

The background of the slide is a light gray gradient with several realistic water droplets of various sizes scattered across it. The droplets have highlights and shadows, giving them a three-dimensional appearance.

ECMO AKO SÚČASŤ TERAPEUTICKEJ INTERVENCIE V KARDIOCHIRURGII

FEDORÁK V.

SÚSCCH a.s. B.Bystrica

ECMO MÁ PŮVOD V KARDIOCHIRUGII



1972



2006

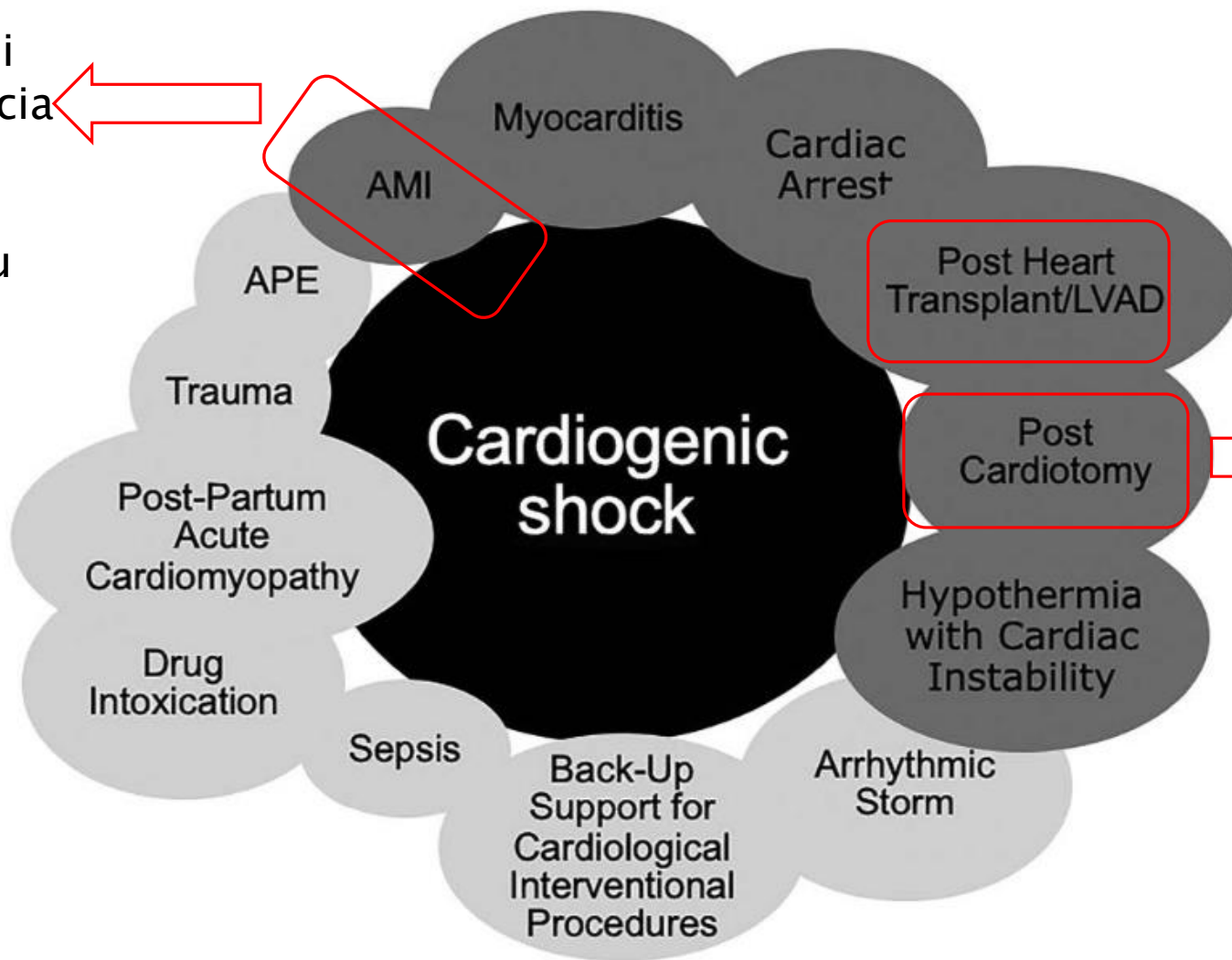


2020

Table 1 Differences between cardiopulmonary bypass (CPB) and extracorporeal membrane oxygenator (ECMO)

Characteristics	CPB	ECMO
Priming volume	Large	Small
Type of oxygenator	Short term use	Short or Long-term use
Pump	Roller or centrifugal	Centrifugal
Reservoir	Present	No reservoir
Cooling possibility	Yes	Limited
Initial heparin bolus	300–400 U/kg	50–100 U/kg
Target ACT	>480	160–200

- Akútna Mi regurgitácia
- VSD
- Ruptúra myokardu



- Ischemická kardiomyopatia
- CHSZ v rámci chlopňových chýb

ÚČEL TERAPIE

- BRIDGE TO RECOVERY
- BRIDGE TO SURGERY
- BRIDGE TO DECISION
- BRIDGE TO BRIDGE/ TRANSPLANT

Bridge to nowhere
!!!

Patient selection for VA ECMO

www.ecmo.icu

Determine **risk score** by combining the scores from diagnostic group ① and clinical modifier ②
Ensure no absolute contraindication ③ present
Use chart ④ to establish eligibility and expected outcome for VA ECMO support

① Diagnostic group

Favourable Diagnostic Categories (Score =1)

- Fulminant myocarditis
- Pulmonary embolism with cardiogenic shock
- First presentation cardiomyopathy
- Primary arrhythmic cardiomyopathy
- Drug overdose with cardiac depression and no long-term sequelae
- Primary graft dysfunction post heart transplant
- Ischaemic VSD post AMI

High Risk Diagnostic Categories (Score =2)

- AMI with early reperfusion
- Papillary muscle rupture/ mitral regurgitation with AMI
- Failure to wean off cardiopulmonary bypass
- Heart transplant recipient with acute rejection suitable for VAD*

Unfavourable Diagnostic Categories (Score =3)

- AMI with delayed or failed reperfusion
- Heart transplant recipient with chronic rejection suitable for VAD*
- Chronic cardiomyopathy not suitable for bridge to VAD* (sepsis and/or renal failure)
- HCCM associated heart failure
- Restrictive chronic cardiomyopathy
- Adult septic shock

② Clinical modifier

Score chronic co-morbidities and acute clinical state

Chronic - one or more present (Score +1)

- Peripheral vascular disease (symptomatic, revascularised or amputation)
- Previously known ischaemic heart disease or prior revascularisation
- Prior valve surgery, CABG or aortic surgery
- Moderate COPD (GOLD Stage II, FEV1 50-80%)
- Chronic renal failure stage 3 or 4 CKD (eGFR 60-15)
- Chronic liver disease
- Long-term immunosuppression

Acute - one or more present (Score +1)

- Lactate ≥10
- AST or ALT > 1000, or, INR >3.0
- Anuria >4 hours

③ Absolute contraindications

Patient profile

- Age >75
- Terminal illness or non-treatable malignancy
- Liver cirrhosis Child-Pugh B or C
- Irreversible CNS injury
- Chronic renal failure CKD 5 or dialysis (unless for parallel kidney transplant)
- End stage COPD
- Chronic symptomatic cardiac failure (NYHA 3 or 4) and not a VAD/transplant candidate
- ECMO initiation would not be in keeping with known patient wishes or that of the patient's medical treatment decision maker (MTDM)

Anatomical consideration

- Inability to cannulate safely due to vascular pathology (e.g. multiple stenosed or thrombosed vessels)
- Moderate or severe aortic regurgitation with no potential for non-surgical correction

Acute condition

- Cardiogenic shock with advanced microcirculatory failure with severe mottling or established peripheral purpura
- Cerebral deficit with fixed dilated pupils

④ Eligibility chart

5	Red	Black	Black	Black
4	Yellow	Red	Red	Black
3	Green	Yellow	Yellow	Red
1-2	Green	Green	Green	Yellow
	<40	40-54	55-64	65-75

The chart indicates eligibility and expected outcome for VA ECMO according to patient age and risk score (1-5) which is the diagnostic group 1, 2 or 3 plus presence of acute (+1) and/or chronic modifiers (+1).

GREEN Good expected outcome
YELLOW Uncertain expected outcome
RED Poor expected outcome/ minimal benefit
BLACK Negligible

*suitability for a durable ventricular assist device (VAD) or heart transplant is viewed as equivalent here and covered in more detail under bridge to transplant
Comments: Patient selection for ECPR scenarios and peri-procedural support in the cardiac catheter lab are not covered with this patient selection tool.

SAVE

Survival After Veno-arterial ECMO

The SAVE Score has been developed by [ELSQ](#) and [The Department of Intensive Care at The Alfred Hospital, Melbourne](#). It is designed to assist prediction of survival for adult patients undergoing Extra-Corporeal Membrane Oxygenation for refractory cardiogenic shock. It should not be considered a substitute for clinical assessment.

For more information see: [Predicting survival after ECMO for refractory cardiogenic shock: the survival after veno-arterial-ECMO \(SAVE\) score](#)

The patient's SAVE Score is

Diagnosis: ●
Select one or more

Myocarditis

Refractory VT/VF

Post heart or lung transplantation

Congenital heart disease

Other diagnoses

Age (years): 18-38

39-52

53-62

≥63

Weight (kg): <65

65-89

≥90

Cardiac:

Pulse pressure pre ECMO ≤20 mmHg

Diastolic BP pre ECMO ≥40 mmHg

Pre-ECMO cardiac arrest

Respiratory:

Peak inspiratory pressure ≤20 cmH₂O

Intubation duration pre ECMO (hrs) ≤10

11-29

≥30

Renal:

Acute renal failure

Chronic renal failure

HCO₃ pre ECMO ≤15 mmol/L

Other organ failures pre ECMO:

Central nervous system dysfunction

Liver failure

NAČASOVANIE- TIMING

ÚČEL TERAPIE DEFINUJE
TIMING



POSTKARDIOTOMICKÝ SY

- NEJEDNOZNAČNÁ DEFICNÍCIA
- VYSOKÁ MORTALITA > 70 %
- NEDOSTATOČNÝ SRDCOVÝ VÝDAJ NAPRIEK INOTROPNEJ A IABP PODPORE POKCH VÝKONE

Table 1. Drug dose administrated to achieve a VIS score of 10

Drug	Dose administrated to achieve a VIS score of 10
Dopamine	10 µg/kg/min
Dobutamine	10 µg/kg/min
Enoximone	10 µg/kg/min
Phenylephrine	1 µg/kg/min
Milrinone	1 µg/kg/min
Olprinone	1 µg/kg/min* 0.4 µg/kg/min**
Levosimendan	0.2 µg/kg/min
Epinephrine	0.1 µg/kg/min
Norepinephrine	0.1 µg/kg/min
Vasopressin	0.001 U/kg/min (0.07 U/min for a 70 kg patient)

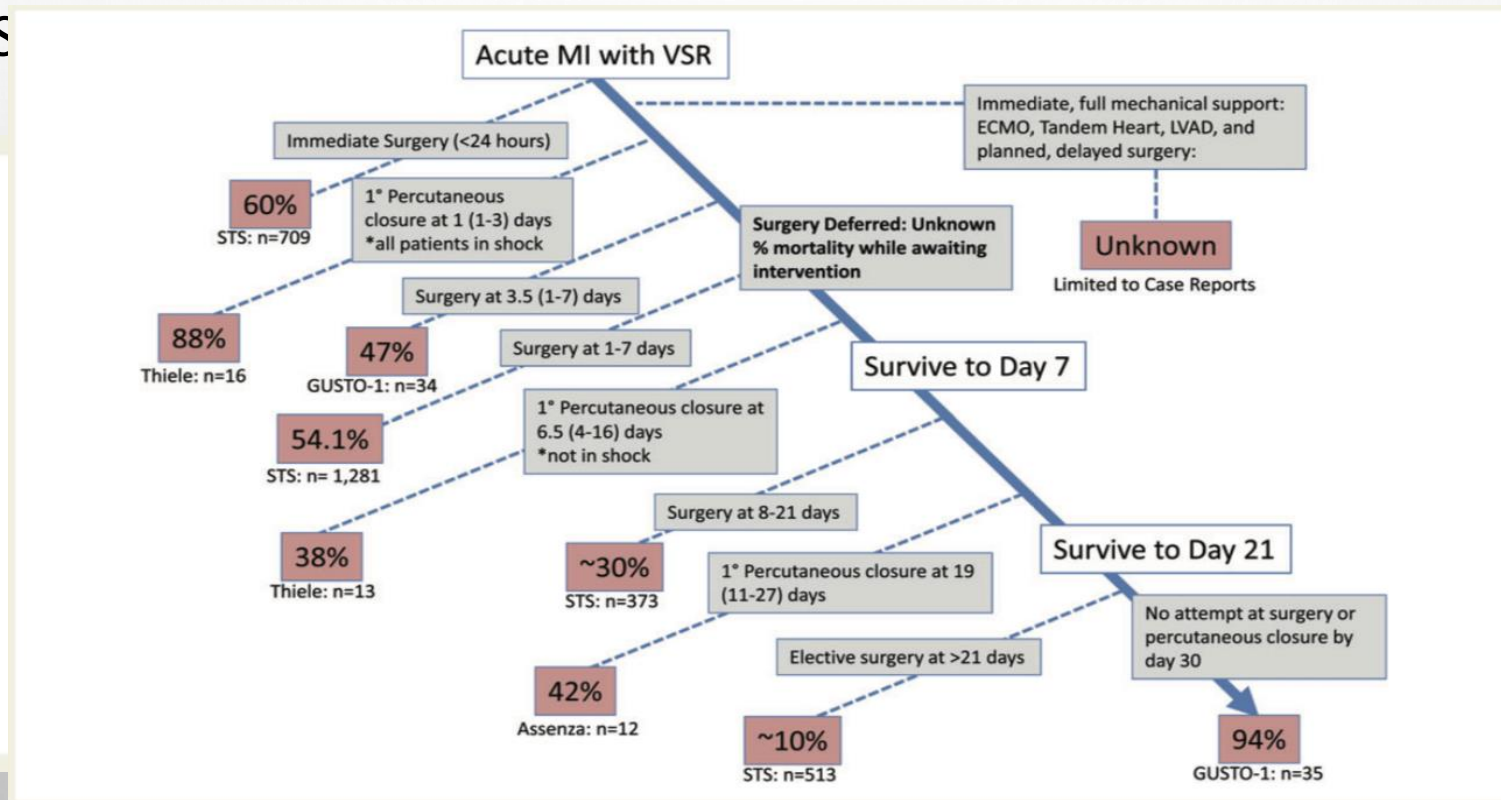
Abbreviations: VIS = Vasoactive Inotropic Score *Yamazaki et al. **Maeda et al.

VIS SCORE > 32  VA ECMO

Bridge to recovery
Bridge to bridge

MECHANICKÉ KOMPLIKÁCIE STEMI

- RUPTÚRA PAPILÁRNEHO SVALU, KRYTÁ RUPTÚRA KOMORY
- DEFEKT VS



SPÔSOBY NAPOJENIA ECMO PODPORY

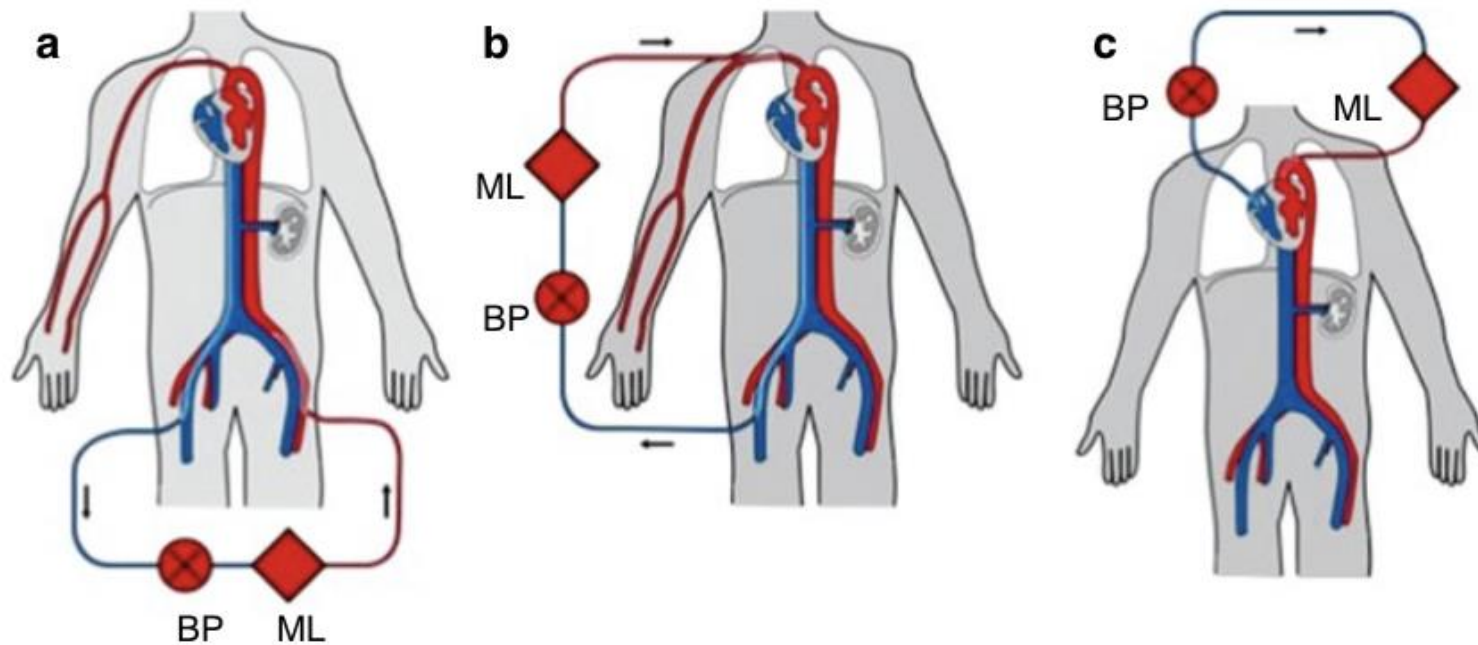
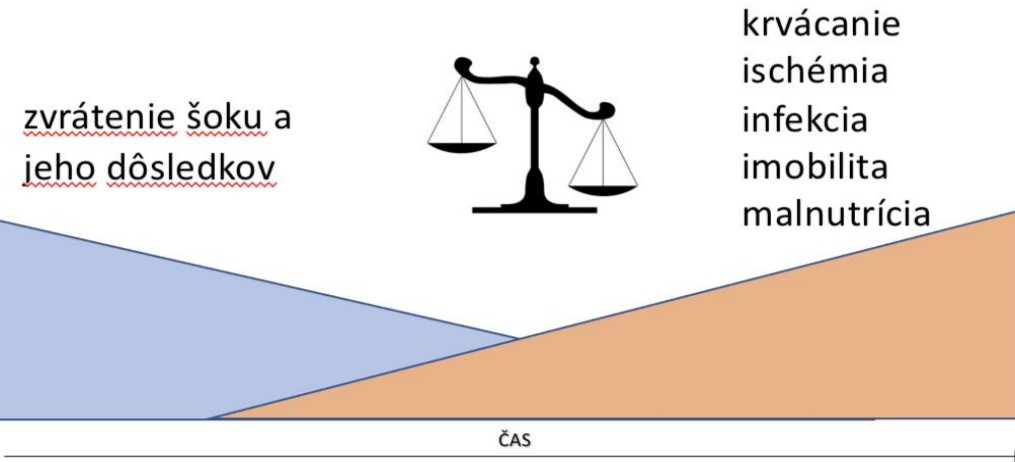


Fig. 3.9 Schematics of possible venoarterial ECMO circuits. (a) Peripheral, femorofemoral cannulation. (b) Peripheral, femoro-axillary cannulation. (c) Central cannulation. *BP* blood pump, *ML* membrane lung

BENEFIT VS KOMPLIKÁCIE

Table 7.1 Main factors contributing to hemorrhagic and thrombotic complications in ECMO

Pro-hemorrhagic factors	Pro-thrombotic factors
Excessive heparin anticoagulation	Inadequate heparin anticoagulation
Consumption of coagulation factors	Acquired antithrombin deficiency
Low fibrinogen levels	Protein C-S complex consumption
Thrombocytopenia	Tissue factor pathway inhibitor consumption
Platelet dysfunction	Endothelial dysfunction
Hyperfibrinolysis	Heparin-induced thrombocytopenia
Acquired von Willebrand disease	Blood stagnation in the cardiac chambers
Surgical site bleeding	Endotoxins



A rationale for early extracorporeal membrane oxygenation in patients with postinfarction ventricular septal rupture complicated by cardiogenic shock

Daniel Rob¹, Rudolf Špunda², Jaroslav Lindner², Vilém Rohm³, Jan Kunstýř⁴, Martin Balík⁴, Jan Rulíšek⁴, Petr Kopecký⁴, Michal Lipsá⁴, Ondřej Šmíd¹, Tomáš Kovárník¹, František Mlejnský², Aleš Linhart¹, and Jan Bělohávek^{6*}

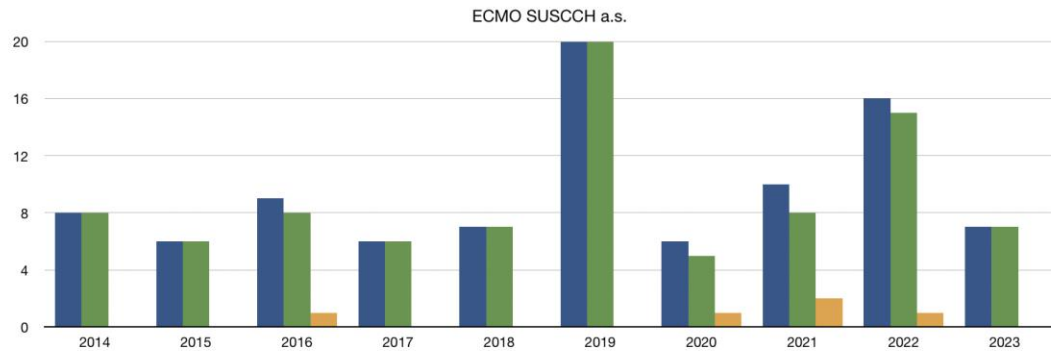
Table 4 Complications in the ECMO group and other patients

Variable	ECMO patients (N = 7)	Non-ECMO patients (N = 24)	P-value
Major bleeding / ECMO related	71.4% (5 / 3)	41.7% (10)	0.17
Fatal bleeding / ECMO related	42.9% (3 / 2)	8.3% (2)	0.03
Infections	100% (7)	66.7% (16)	0.08
Severe limb ischemia	14.3% (1)	12.5% (3)	0.90
Renal Replacement Therapy	28.6% (2)	16.7% (4)	0.49

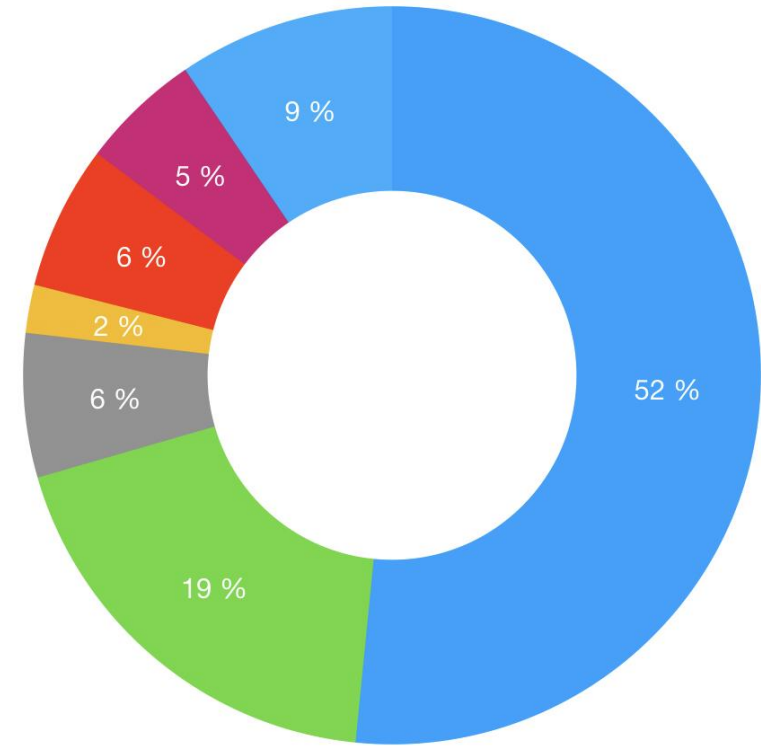
TRVANIE ECMO PODPORY

- ECMO JE KRÁTKODOBÁ PODPORA – DO 30 DNÍ
- V PRÍPADE VA ECMO JE TO ZVYČAJNE KRATŠIE
 - BRIDGE TO SURGERY : 24–48 HODÍN, VÝNIMKOU JE VSD < 21 DNÍ
 - BRDIDGE TO RECOVERY, VAD, TRANSPLANT : 3–7 DNÍ

ŠTATISTIKA



Rok	celkový počet 95	VA	90	VV	5
2014	8	8	8	0	0
2015	6	6	6	0	0
2016	9	8	8	1	0
2017	6	6	6	0	0
2018	7	7	7	0	0
2019	20	20	20	0	0
2020	6	5	5	1	0
2021	10	8	8	2	0
2022	16	15	15	1	0
2023	7	7	7	0	0



- Poskardiotomický sy
- Defekt komorového septa
- Rizikova PCI
- Myokarditída
- Akútny koronárny sy
- ARDS
- Iné

ZÁVER.

- ECMO JE PLNE ETABLOVANOU KRÁTKODOBOU PODPOROU V KARDIOCHIRURGII
- ESKALÁCIA LIEČBY DO ECMO PODPORY MÁ V KARDIOCHIRURGII SVOJE ŠPECIFICKÁ
- MUSÍ BYŤ PRÍSNE INDIVIDUALIZOVANÁ
- VYŽADUJE ČASTO MULTIODBOROVÝ PRÍSTUP
- NIE JE A NEMÁ BYŤ KONEČNOU METODÓU LIEČBY

Ďakujem za
pozornosť

POZÝVAME VÁS NA ECMO BB 2023

3. november
2023

9:00



SÚSCCH a.s.
Stredoslovenský ústav
srdcových a cievnych chorôb



O PODUJATÍ

Pozývame vás na 2. ročník ECMO kreditovanej konferencie v Banskej Bystrici. Podujatie je organizované pre všetkých, ktorých zaujímajú novinky vo svete ECMO.

Zároveň bude priestor na neformálne rozhovory a tvorbu ECMO programu na Slovensku.

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