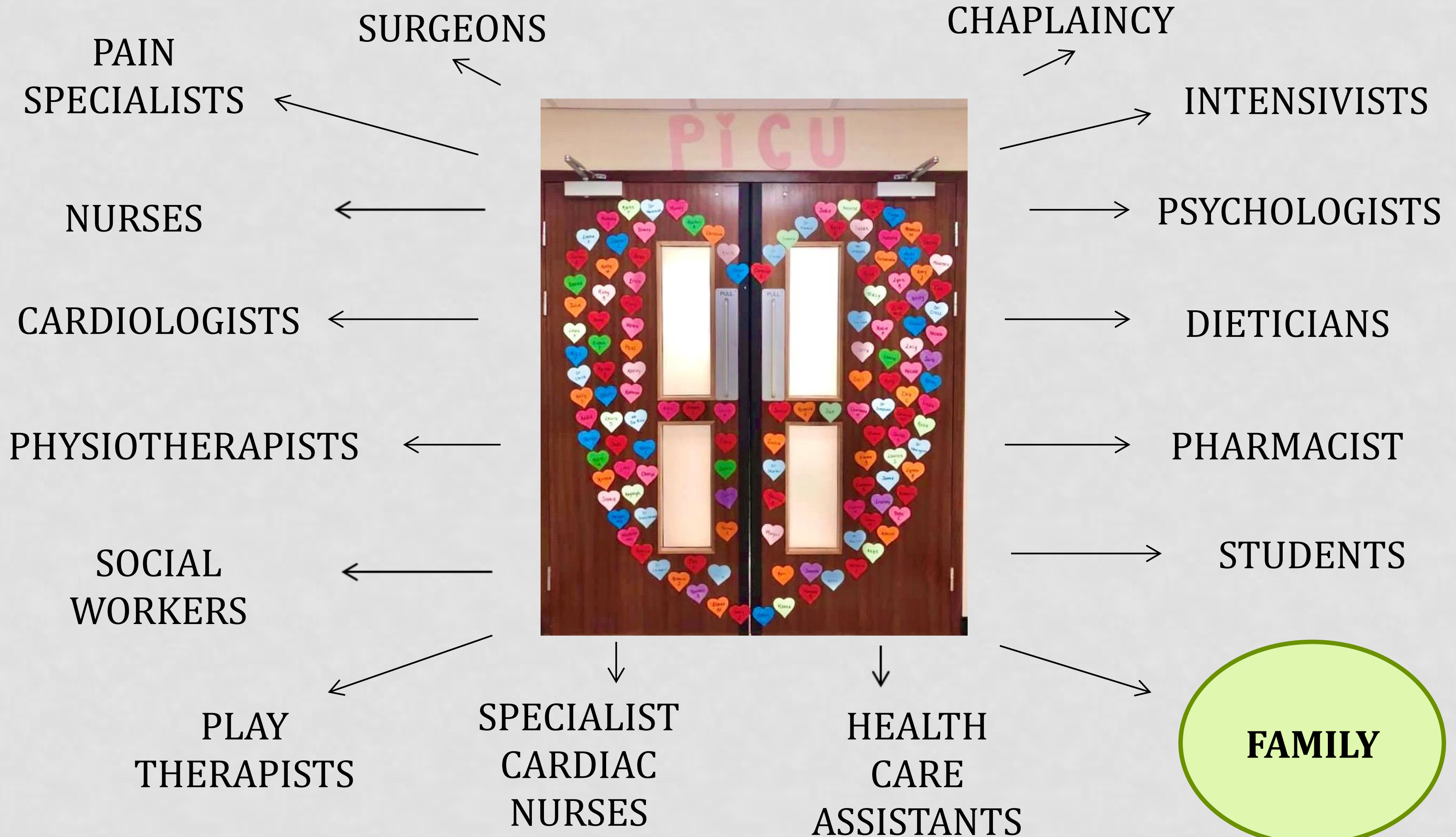
ECMO



Extra corporeal membrane oxygenation for:

- Failure to wean from bypass
- Severe heart failure and low cardiac output
- Severe SIRS response and instability
- Hypoxia
- ARDS
- ECPR

PICU TEAM!



THANK YOU!