

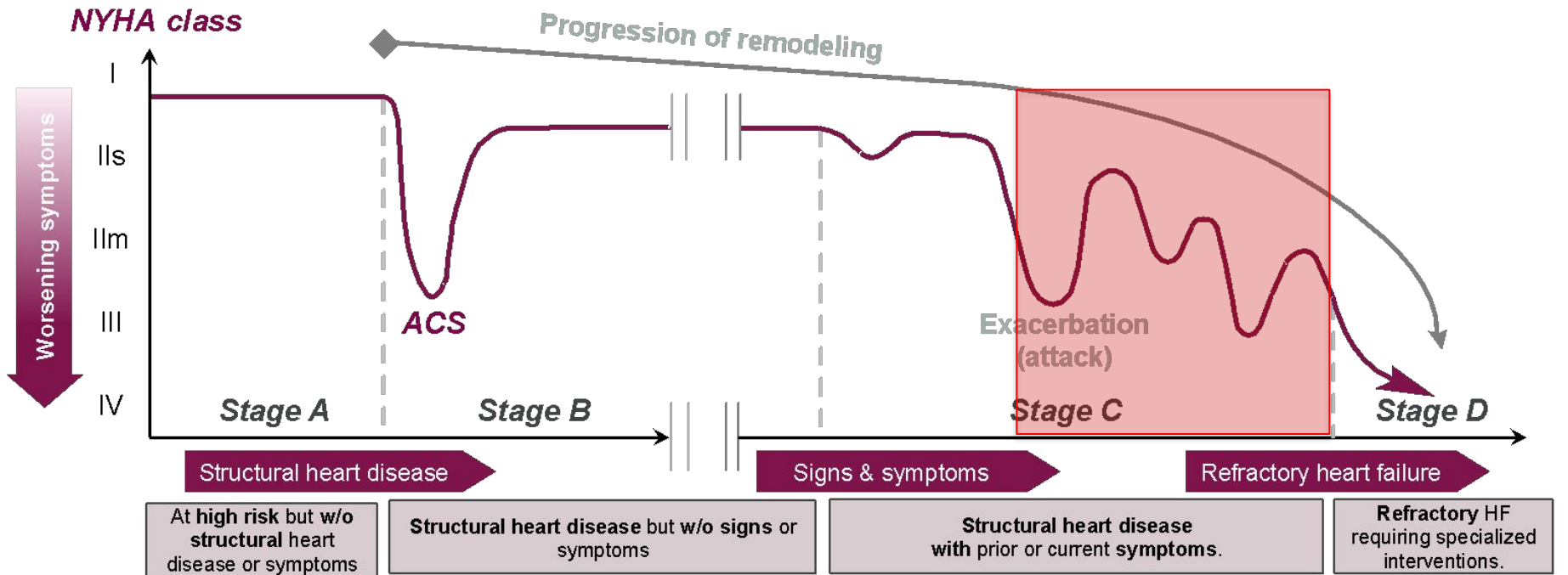
Zdravljenje napredovalega srčnega popuščanja

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Program za napredovalo srčno popuščanje in transplantacije srca
Klinični oddelek za kardiologijo
UKC Ljubljana



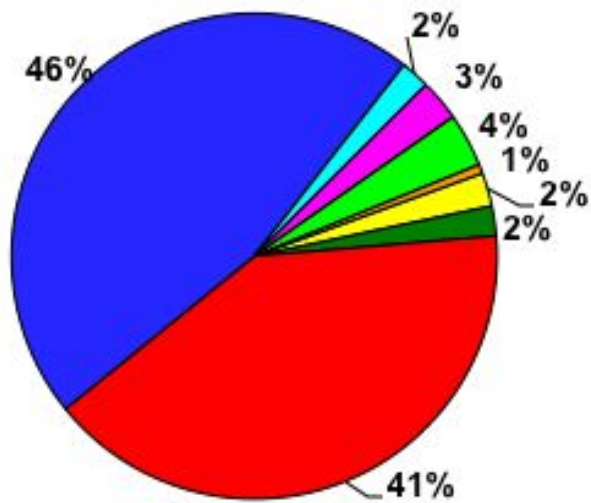
Klinični potek srčnega popuščanja



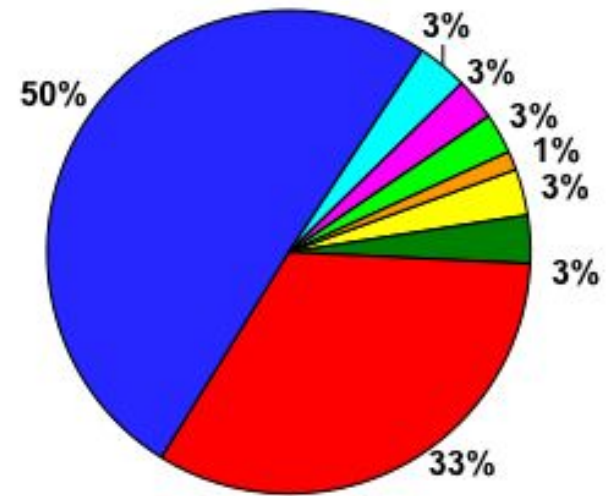
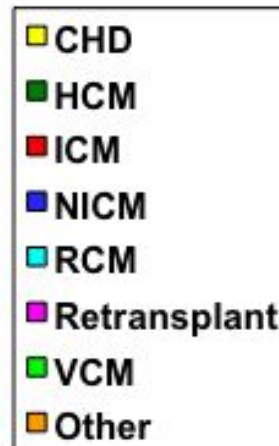
Definicija napredovalega srčnega popuščanja

1. Severe and persistent symptoms of heart failure (NYHA class III [advanced] or IV)
2. Severe cardiac dysfunction, defined by:
 - reduced LVEF $\leq 30\%$
 - isolated RV failure (e.g. ARVC)
 - non-operable severe valve abnormalities
 - congenital abnormalitiespersistently high (or increasing) BNP or NT-proBNP values and data showing severe diastolic dysfunction or LV structural abnormalities, according to the ESC definition of HFpEF and HFmrEF
3. Episodes of pulmonary or systemic congestion requiring high-dose intravenous diuretics (or diuretic combinations) or episodes of low output requiring inotropes or vasoactive drugs or malignant arrhythmias causing >1 unplanned visit or hospitalisation in the past 12 months
4. Severe impairment of exercise capacity with inability to exercise or low 6MWT (<300 m) or pV_{O_2} ($<12-14$ ml/kg/min), estimated to be of cardiac origin

Etiologija napredovalega srčnega popuščanja

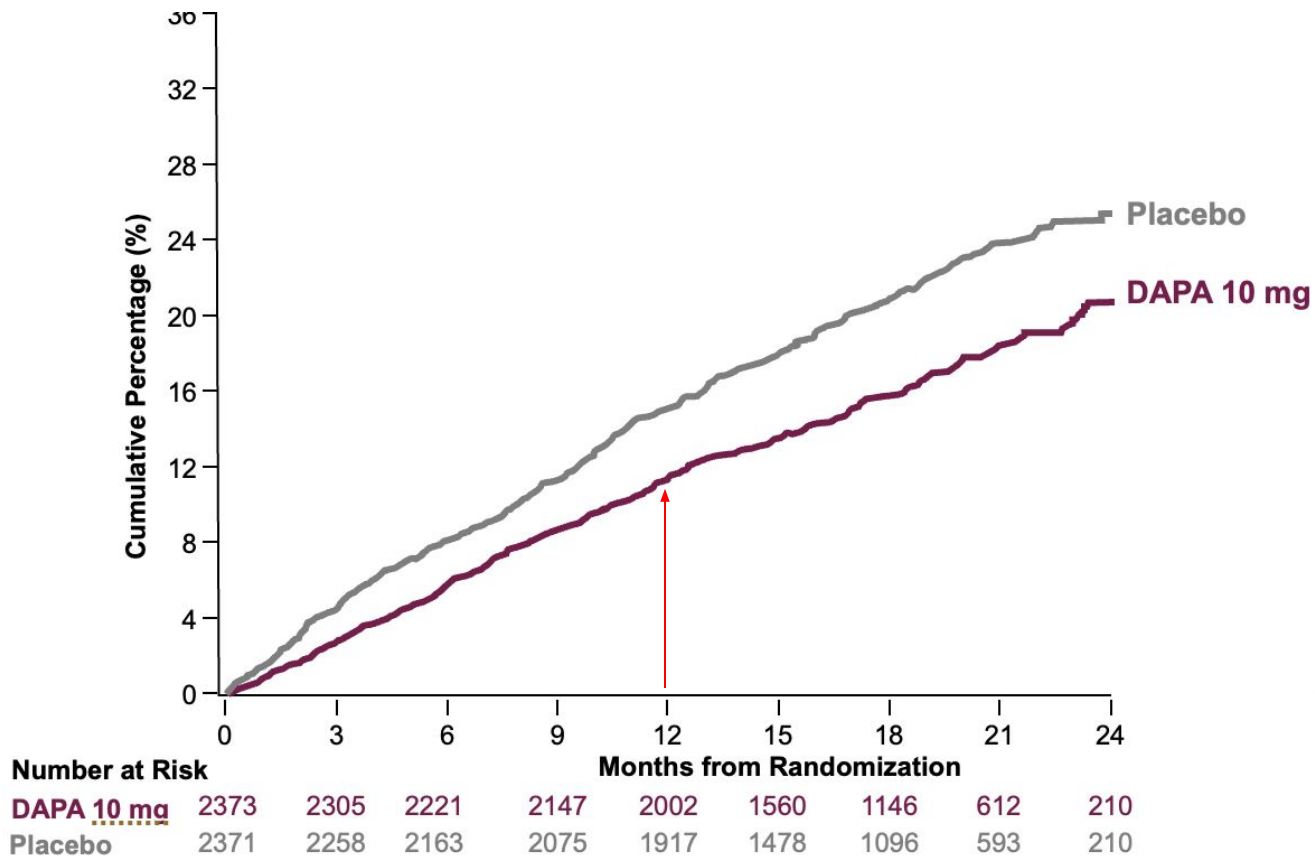


1/1982 – 6/2017

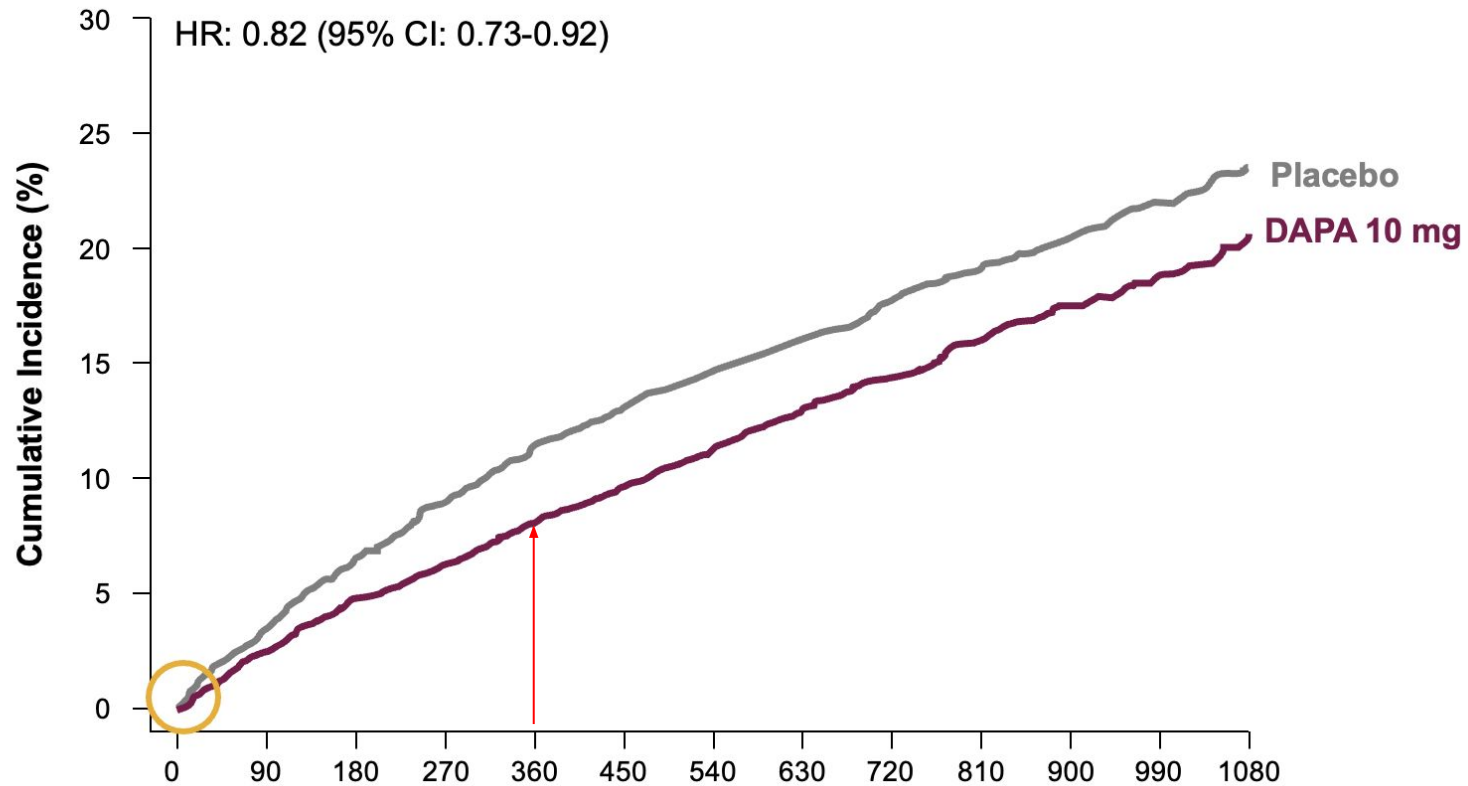


1/2009 – 6/2017

Epidemiologija srčnega popuščanja: HFrEF



Epidemiologija srčnega popuščanja: HFpEF



Zdravljenje napredovalega srčnega popuščanja

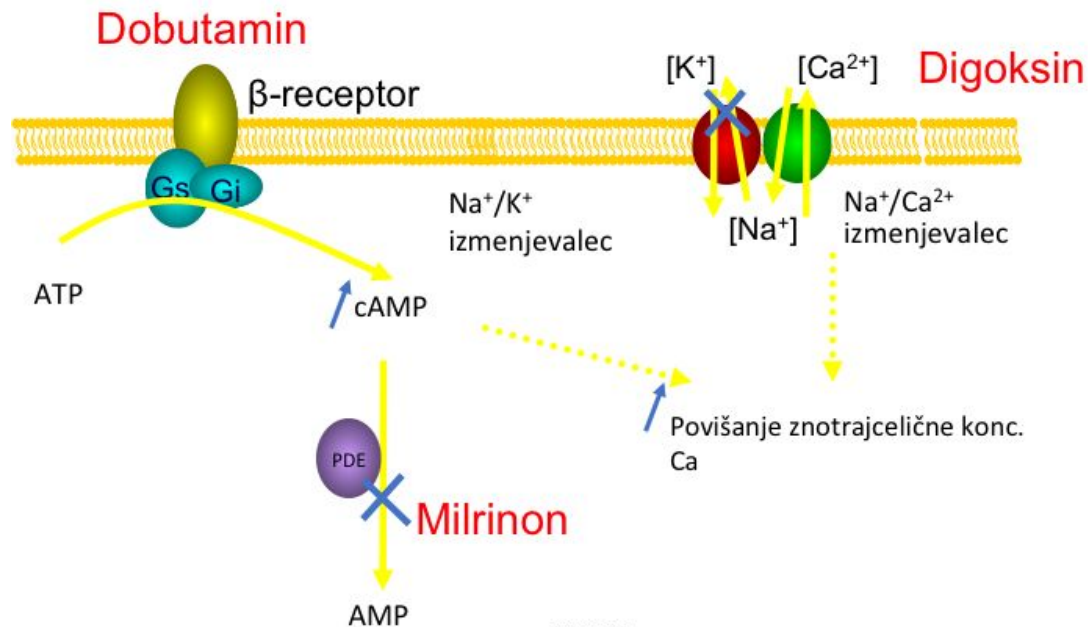
- Zdravljenje z zdravili
- Mehanska podpora
- Presaditev srca
- Nove možnosti zdravljenja

Zdravljenje napredovalega srčnega popuščanja

- Zdravljenje z zdravili
- Mehanska podpora
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- Nove možnosti zdravljenja

Zdravljenje z zdravili

Inotropic agents – dobutamine, dopamine, levosimendan, phosphodiesterase III (PDE III) inhibitors		
Short-term, i.v. infusion of inotropic agents may be considered in patients with hypotension (SBP <90 mmHg) and/or signs/symptoms of hypoperfusion despite adequate filling status, to increase cardiac output, increase blood pressure, improve peripheral perfusion and maintain end-organ function.	IIb	C
An intravenous infusion of levosimendan or a PDE III inhibitor may be considered to reverse the effect of beta-blockade if beta-blockade is thought to be contributing to hypotension with subsequent hypoperfusion.	IIb	C
Inotropic agents are not recommended unless the patient is symptomatically hypotensive or hypoperfused because of safety concern.	III	A

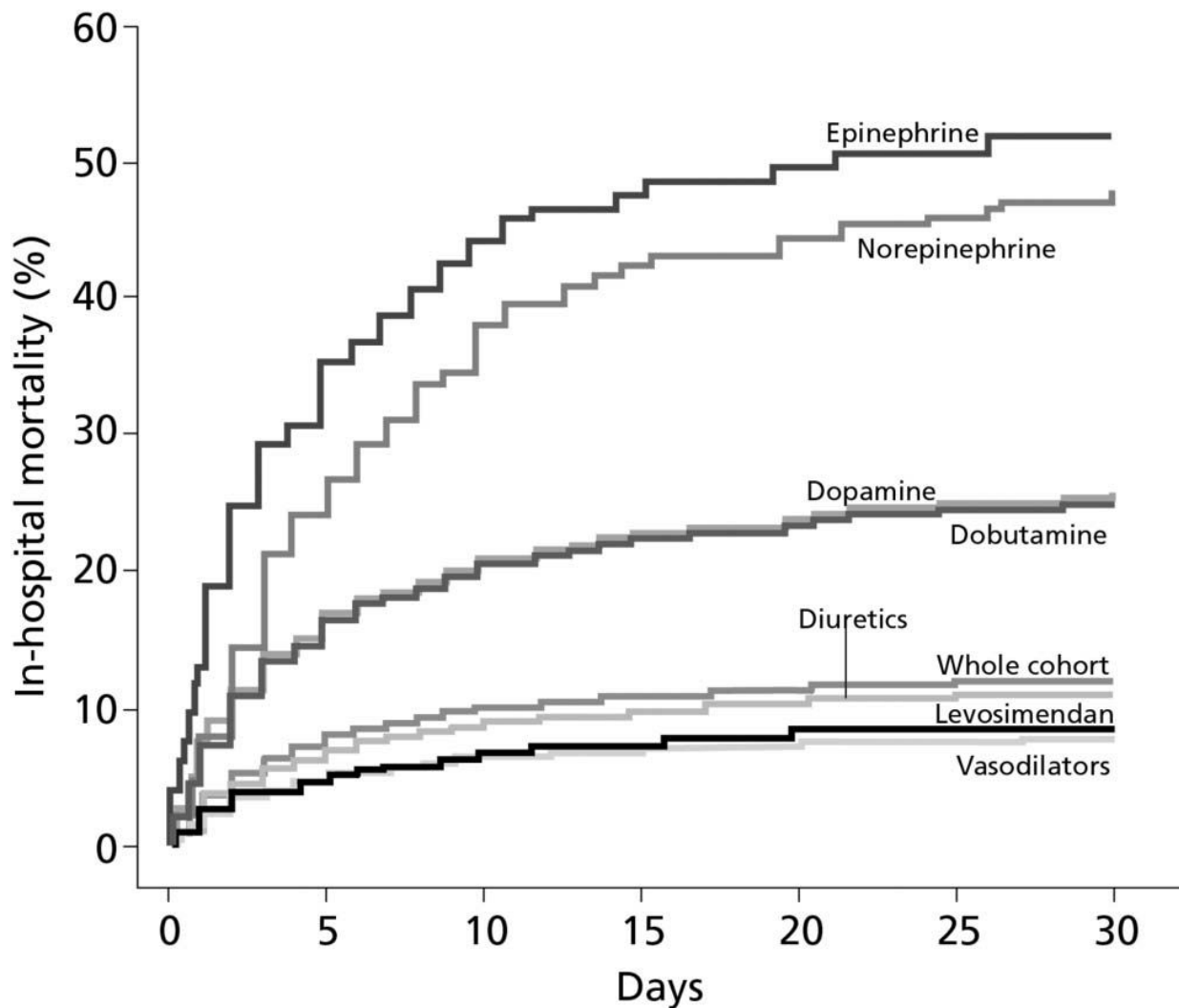


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Zdravljenje napredovalega srčnega popuščanja z inotropi

	Levosimendan	Dobutamin	Milrinon
Povišuje cAMP ?	Ne	Da	Da
Poveča porabo kisika v miokardu ?	Ne	Da	Da
Je antagonist beta blokatorjem ?	Ne	Da	Ne
Deluje proaritmogeno ?	Ne	Da	Da

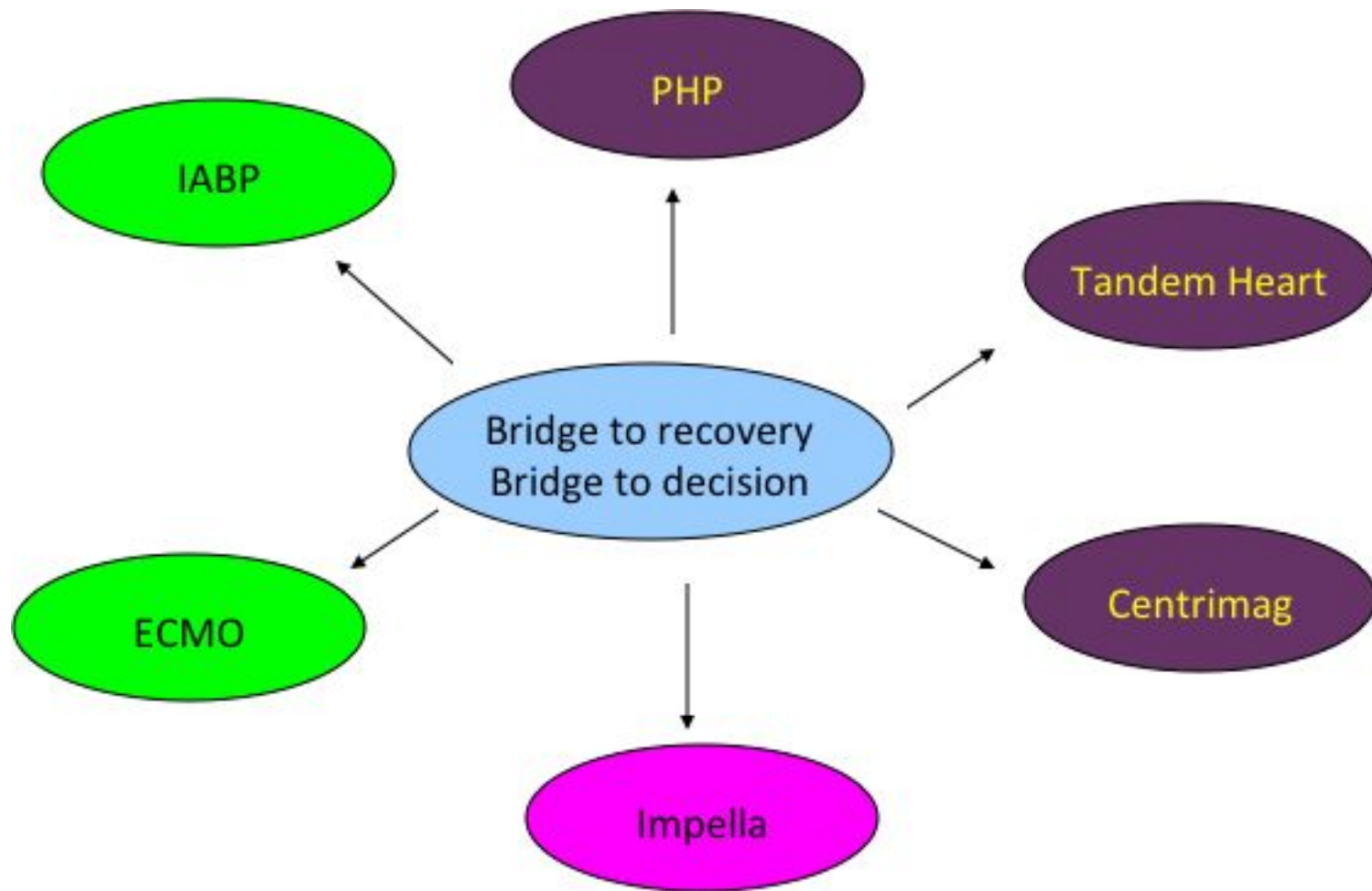
Zdravljenje napredovalega srčnega popuščanja z inotropi



Zdravljenje napredovalega srčnega popuščanja

- Zdravljenje z zdravili
- Mehanska podpora
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Kratkotrajna mehanska podpora



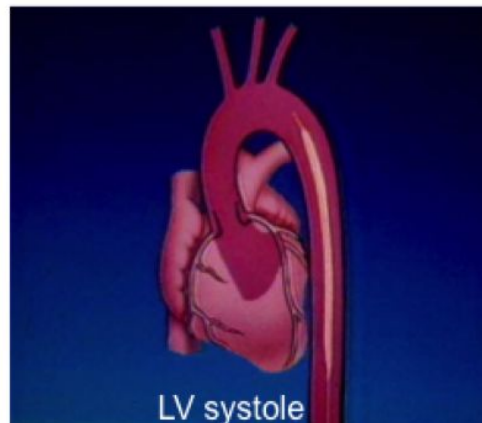
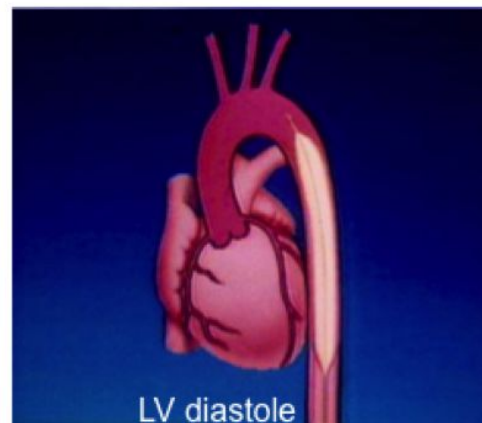
Aortna črpalka

PROs:

- Mature technology
- Increases modestly Cardiac Output
- Increase Coronary Perfusion
- Ease of Use
- Lower Complication rate over time

CONs:

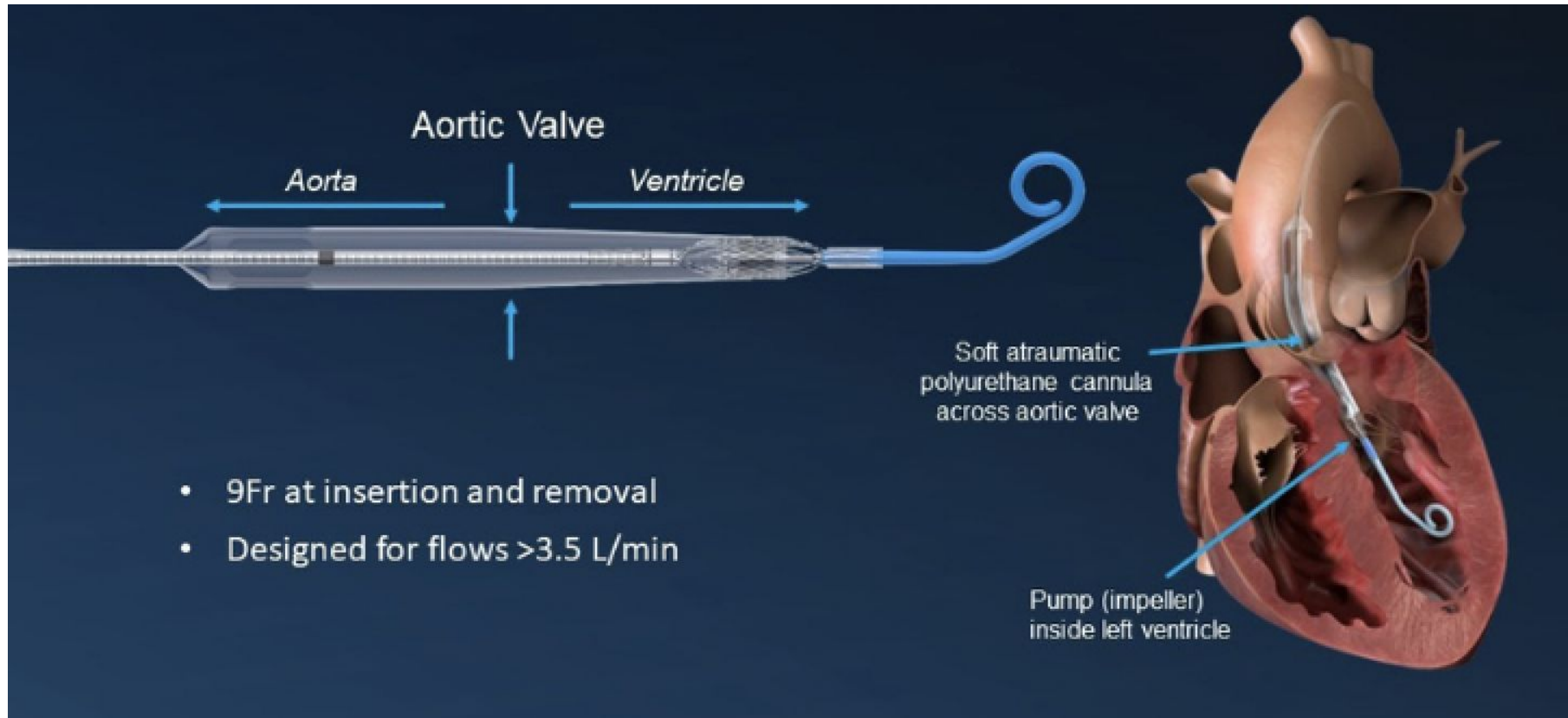
- Does not unload the heart
- Require a minimum of cardiac function
- Require a stable rhythm
- No proven benefit on mortality



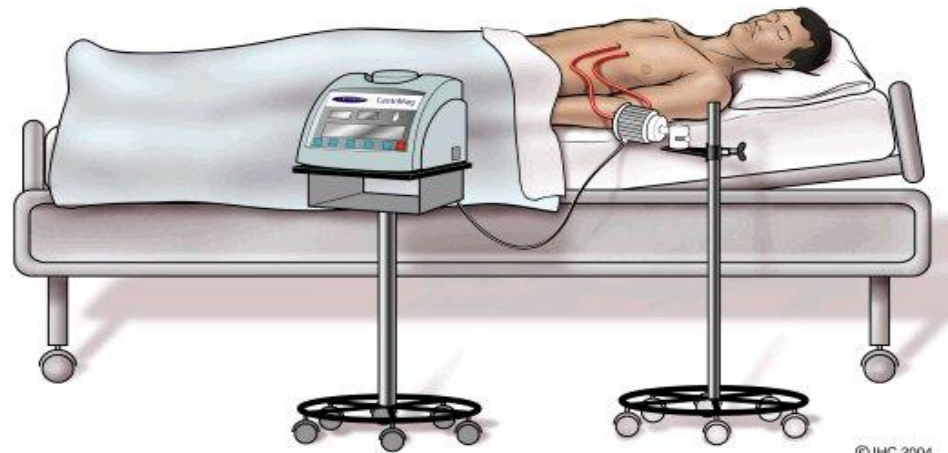
ECMO



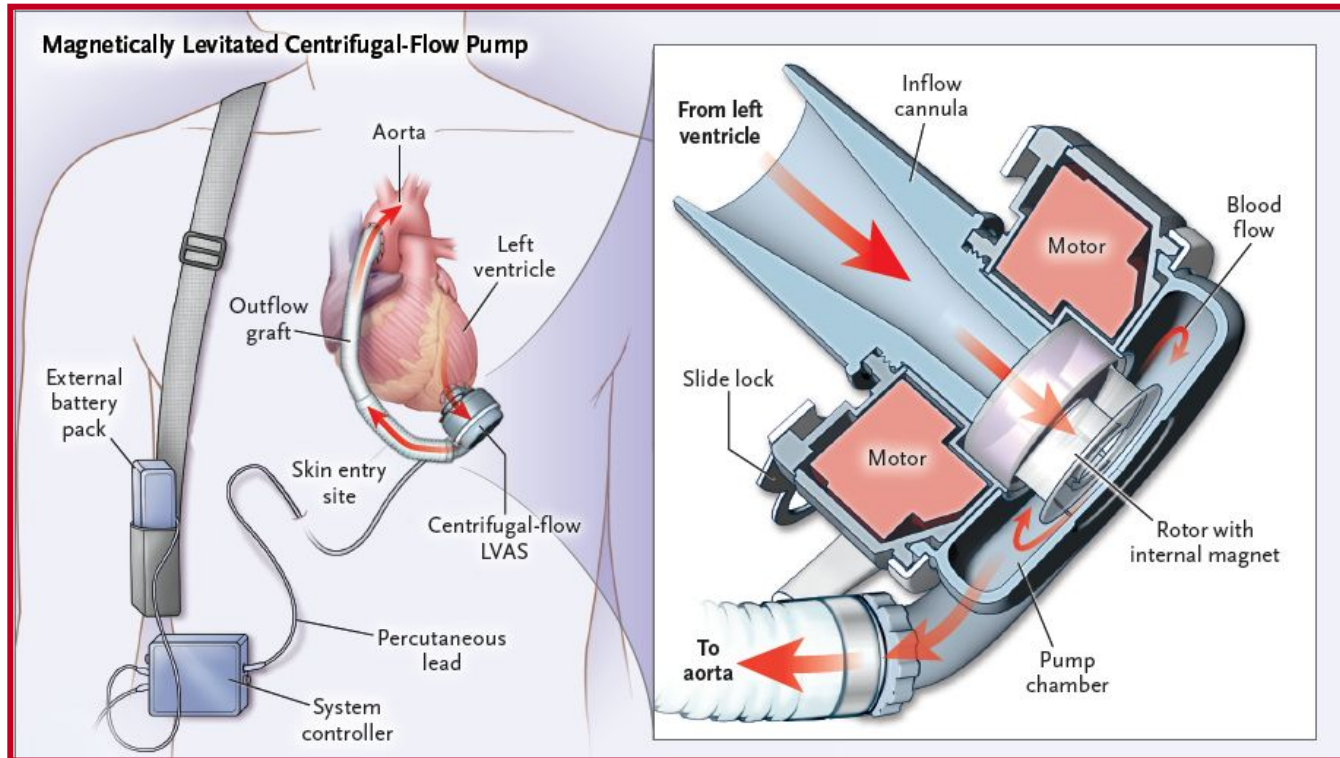
Impella



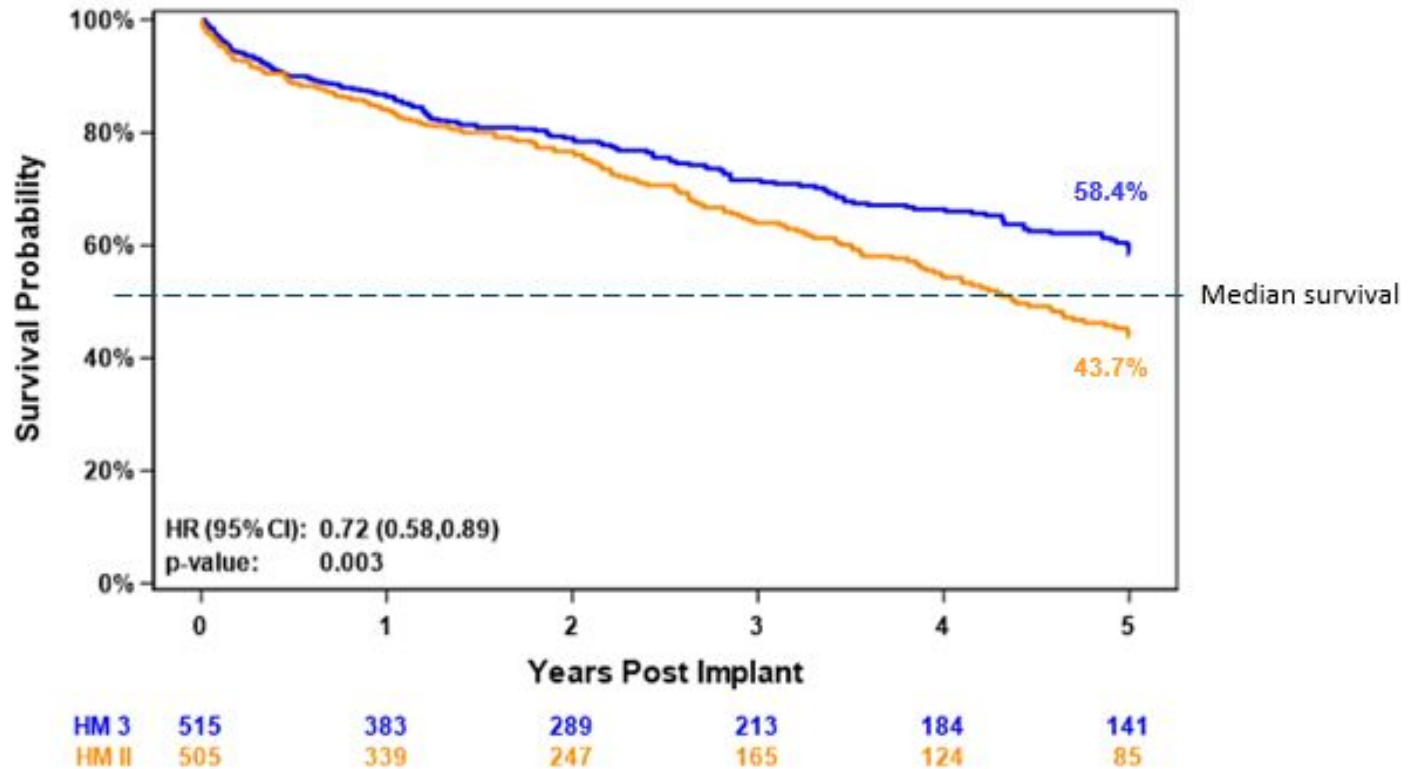
Centrimag



Dolgotrajna mehanska podpora



MOMENTUM 3: 5-letno preživetje



58,4% SURVIVAL AT 5 YEARS WITH THE HEARTMATE 3 LVAD

Smernice za uporabo dolgotrajne mehanske podpore

2021 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

Developed by the Task Force for the diagnosis and treatment of acute and chronic heart failure of the European Society of Cardiology (ESC)

Recommendations for the treatment of patients with advanced heart failure

Recommendations	Class ^a	Level ^b
Long-term MCS should be considered in patients with advanced HFrEF despite optimal medical and device therapy, not eligible for heart transplantation or other surgical options, and without severe right ventricular dysfunction, to reduce the risk of death and improve symptoms. ^{378,396,397,401,402,404,417}	IIa	A
Long-term MCS should be considered in patients with advanced HFrEF refractory to optimal medical and device therapy as a bridge to cardiac transplantation in order to improve symptoms, reduce the risk of HF hospitalization and the risk of premature death. ^{398–400,402,404}	IIa	B

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CLINICAL PRACTICE GUIDELINE: FULL TEXT

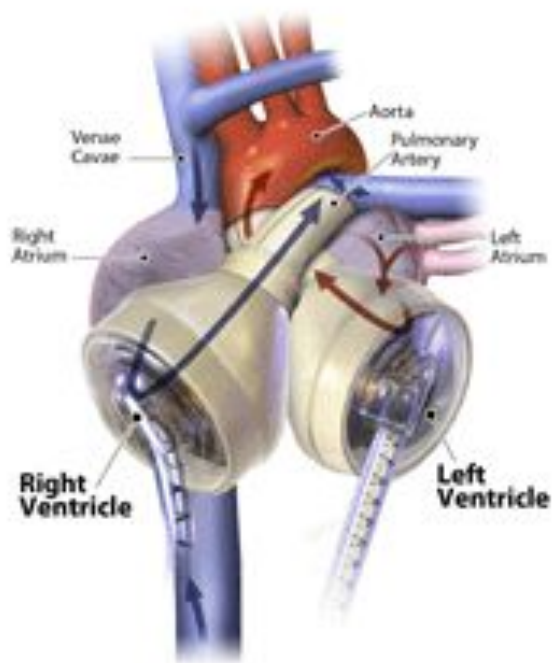
2022 AHA/ACC/HFSA Guideline for the Management of Heart Failure

A Report of the American College of Cardiology/American Heart Association Joint Committee on Clinical Practice Guidelines

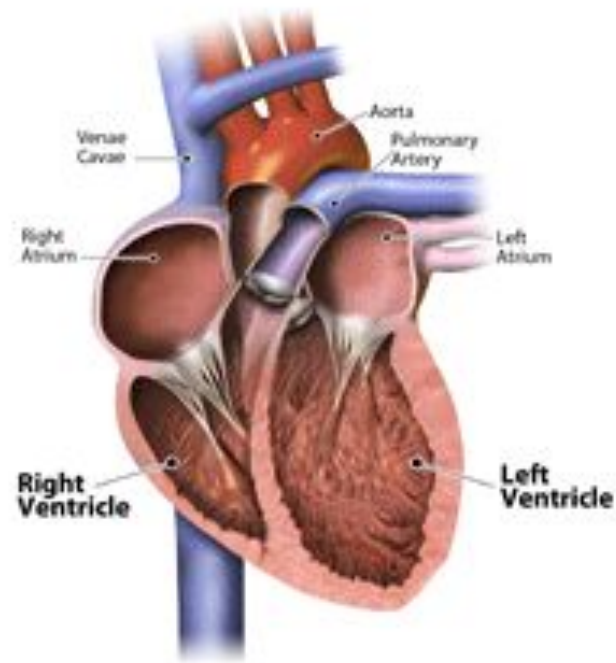
Recommendations for Mechanical Circulatory Support

COR	LOE	RECOMMENDATIONS
1	A	Advanced HFrEF NYHA Class IV patient on inotropes or temp. MCS
2a	B-R	Advanced HFrEF NYHA Class IV symptoms despite GDMT

Umetno srce

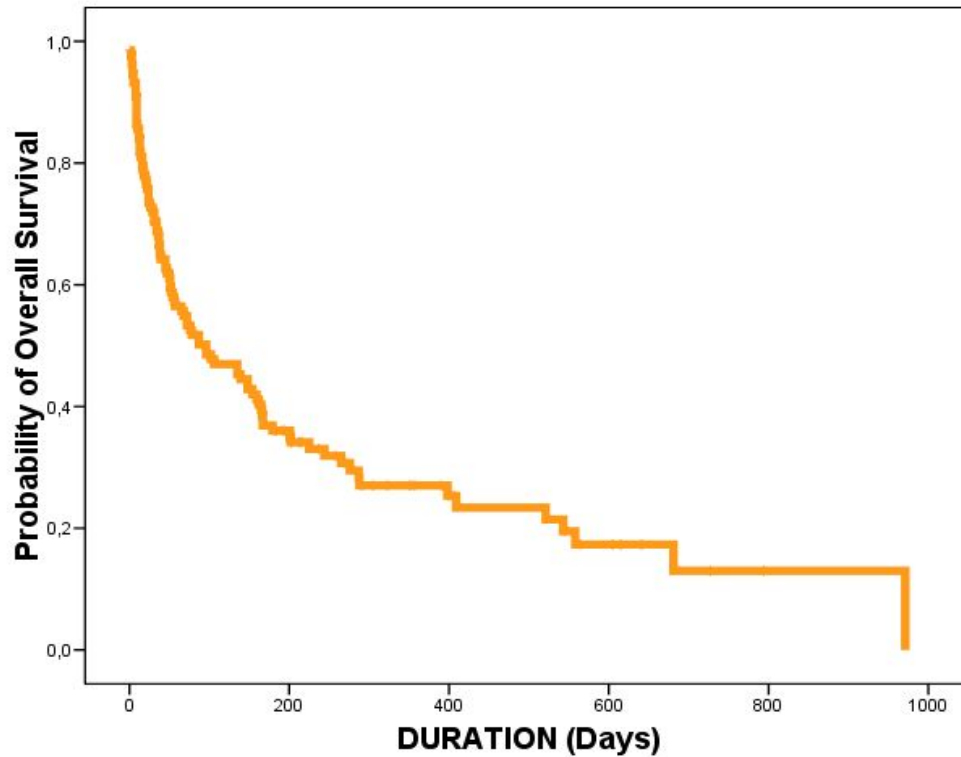


Total Artificial Heart



Human Heart

Umetno srce



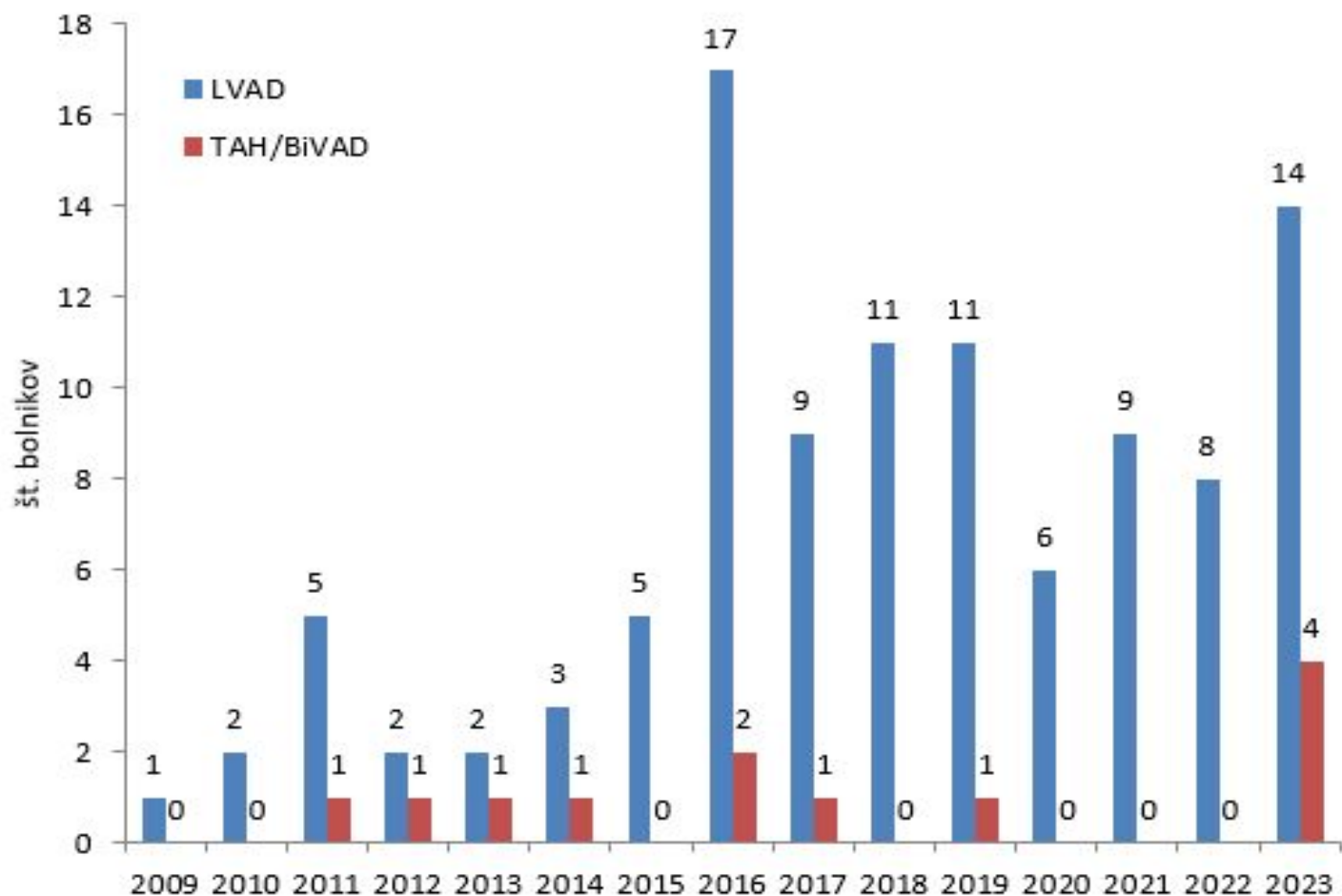
Experience in Bad Oeynheusen:

Patients: 150

Mean duration of support: 164 days

Longest duration: 971 days

Uporaba mehanske podpore v Sloveniji



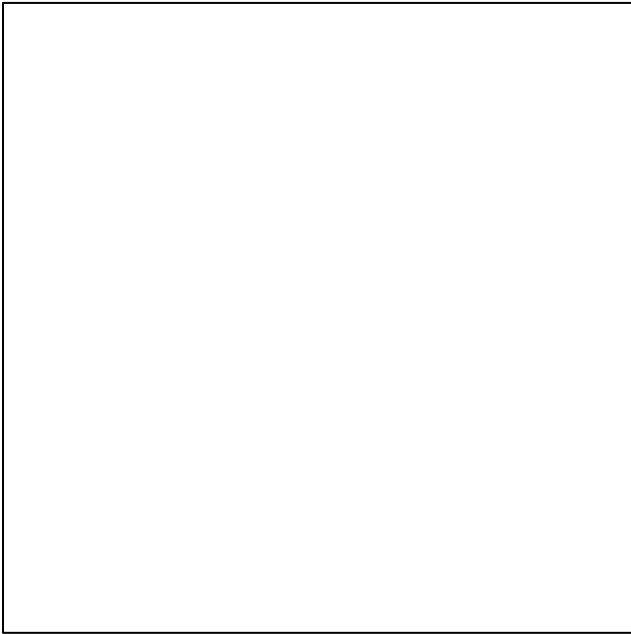
Zdravljenje napredovalega srčnega popuščanja

- Zdravljenje z zdravili
- Mehanska podpora
- **Presaditev srca**
- Nove možnosti zdravljenja

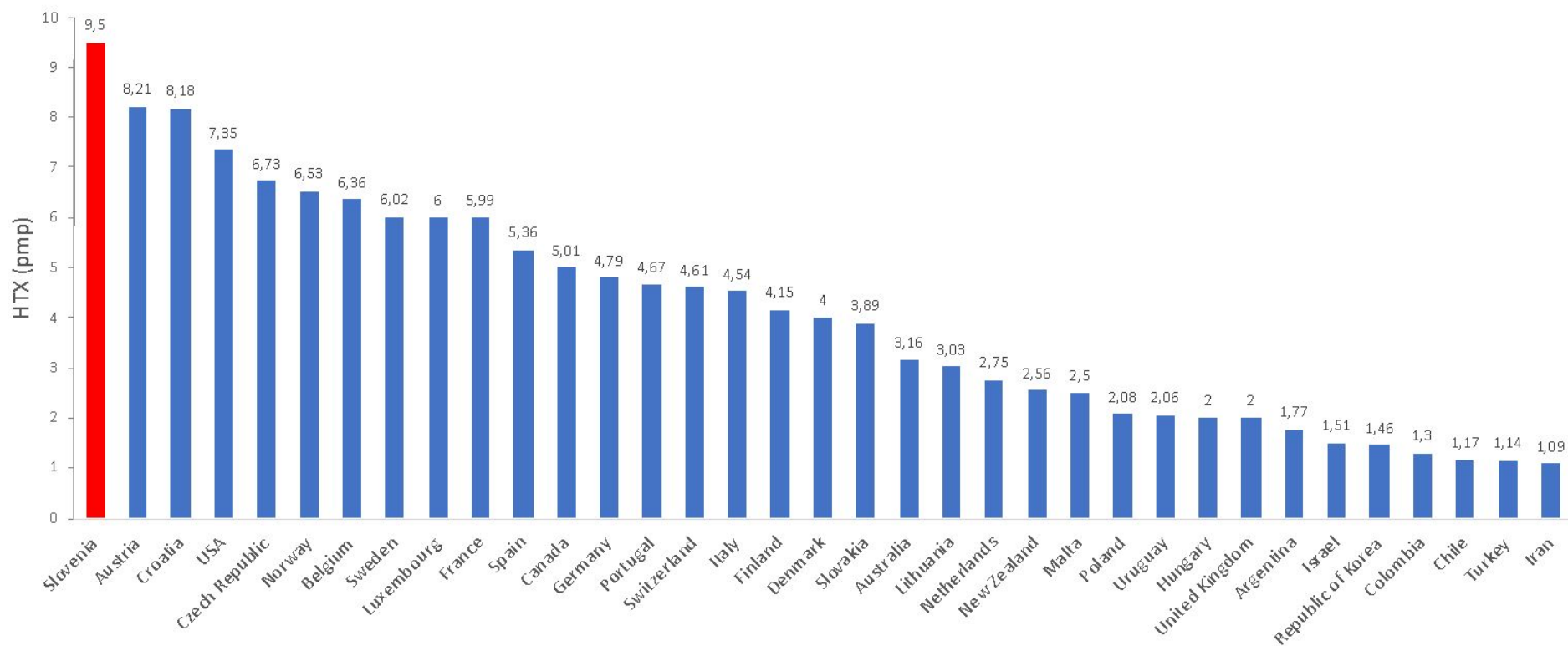
Presaditev srca: izbira prejemnika

1. Starost prejemnika <70 let
2. Bolezni pljuč TPG < 15 mmHg
3. Bolezni ledvic kreatinin < 350 $\mu\text{mol/l}$
4. Bolezni jeter bilirubin < 50 $\mu\text{mol/l}$
5. Maligne bolezni >5 let pred TX
6. Bolezni presnove ne SB s poznimi zapleti
7. Psihiatrična obolenja psihosocialna stabilnost

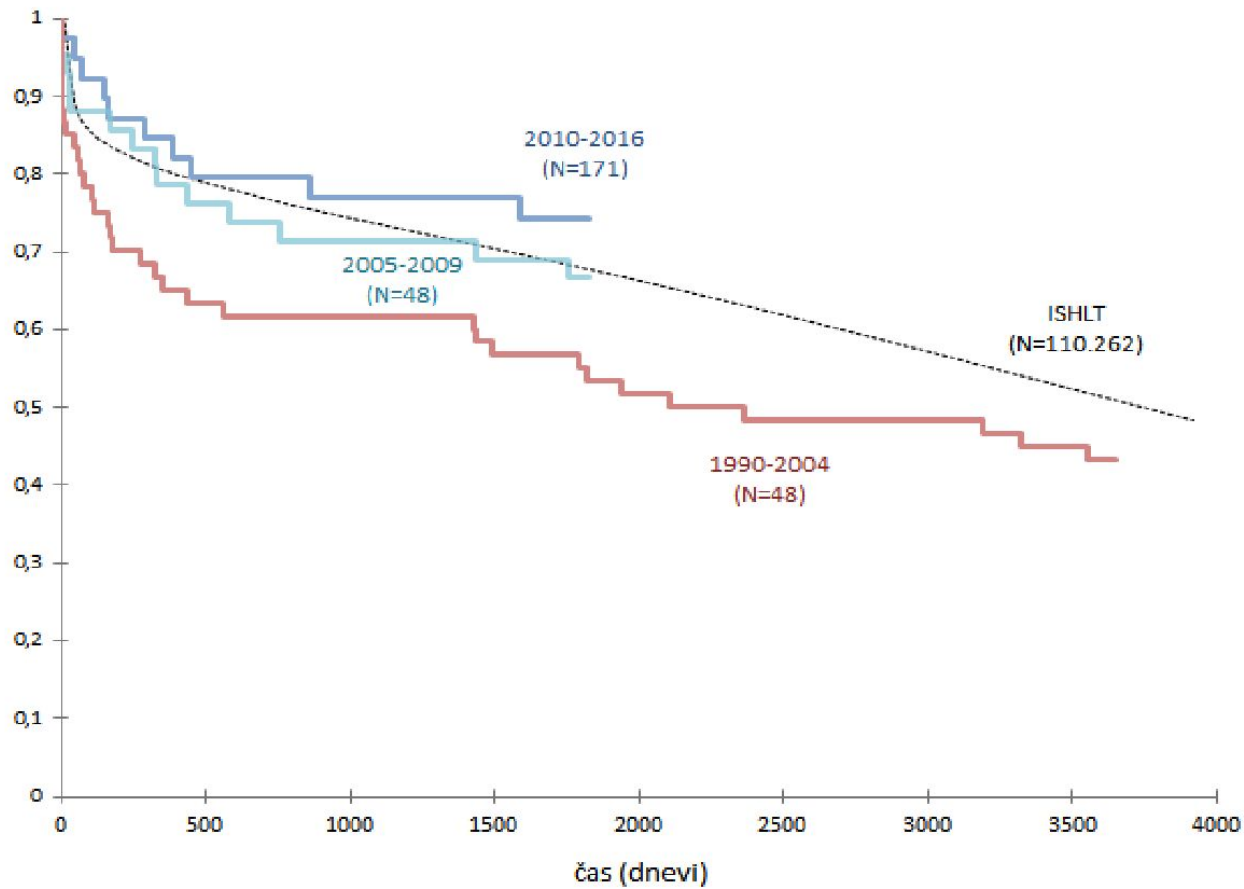
Presaditev srca v Sloveniji



Presaditev srca v svetu (2010-2022)



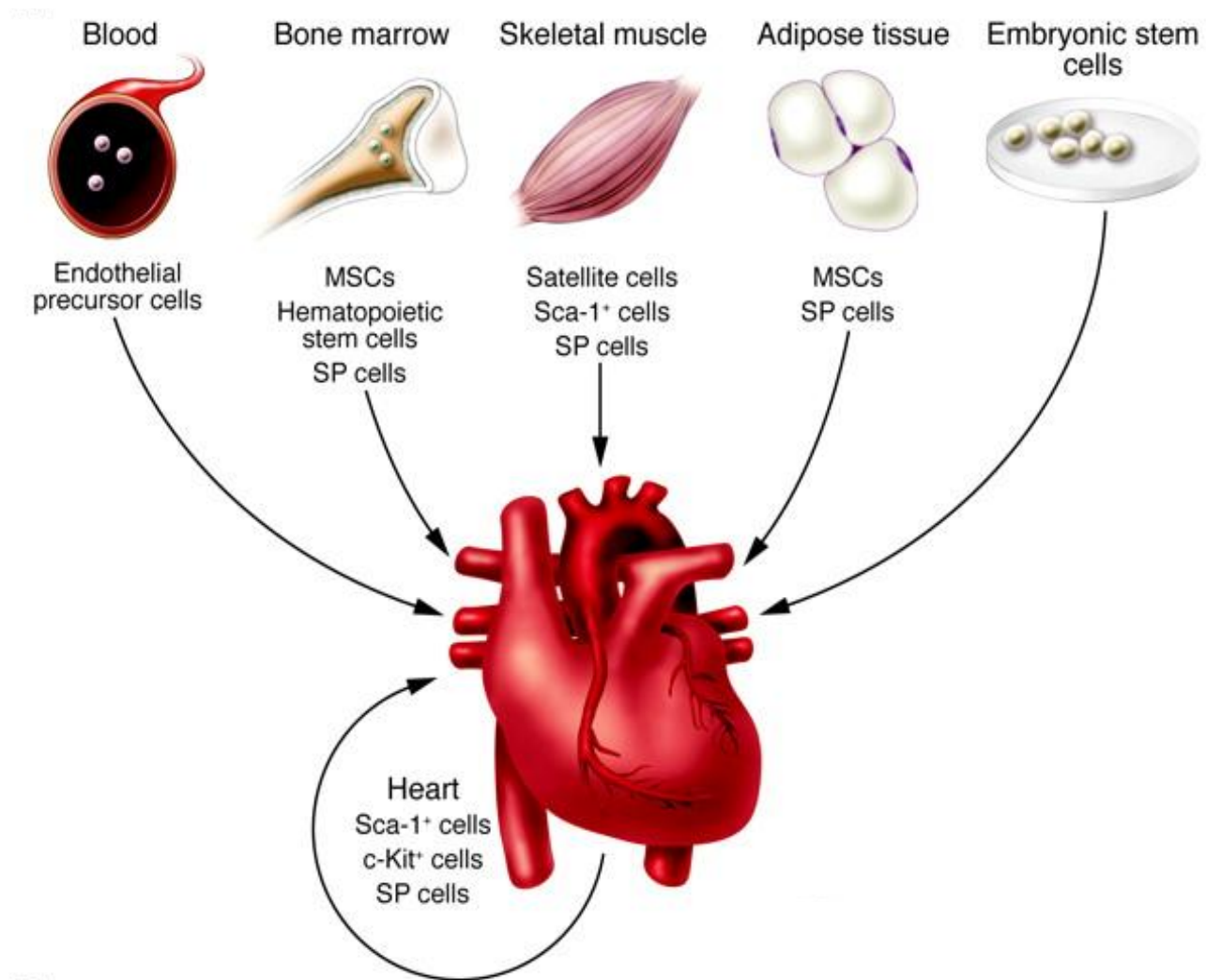
Preživetje po presaditvi srca



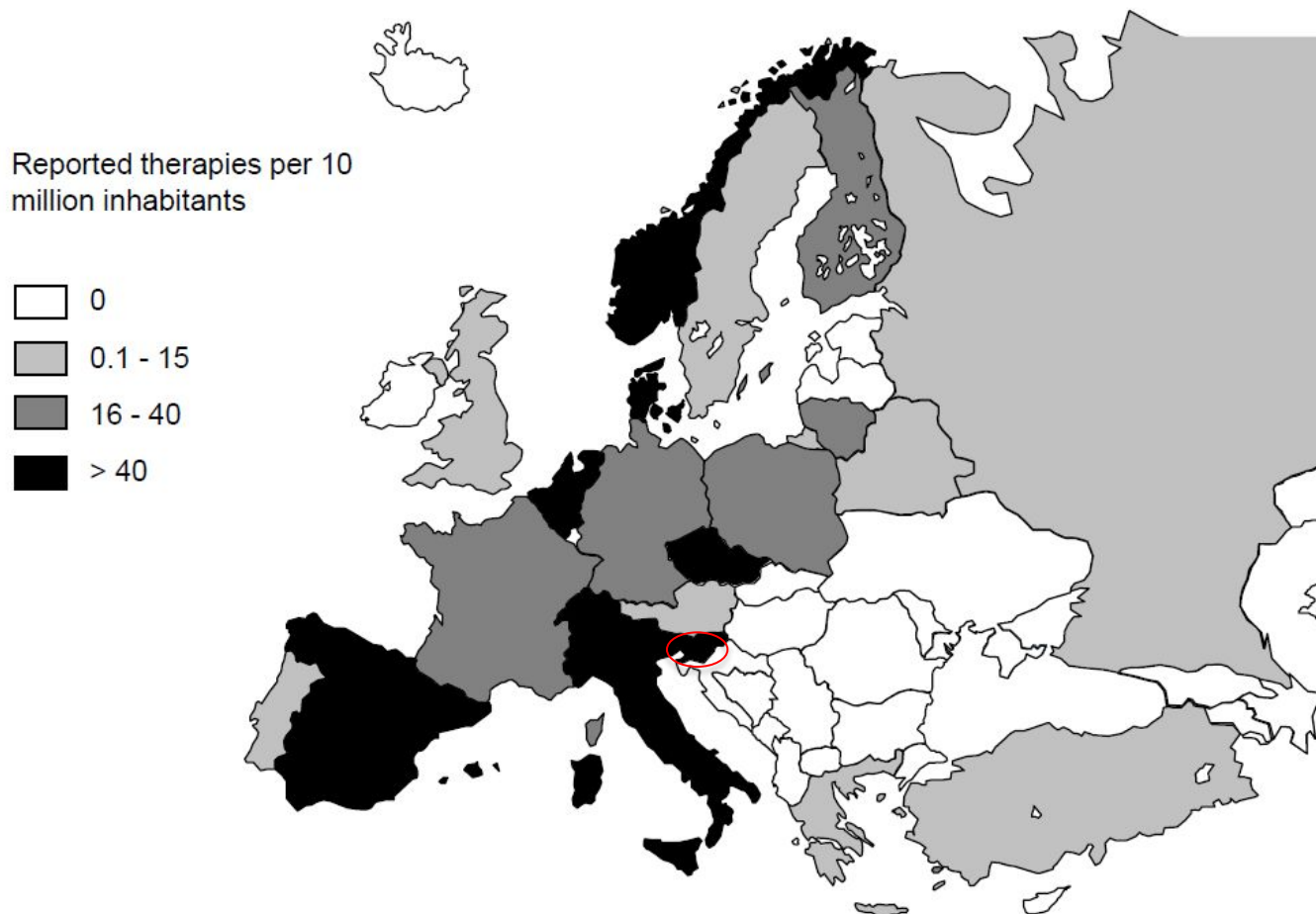
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Presaditev matičnih celic



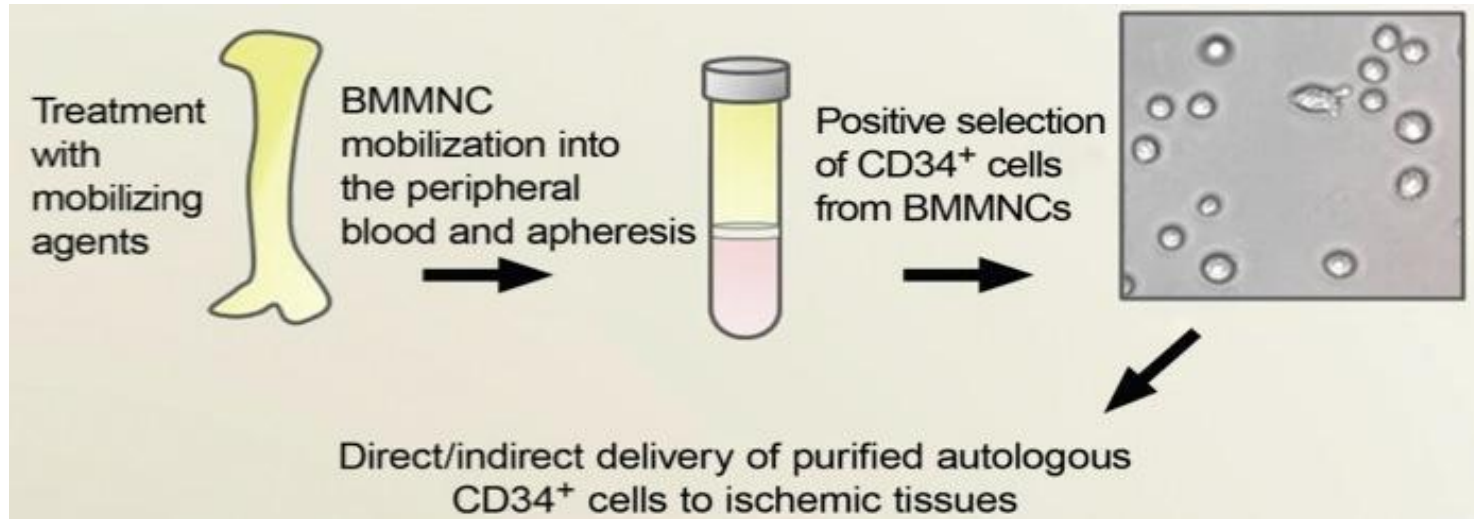
Presaditev matičnih celic v Sloveniji



The highest transplant rates were reported in (in decreasing order) **Slovenia**, the Netherlands, Italy, Spain, Belgium, Denmark, the Czech Republic, Norway and Switzerland.

Iran
Israel

CD34⁺ matične celice



Bone marrow stimulation: G-CSF: 10 µg/kg daily, 5 days
Cytopheresis and immune selection of CD34⁺ cells in vitro
Mean CD34⁺ cell numbers obtained for injection: 106 ± 35 million

Izbira bolnikov

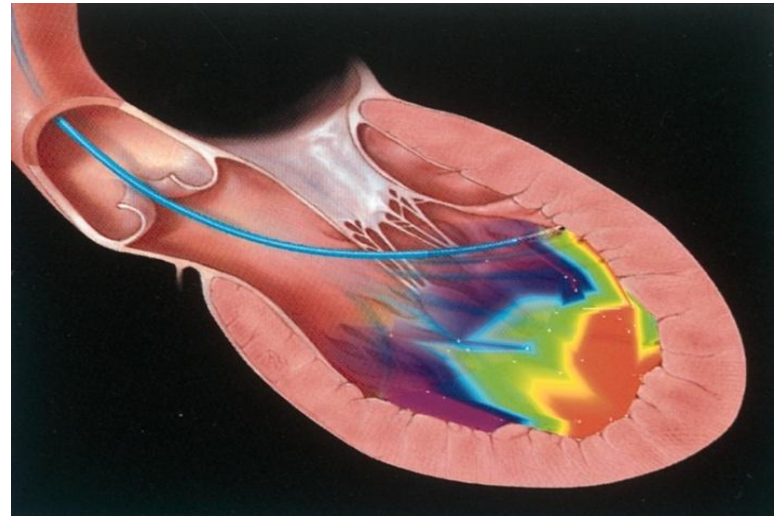
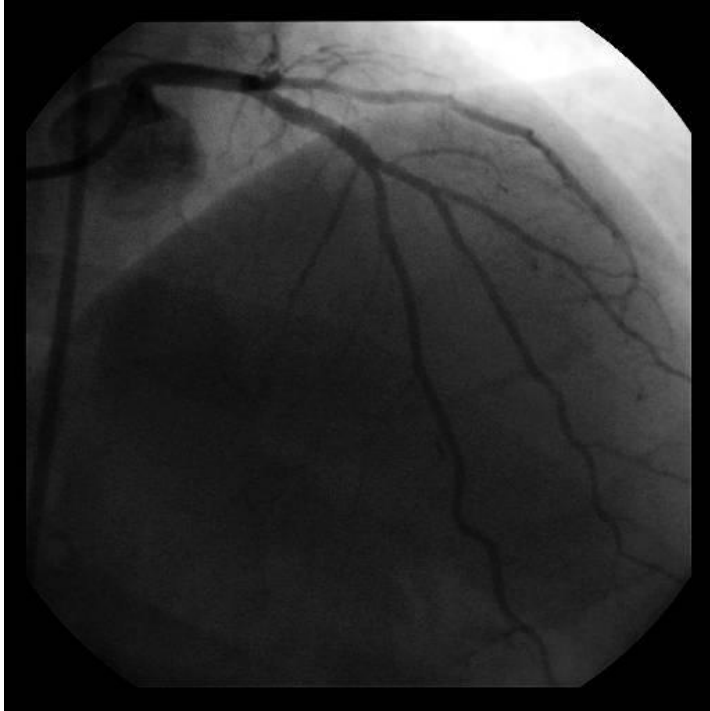
Inclusion criteria:

- Dilated cardiomyopathy
(no CAD, valve disease, hypertension, substance abuse)
- Patient age >18 years
- Optimal medical management for 6 months
- Left ventricular ejection fraction <40%
- Advanced clinical symptoms (NYHA III)

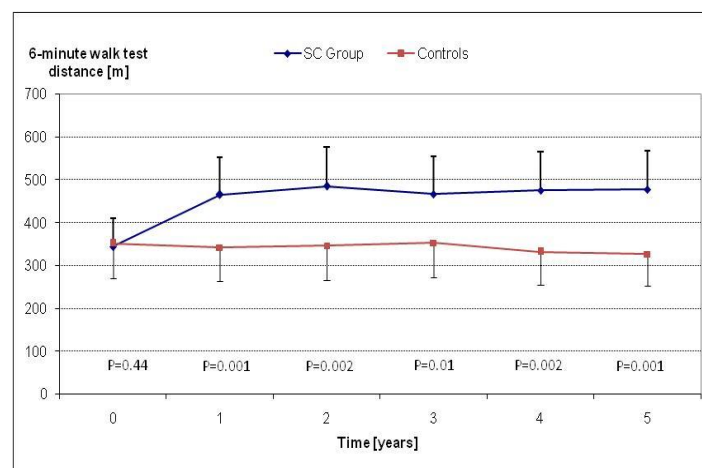
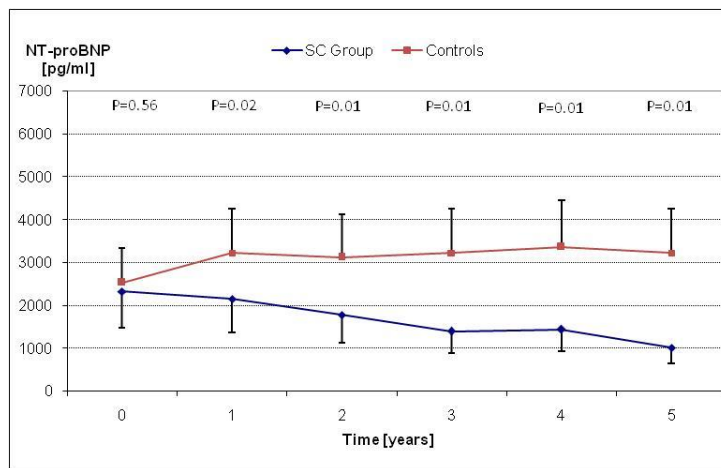
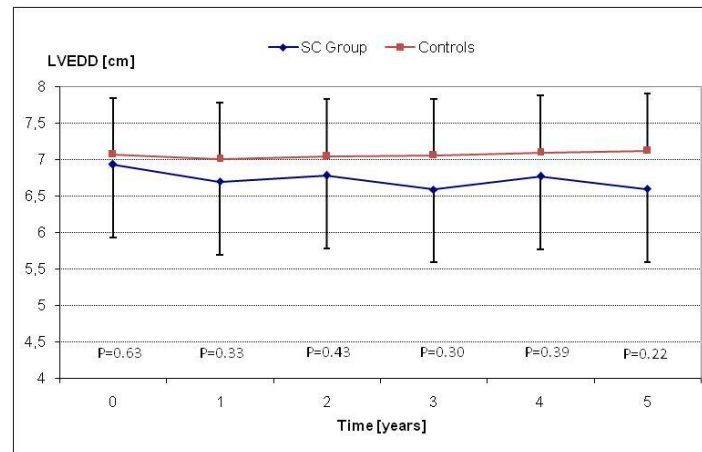
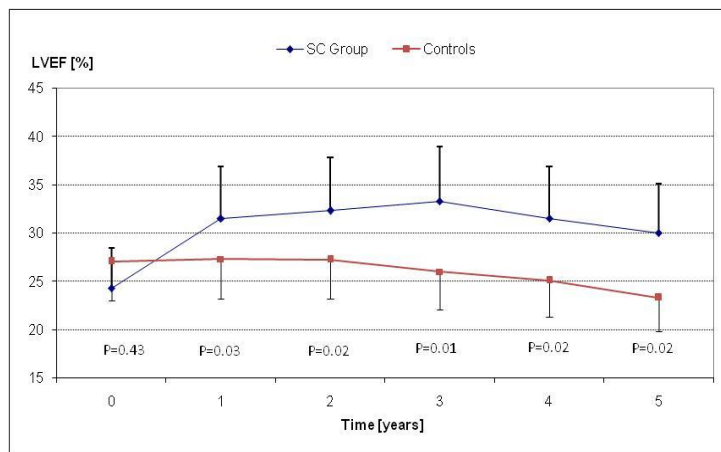
Exclusion criteria:

- Left ventricular aneurysm or thrombus
- Hematologic disease
- Multiorgan failure

Načini aplikacije



Klinični izhod zdravljenja



Tkivni inženiring

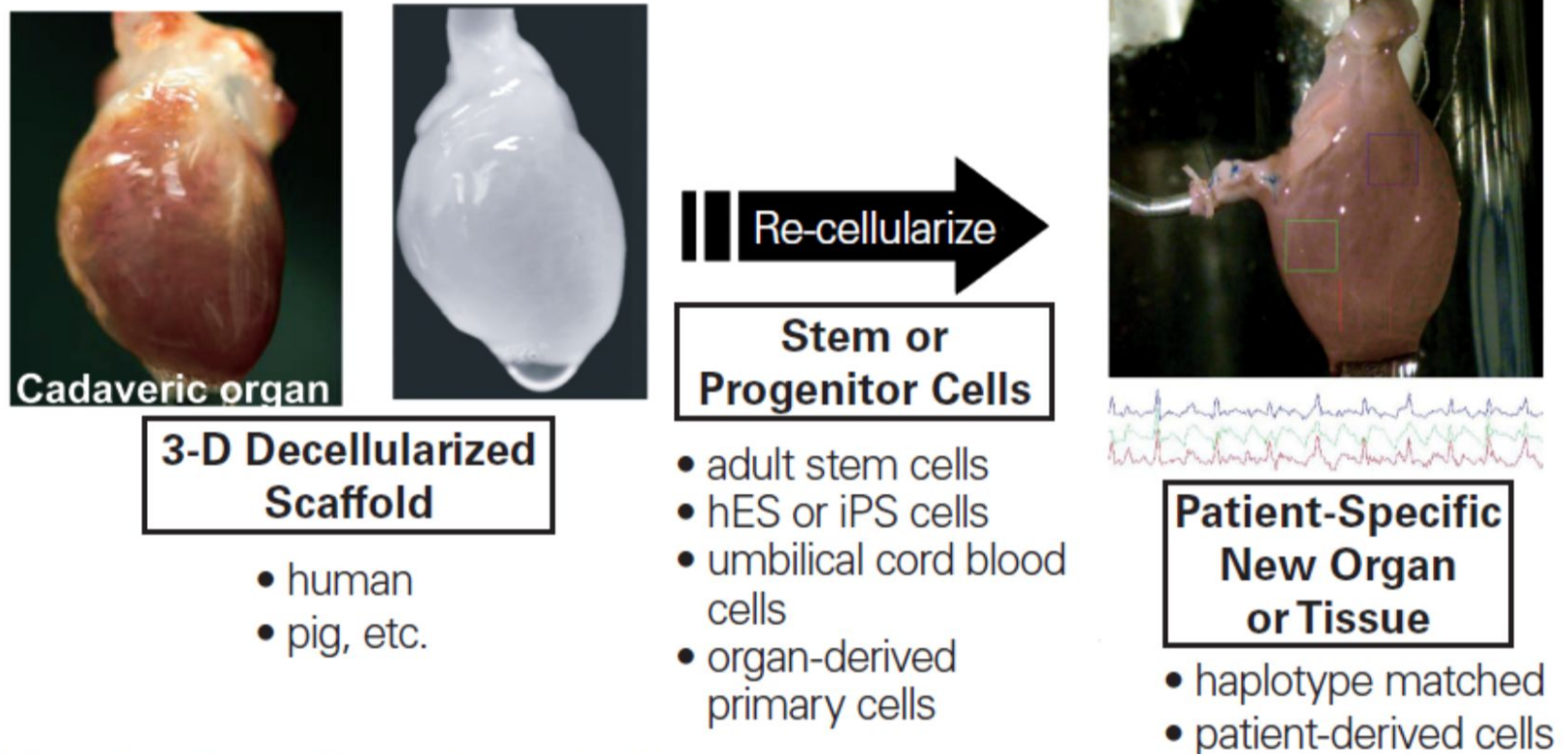


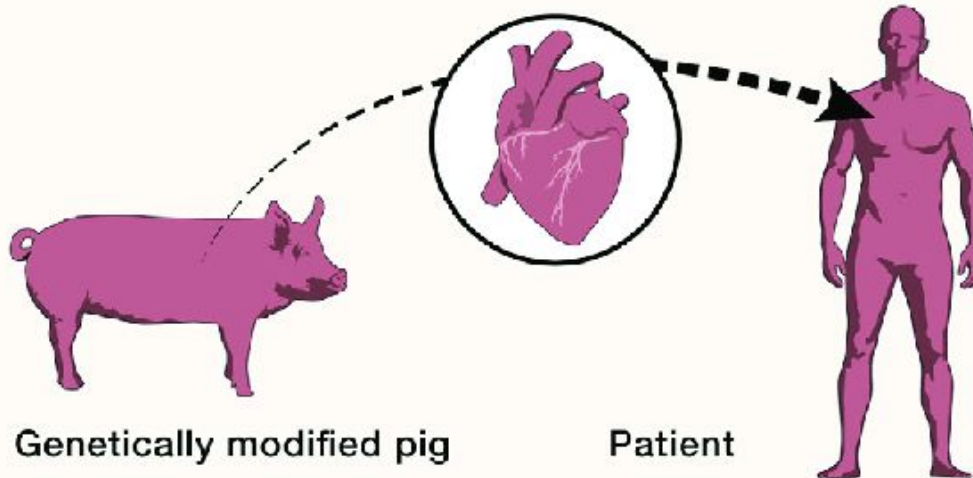
Fig. 1 Generating patient-specific organs for transplantation

hES = human embryonic stem; iPS = induced pluripotent stem

Xenotransplantacija

Xenotransplantation: first pig heart into a human

January 7, 2022, at the University of Maryland Medical Center



Genetically modified pig

- 10 genes edited
- 3 glycosyl transferase genes knocked out that would have resulted in rejection
- 1 gene switched off to prevent excessive growth
- 6 human genes to enable human acceptance

Patient

- 57 year old male
- Ineligible for a human heart transplant or artificial heart
- Pig heart transplant was a compassionate-use effort to save his life
- Patient died on March 9, 2022
- Patient lived longer than first human heart transplant recipients

Zdravljenje napredovalega srčnega popuščanja

**HVALA ZA
POZORNOST!**

