

XI Reunión. Estado del Arte en
INSUFICIENCIA CARDIACA

PRÁCTICA CLÍNICA Y MODELOS ORGANIZATIVOS

Sede: Hotel Meliá MaríaPita, A Coruña

A CORUÑA 27-28 SEPTIEMBRE 2024



XI Meeting. State of the Art in
HEART FAILURE

CLINICAL PRACTICE AND ORGANIZATIONAL MODELS

Venue: Hotel Meliá MaríaPita, A Coruña

#ACoruñaHF2024

A CORUÑA 27-28 SEPTEMBER 2024

SHORT-TERM MECHANICAL CIRCULATORY SUPPORT



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INTRODUCTION

HEART FAILURE WORLDWIDE PREVALENCE :
64 MILLION PEOPLE (8,5 / 1000 habitantes)

“INCREASING due to ageing of the population, improved treatment and survival of patients with HF”



MULTIDISCIPLINARY APPROACH
MULTIPLE MODALITIES OF TREATMENT



LIFESTYLE MODIFICATIONS
PHARMACOLOGIC AGENTS
DEVICE THERAPIES :

- IMPLANTABLE CARDIOVERTER-DEFIBRILLATOR (ICD)
- CARDIAC RESYNCHRONIZATION THERAPY (CRT)



SHORT & MID TERM MECHANICAL CIRCULATORY SUPPORT (IABP, ECMO...)
LONG TERM MCS - LEFT VENTRICULAR ASSIST DEVICES (LVAD)
HEART TRANSPLANT (WAITING LIST – Number of donor hearts available)

INTRODUCTION

*** DEFINITIVE TREATMENT HF **HEART TRANSPLANT**

“Heart transplantation (HTx) is recommended for patients with advanced heart failure refractory to medical and device therapy who do not present absolute contraindications after a careful evaluation of candidacy”

↑↑ **WAITING LIST**

↓↓ **USEABLE DONOR HEARTS**



USE of **MCS** before cardiac transplantation ↑↑

INTRODUCTION



The Journal of Heart and Lung Transplantation

Available online 26 April 2018

In Press, Corrected Proof



Original Clinical Science

Incidence of temporary mechanical circulatory support before heart transplantation and impact on post-transplant outcomes

David Ouyang MD ^a, Gunesagar Gulati AB ^a, Richard Ha MD ^b, Dipanjan Banerjee MD, MS ^a,

National Inpatient Sample (UNITED NETWORK FOR ORGAN SHARING) US

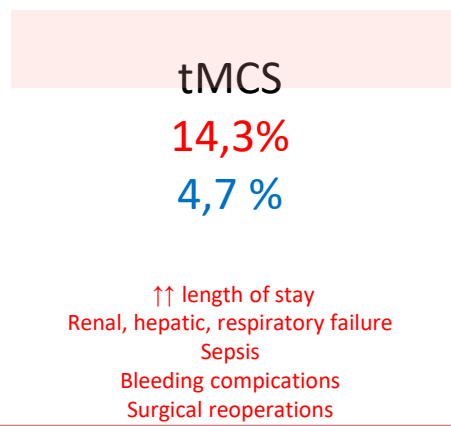
6892 patients - heart transplant 1998 to 2014

tMCS pre-transplant Vs No tMCS pre-transplant

Use of tMCS 1998 to 2014 → ↑↑ more than doubled (17cases /year → 40 cases /year)

RESULTS:

In hospital mortality
1998 - 2007 (p 0,05)
2007 - 2014 (p 0,9)



No tMCS
7,5%
5,1%

INTRODUCTION



The Journal of
Heart and Lung
Transplantation
<http://www.jhltonline.org>



Temporal trends in the use and outcomes of temporary mechanical circulatory support as a bridge to cardiac transplantation in Spain. Final report of the ASIS-TC study

Eduardo Barge-Caballero, MD, PhD,^{a,b} Francisco González-Vílchez, MD, PhD,^c
Luis Almenar-Bonet, MD, PhD,^{b,d}
María Dolores García-Cosío Carmena, MD, PhD,^{b,e} José González-Costello, MD,^f
Manuel Gómez-Bueno, MD,^{b,g} María Ángeles Castel-Lavilla, MD,^{b,h}
José Luis Lambert-Rodríguez, MD, PhD,ⁱ Manuel Martínez-Sellés, MD, PhD,^{b,j}
Sonia Mirabet-Pérez, MD, PhD,^{b,k} Luis De la Fuente-Galán, MD, PhD,^{b,l}
Daniela Hervás-Sotomayor, MD,^m Diego Rangel-Sousa, MD,ⁿ
Iris P. Garrido-Bravo, MD, PhD,^{b,o} Teresa Blasco-Peiró, MD,^p
Gregorio Rábago Juan-Aracil, MD, PhD,^q Javier Muñiz, MD, PhD,^{b,r} and
María G. Crespo-Leiro, MD, PhD^{a,b,r}

Emergency HTx while being supported with temporary MCS devices in 16 Spanish centers during the period

2010 to 2020 (1036 patients)

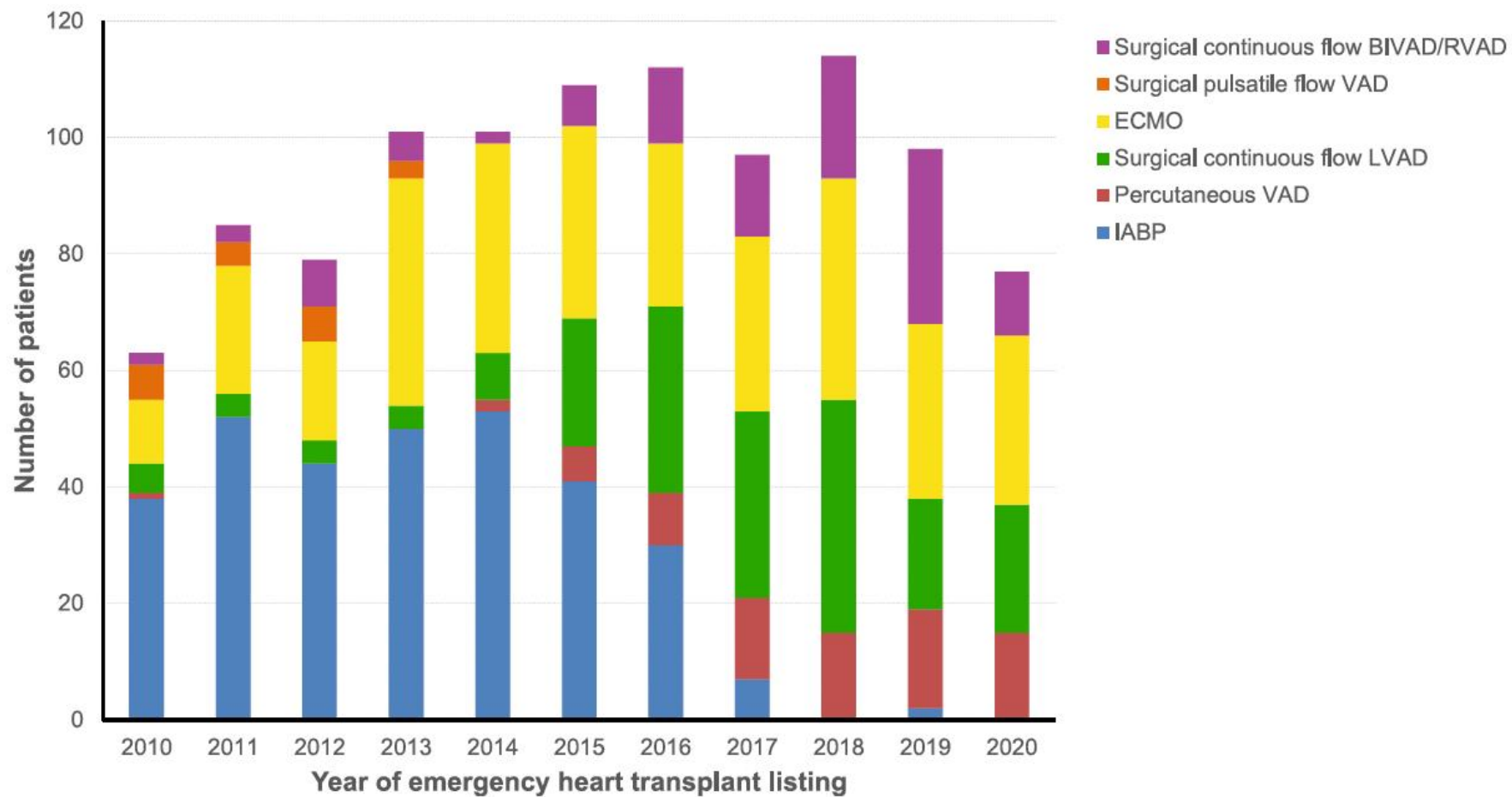
IABP	317 (30.6%)
Percutaneous VADs	79 (7.6%)
ECMO	313 (30.1%)
Surgical continuousflow VADs	308 (29.7%)
Surgical pulsatile-flow VADs	19 (1.8%)

(Cumulative rate of HTx in this population 85%. One-year post-transplant survival 76%⁹)

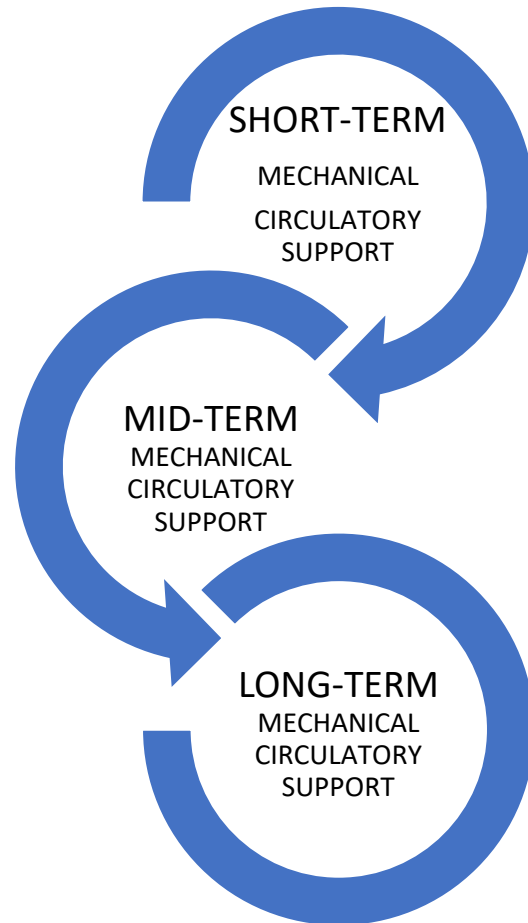
The mode of temporary MCS → impact on post-transplant outcomes (**ECMO - increased post-transplant mortality**)

Emergency procedures represent more than **one-third** of all HTx performed in Spain every year

INTRODUCTION



INTRODUCTION



CATEGORIES OF USE ...

- BRIDGE TO **DECISION**
- BRIDGE TO **RECOVERY**
- BRIDGE TO **CANDIDACY**
- BRIDGE TO **TRASPLANTATION**
- BRIDGE TO **THERAPY**

90-95% LVAD / 5-10% BiVAD

CHUAC IMPLANTS

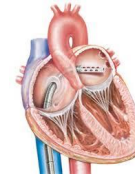
- MEDTRONIC BIOMEDICUS CENTRIFUGAL PUMP
- IMPELLA 2, 5L Y 5L
- BERLINHEART EXCOR PEDIATRIC

2010



- IMPELLA CP
- HEARTWARE
- CENTRIMAG
- PROTEKSOLO

2021



- **CARDIOHELP SYSTEM (MAQUET)**



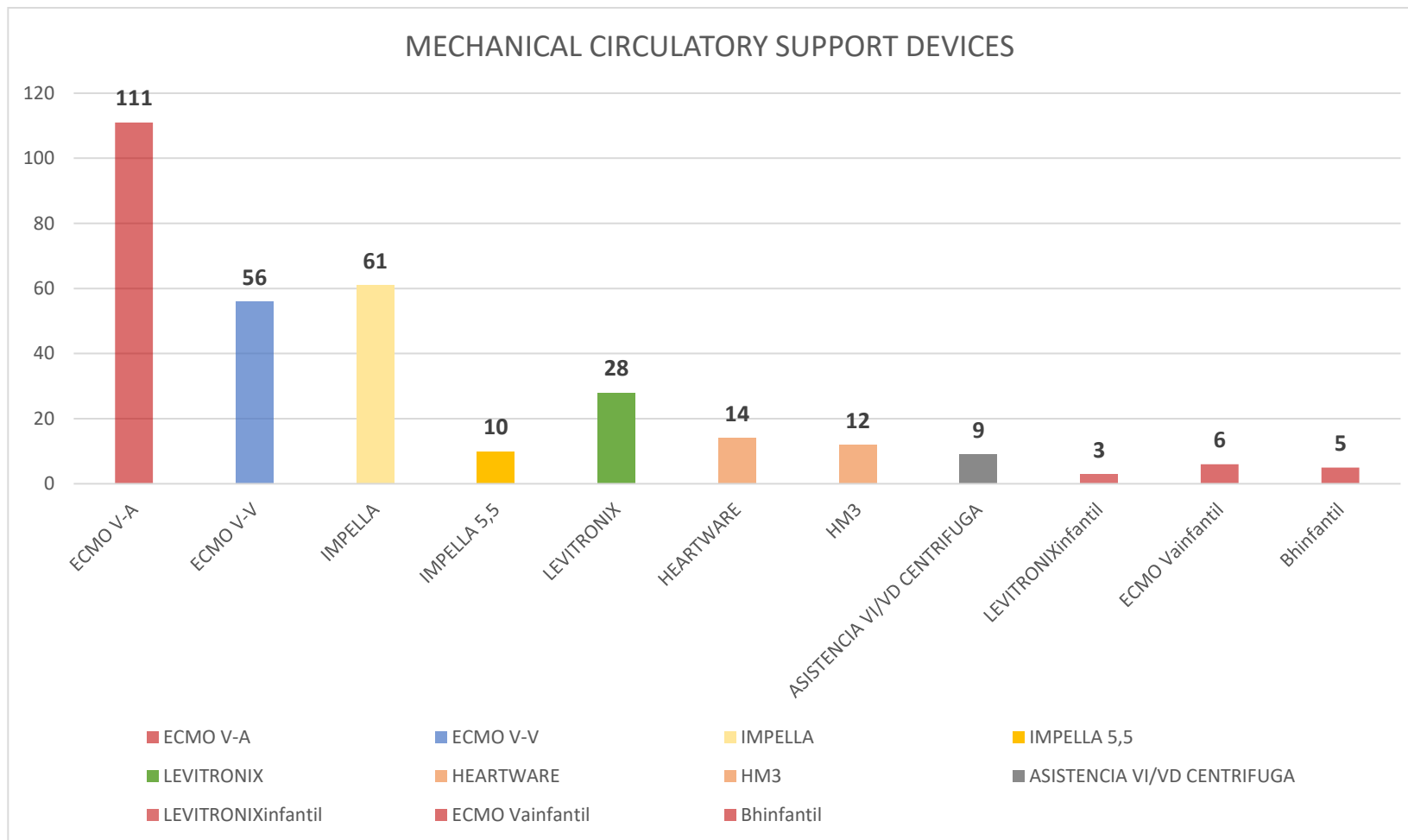
*** MECHANICAL CIRCULATORY SUPPORT PROGRAM AT CHUAC STARTS IN 2010



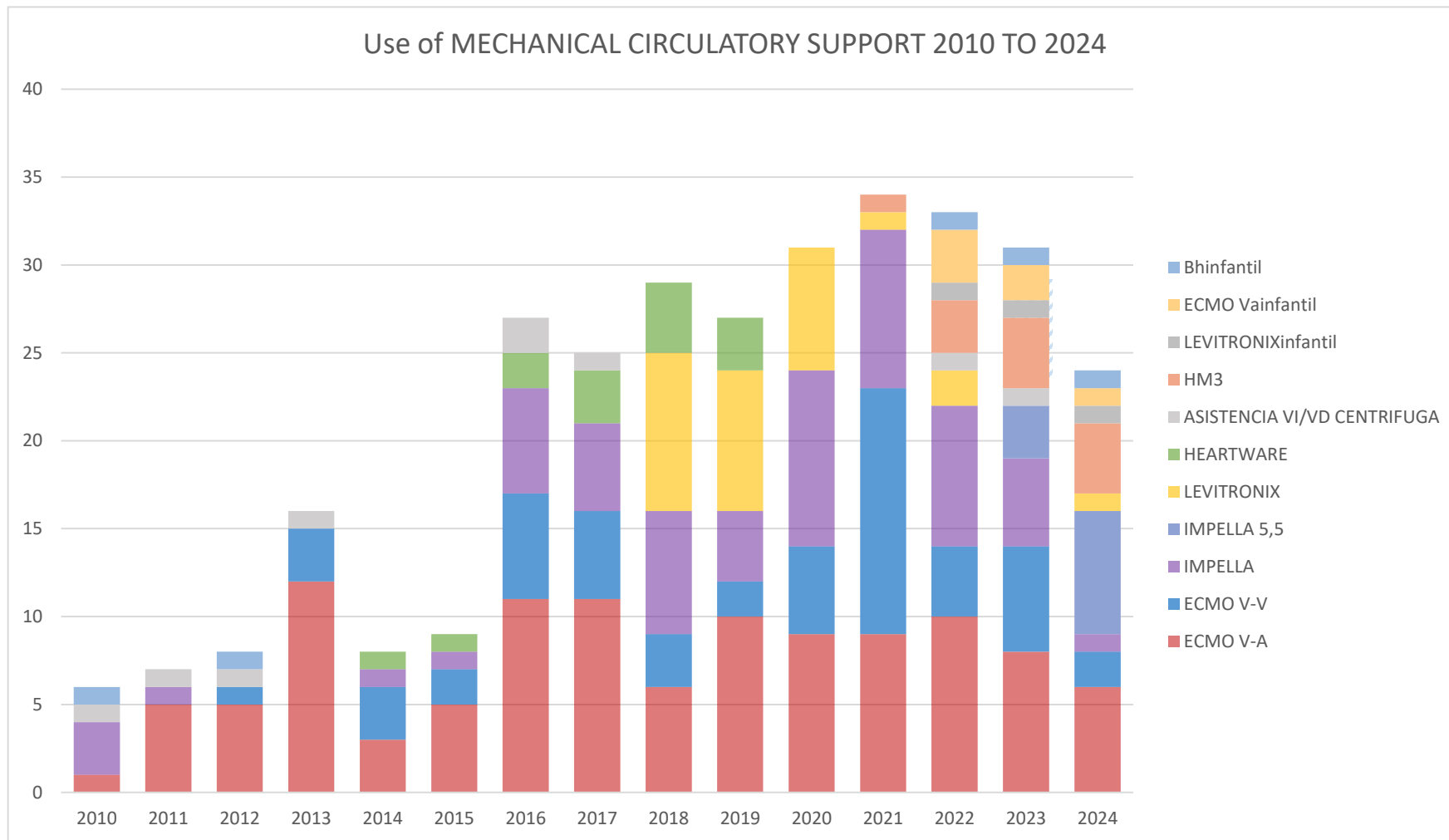
CHUAC IMPLANTS

	N
ECMO V-A	111
ECMO V-V	56
IMPELLA	61
IMPELLA 5,5	10
LEVITRONIX	28
HEARTWARE	14
HM3	12
ASISTENCIA VI/VD CENTRIFUGA	9
LEVITRONIX (<14yo)	3
ECMO (<14yo)	6
BH (<14yo)	5
TOTAL	315

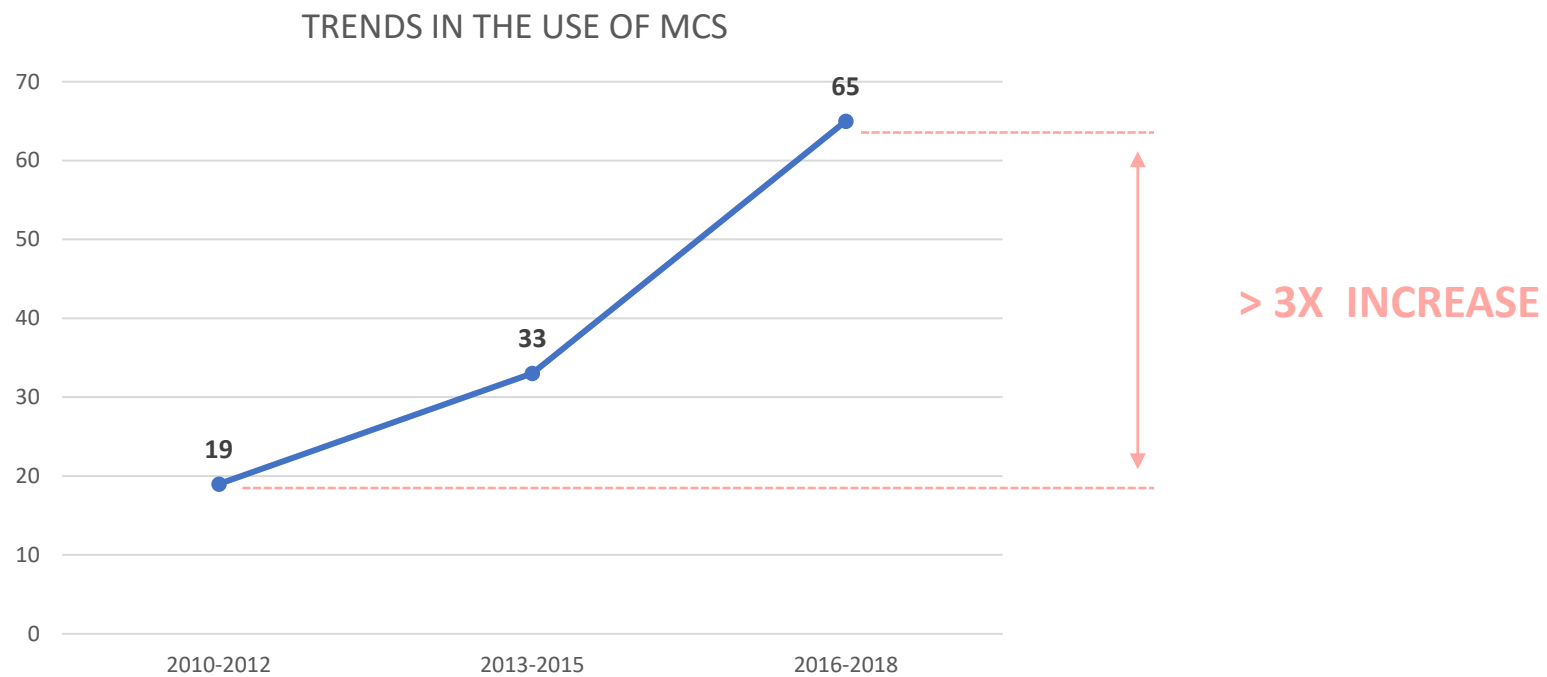
CHUAC IMPLANTS



CHUAC IMPLANTS



CHUAC IMPLANTS

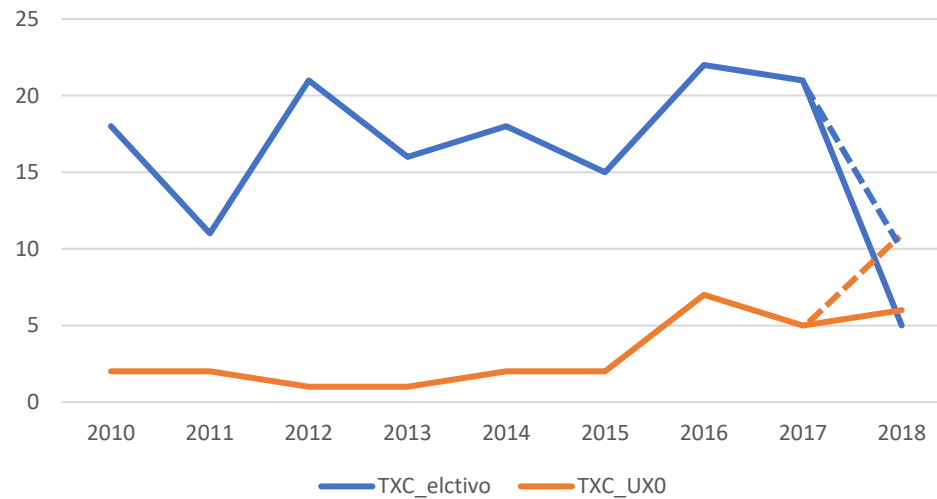


	Num MCSd	Num HTx	HTx elective	HTx UO	% Tx UxO
2010-2012	19	55	50	5	9%
2013-2015	33	54	49	5	9%
2016-2018	65	66	48	18	27%



HEART TRANSPLANT TRENDS

Heart transplant ELECTIVE Vs EMERGENCY



ONT (SPAIN)

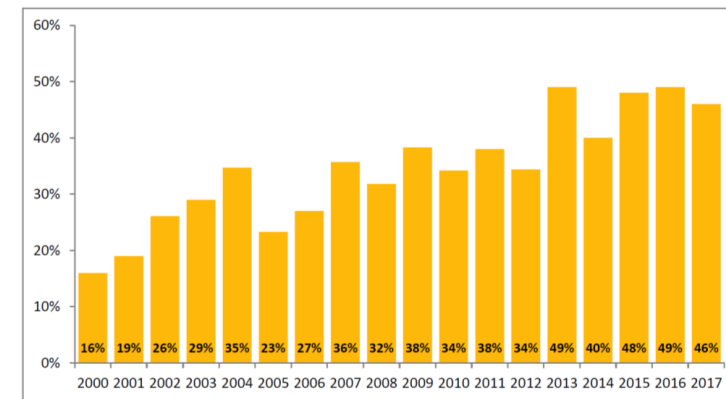


Figura 29. Porcentaje de trasplantes cardiacos realizados en urgencia en relación al número total de trasplantes cardiacos. Urgencias cardiacas. España 2000-2017

>45% EMERGENCY HEART TRANSPLANTATION

	Num MCSd	Num HTx	HTx elective	HTx U0	% Tx Ux0	M Electivos	M Ux0	N M Ux0
2010-2012	19	55	50	5	9%	10%	0%	0
2013-2015	33	54	49	5	9%	16%	40%	2
2016-2018	65	66	48	18	27%	4%	6%	1



HEART TRANSPLANT TRENDS

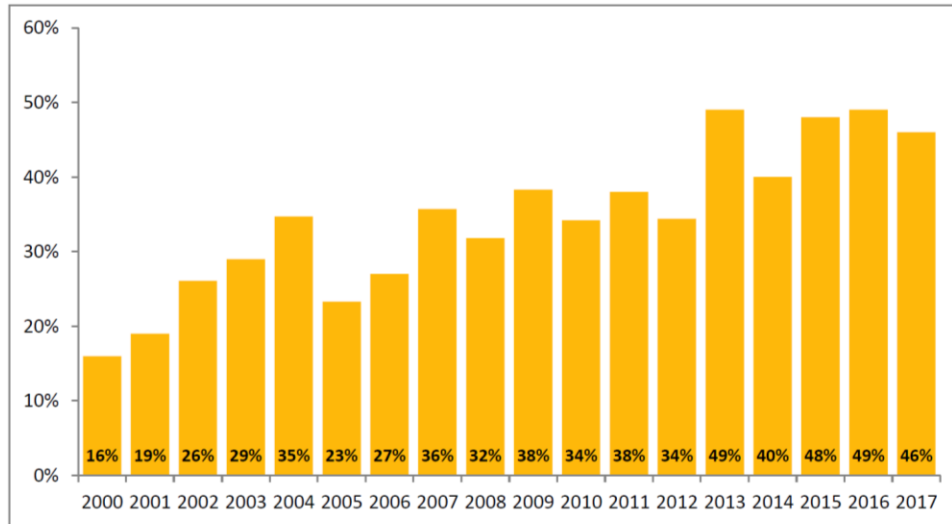
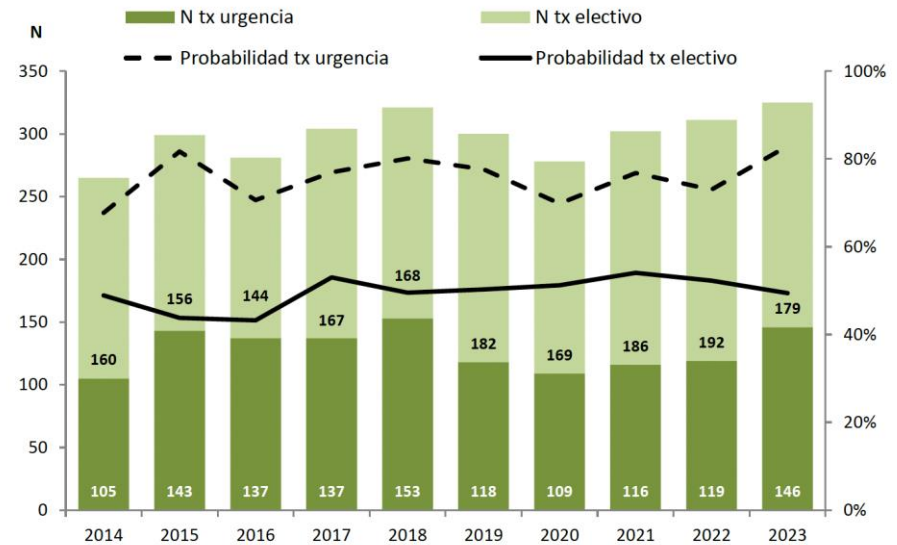
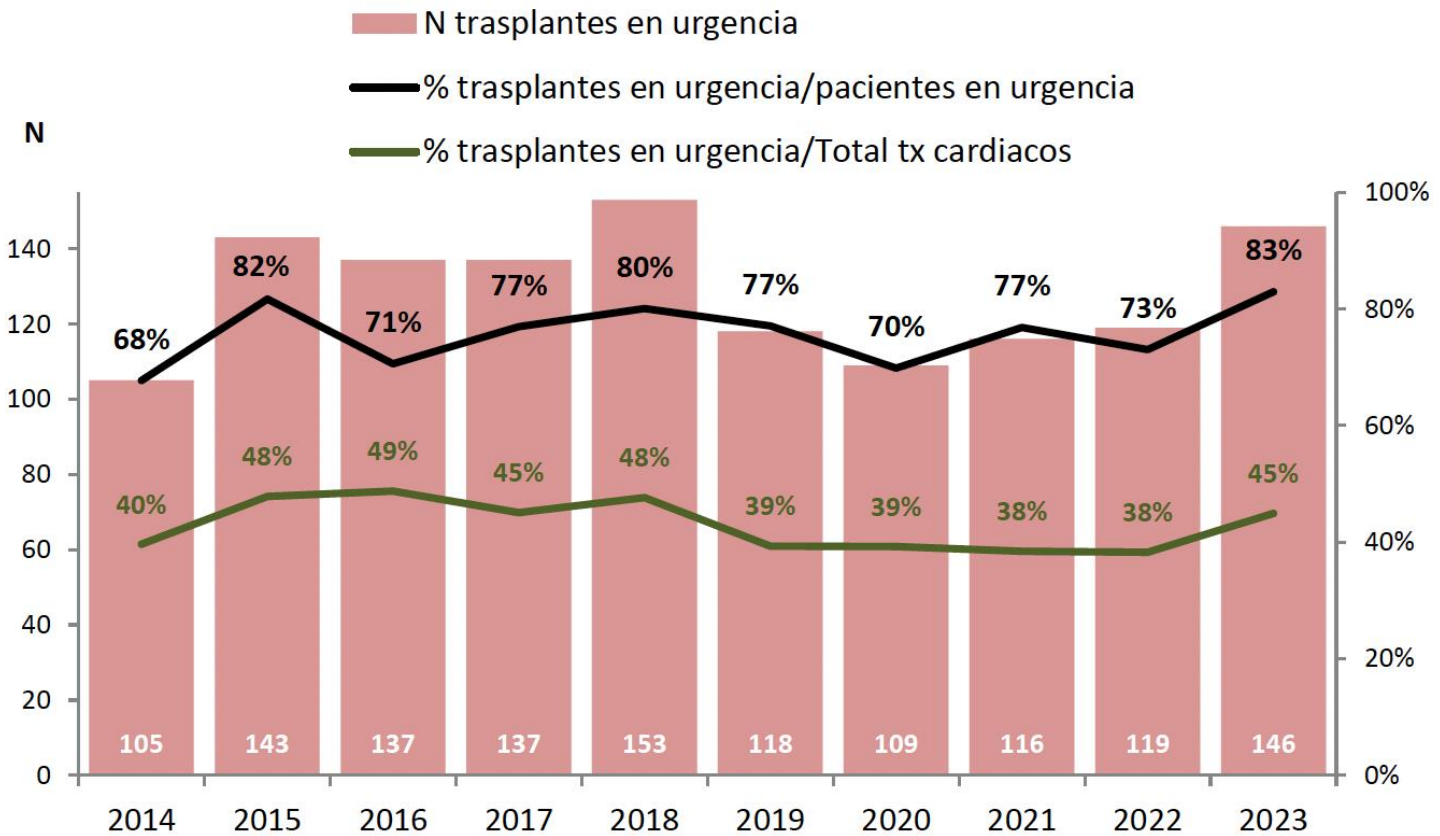


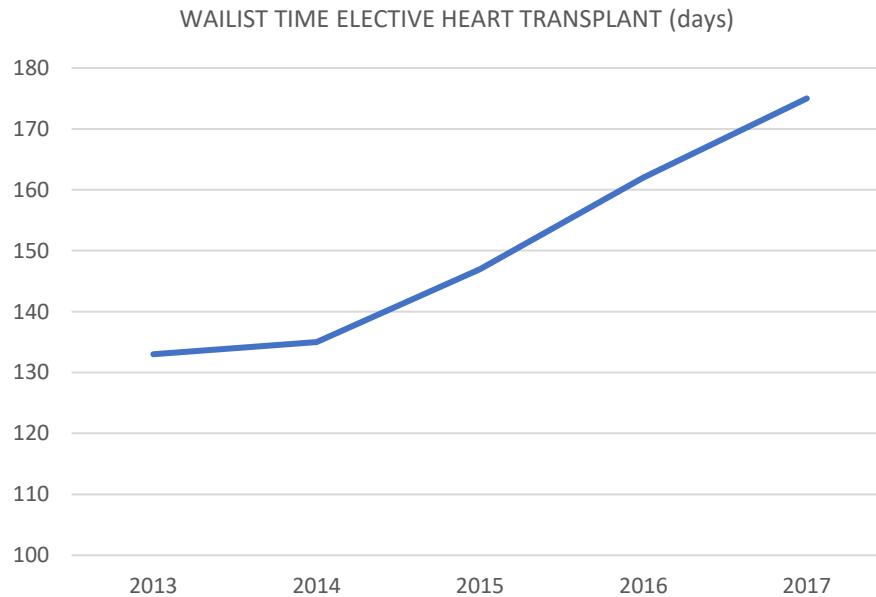
Figura 29. Porcentaje de trasplantes cardíacos realizados en urgencia en relación al número total de trasplantes cardíacos. Urgencias cardíacas. España 2000-2017





HEART TRANSPLANT TRENDS

RECIPIENT WAITLIST TIME FOR ELECTIVE HEART TRANSPLANT IN SPAIN (ONT)



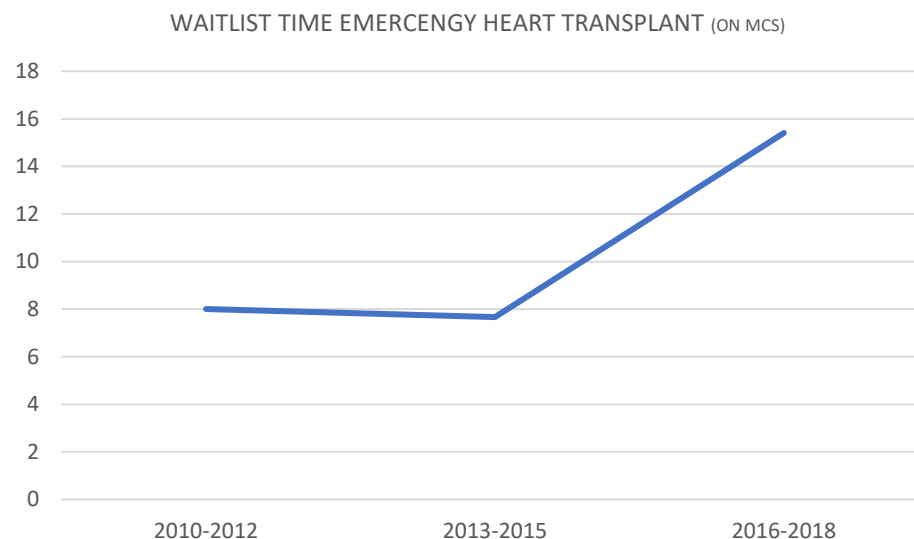
2017 ≈ 6 moths

Tabla VI. Tiempo en lista de espera cardiaca (días). Lista de espera cardiaca. España 2013-2017.

Año	N	Media (DE)	Mediana (25%-75%)
2013	376	133 (145)	85 (24-226)
2014	422	135 (147)	82 (25-209)
2015	469	147 (157)	91 (27-222)
2016	441	162 (172)	98 (26-248)
2017	427	175 (209)	90 (22-256)

Eliminados pacientes excluidos de la lista de espera y en lista urgente a final de año.

HEART TRANSPLANT TRENDS



ONT (SPAIN)

	Pacientes en lista	Mediana	(RIC)
Urgencia NO	362	133	(42-258)
Urgencia SI	176	18	(5-115)
Global	538	87	(17-230)

8 days in MCS (2010-2012) → 15 days in MCS (2016-2018)

MECHANICAL CIRCULATORY SUPPORT TRENDS

PATIENT MANAGEMENT GOALS MECHANICAL CIRCULATORY SUPPORT

Ethical issues

- Unload the LV (when necessary) to promote myocardial recovery
- Unload the LV (when necessary) to allow lung healing and prevent further lung damage
- Restore optimal intravascular volume
- Restore normal oxygenation and acid-base balance, when necessary
- Unload the RV
- Prevent upper body hypoxia [harlequin (north/south) syndrome]
- Maintain distal limb perfusion (peripheral ECMO)
- Balance prevention of thrombosis with bleeding
- Maintain some LV ejection to reduce risk of intracardiac thrombus
- Monitor and promote recovery of renal and hepatic function
- Implement adequate nutrition and physical therapy
- Determine wishes of patient and/or family for durable MCS and/or transplantation as well as wishes for duration of ECMO support could serious complications occur
- Bridge patient to myocardial recovery, durable LVAD support, and/or transplantation when desired and medically appropriate or to desired end of life

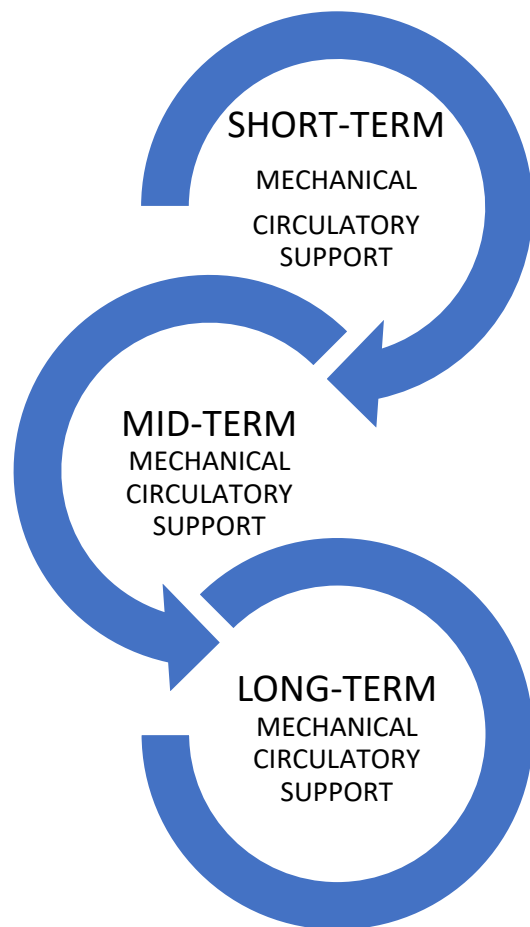


Possible Ambulation with Internal Jugular and Axillary Artery Cannulation

- Minimal invasive techniques
- Upper body cannulation



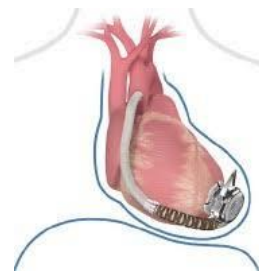
MECHANICAL CIRCULATORY SUPPORT TRENDS



Impella
ECMO



Centrimag
Impella 5,5l
BH



HM III

MECHANICAL CIRCULATORY SUPPORT AT CHUAC

SHORT TERM DEVICES: ECMO



SURGICAL IMPLANT
BLEEDING RISK



PERCUTANEUS IMPLANT
THROMBOSIS RISK
(INTRODUCATOR KINKING)



REINFORCED 8F CANNULA
✓

V-A ECMO

TECHNICAL CONTRAINDICATIONS

Moderate to severe aortic insufficiency

Contraindication to anticoagulation

COMPLICATIONS

HEMOLYSIS

THROMBOSIS OF CIRCUIT

LV DILATATION

LIMB ISCHAEMIA

UPPER BODY HYPOXIA

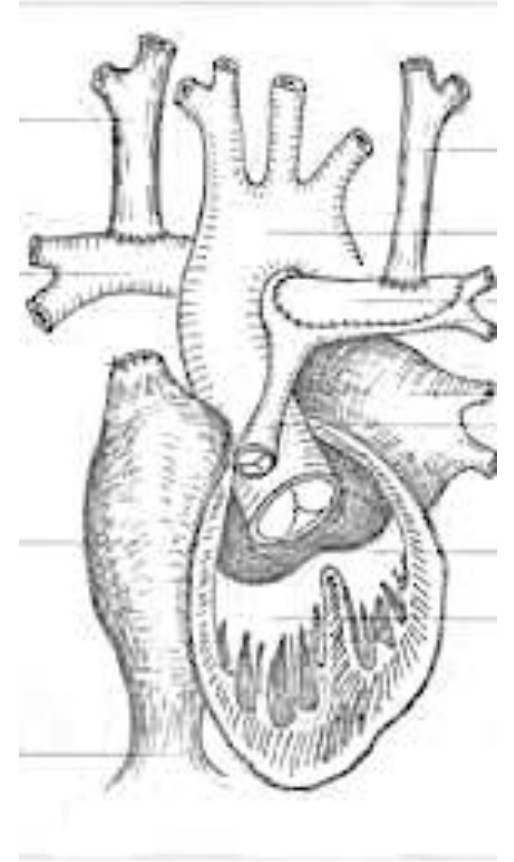
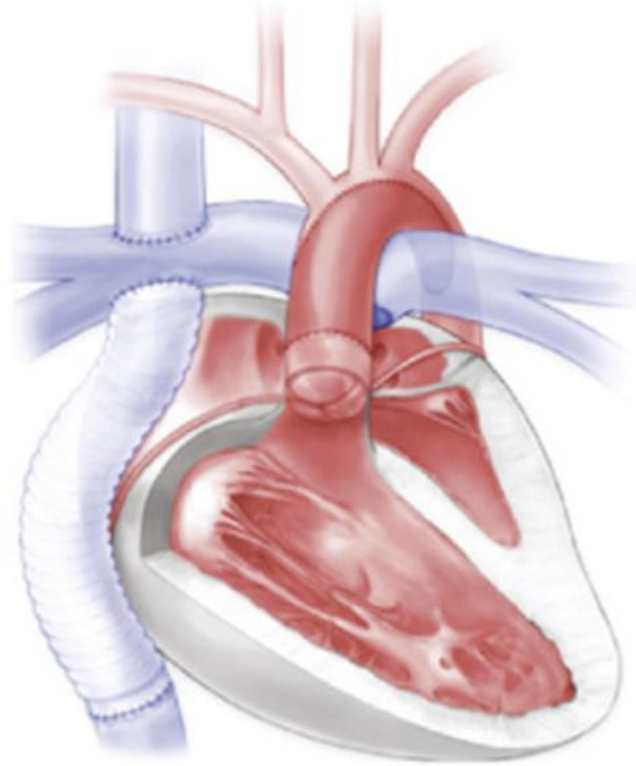
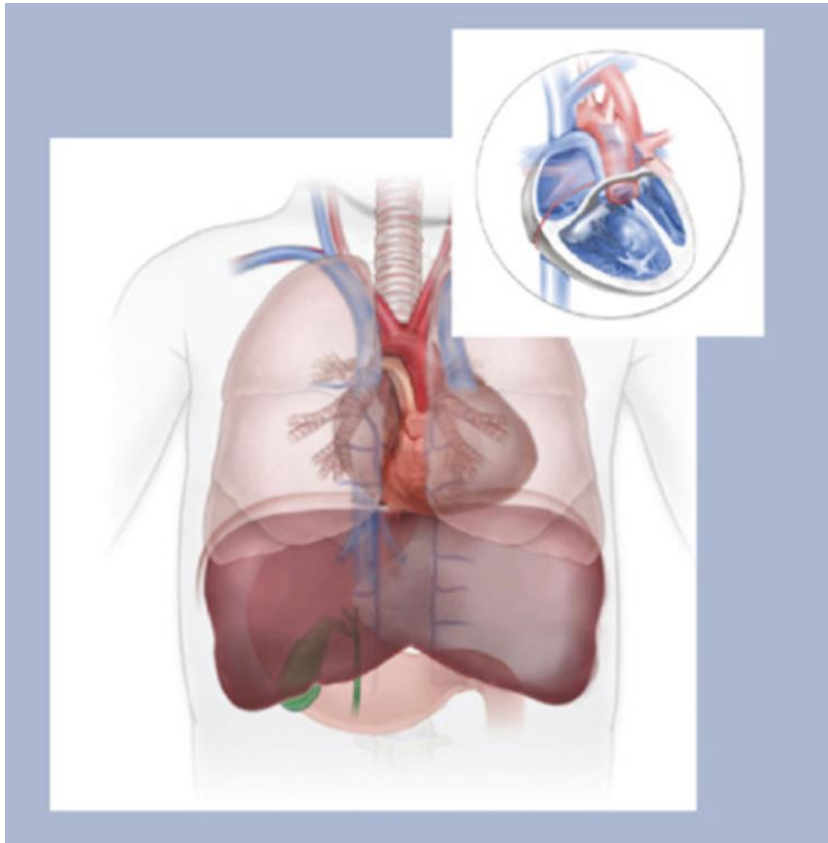
MECHANICAL CIRCULATORY SUPPORT AT CHUAC

SHORT TERM DEVICES: ECMO

PERCUTANEOUS Vs SURGICAL, O.R. Vs BEDSIDE PATIENT

	PERCUTANEOUS	SURGICAL	O.R.	BEDSIDE
IMPLANT TIME	+++ SELDINGER ✓	+ VESSEL EXPOSURE	+	+++ ✓
SAFETY	++	+++ ✓	+++ ✓	+
RX CONTROL	-	-	+++ ✓	-
CANNULATION SITE	+ (femoral / yugular)	+++ ✓ (central/peripheral)	+++ ✓ (central/peripheral)	+ (femoral / yugular)
BLEEDING	+	+++	-	-
INFECTION	+ ✓	+++	+++ ✓	+
DECANNULATION	++ ✓	+++ ✓	+++ ✓	+ (VV)

***** EMERGENCY SITUATIONS → BEDSIDE PERCUTANEOUS IMPLANT**



MECHANICAL CIRCULATORY SUPPORT AT CHUAC

SHORT TERM DEVICES: ECMO

Table 2 Advantages and potential pitfalls of different ECMO/ECLS arterial cannulation techniques

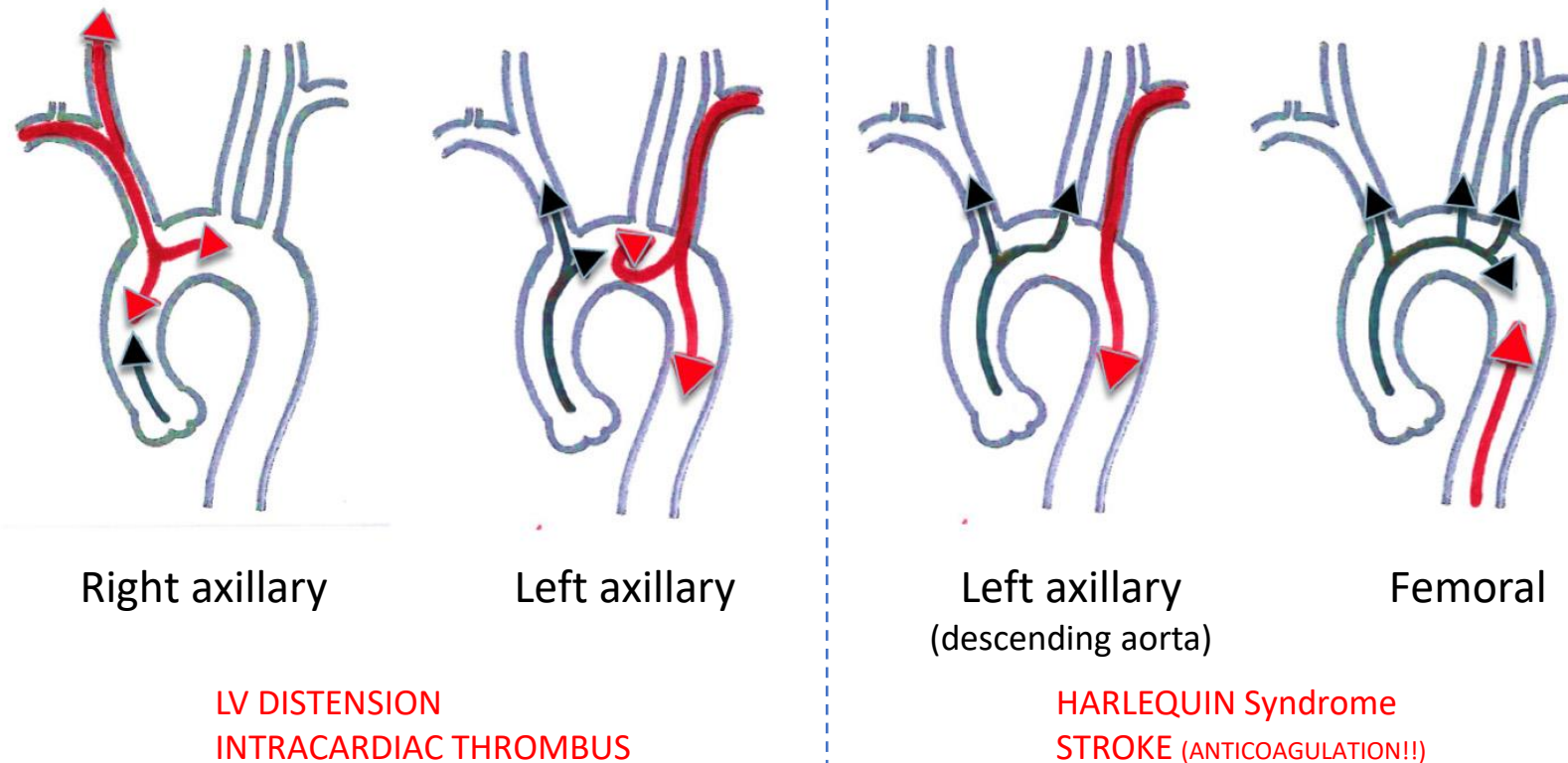
	Femoral	Subclavian	Carotid	Aortic
Percutaneous insertion	Yes ✓	No		No
Distal perfusion complications requiring fasciotomy	10.8-23%	2.5% ✓		3.3%
Distal perfusion complications requiring amputation	0.7%-4.8%	No		No
Implantation requiring usage of graft	Less than 10%	79%		No
Implantation requiring midline sternotomy	No	No		Yes
Stroke rate	5.9-22.7%	6.2-10.6% ✓		21.3%
Bleeding	5.4-31%	9-17.3% ✓		5.4%
Infection at cannulation site	0.7-20.2%	5% ✓		Unknown
Explantation requiring vessel reconstruction	15%	No ✓		No

- Pediatría -

MECHANICAL CIRCULATORY SUPPORT AT CHUAC

SHORT TERM DEVICES: ECMO

IMPACT OF VA-ECMO CANNULATION ON AFTERLOAD AND UPPER BODY PERFUSION



MECHANICAL CIRCULATORY SUPPORT AT CHUAC

SHORT TERM DEVICES: ECMO

DIFFERENTIAL HYPOXIA /HARLEQUIN Syndrome / Fen. Watershed /North-south Syndrome

→ PRESERVED CARDIAC OUTPUT + LUNG DAMAGE

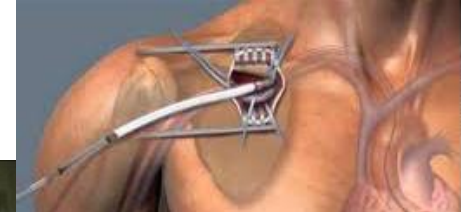


MECHANICAL CIRCULATORY SUPPORT AT CHUAC

SHORT TERM DEVICES: IMPELLA

CHUAC

Impella 2,5L femoral		
Impella 5L femoral		
Impella 5L central		
Impella CP axilar		
Impella CP femoral		
Impella 5,5L axilar		



Sutura injerto dacron de forma termino-lateral a art. subclavia

MECHANICAL CIRCULATORY SUPPORT AT CHUAC

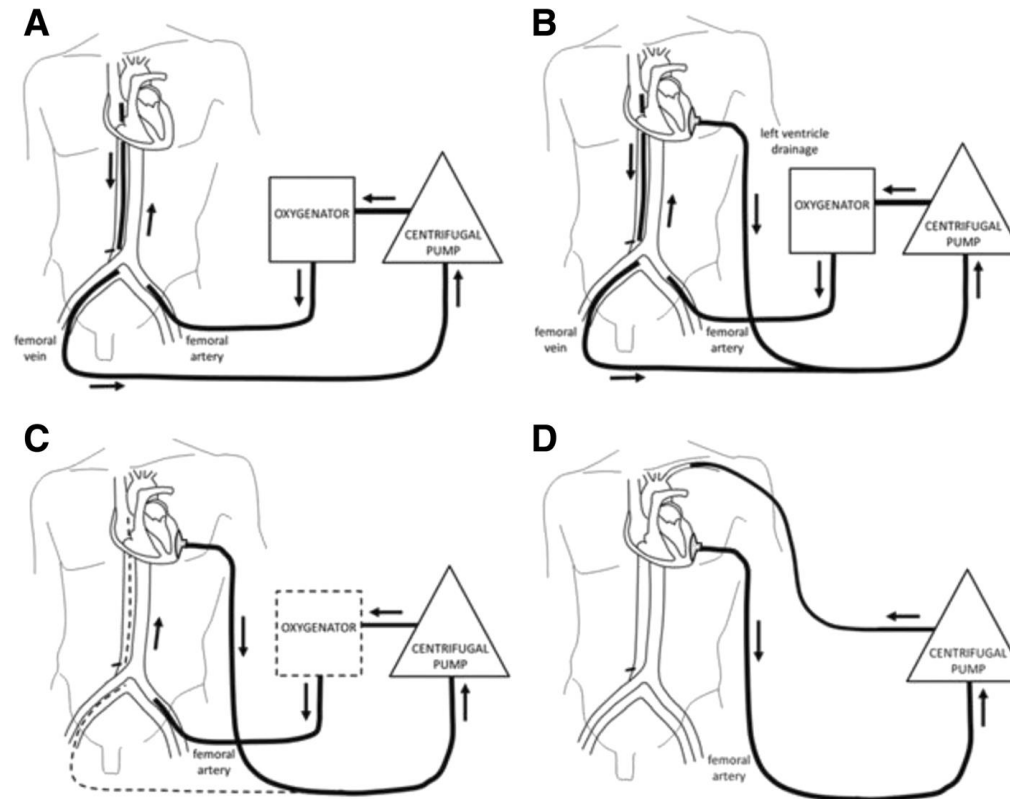
SHORT TERM DEVICES: IMPELLA

IMPELLA	
TECHNICAL CONTRAINDICATIONS	COMPLICATIONS
LV Thrombus	HEMOLYSIS ++
Moderate to severe aortic stenosis	PUMP MIGRATION ++
Moderate to severe aortic insufficiency	AORTIC VALVE INJURY
Mechanical aortic valve	AORTIC INSUFFICIENCY ++
Recent TIA or stroke	TAMPONADE DUE TO LV PERFORATION
Aortic abnormalities	VANTRICULAR ARRHYTHMIA
Contraindication to anticoagulation	STROKE

MECHANICAL CIRCULATORY SUPPORT AT CHUAC

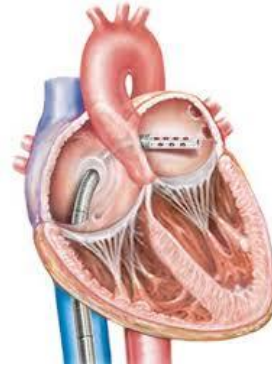
SHORT TERM DEVICES: ECMO

FROM VA - ECMO TO CENTRIMAG



MECHANICAL CIRCULATORY SUPPORT AT CHUAC

MID TERM DEVICES: CENTRIMAG



MECHANICAL CIRCULATORY SUPPORT AT CHUAC

MID TERM DEVICES: CENTRIMAG

CENTRIMAG	
TECHNICAL CONTRAINDICATIONS	COMPLICATIONS
Contraindication to anticoagulation	THROMBOEMBOLIC EVENTS
	AIR EMBOLISM
	BLEEDING

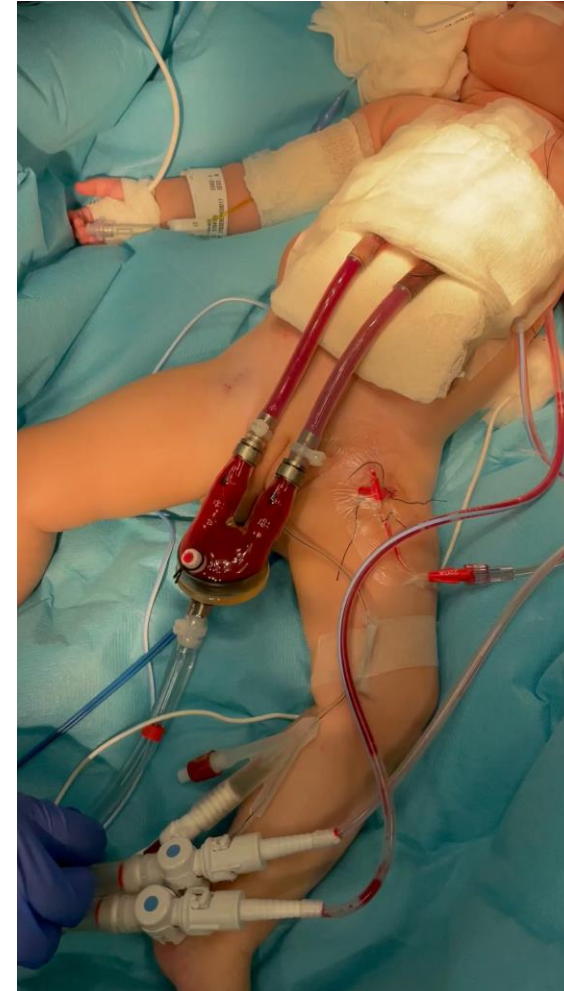
MECHANICAL CIRCULATORY SUPPORT AT CHUAC

PULSATILE DEVICES: BERLIN HEART

A



B



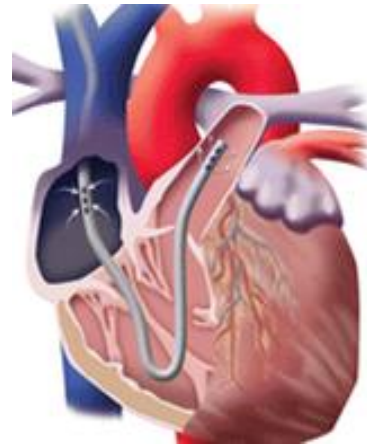


MECHANICAL CIRCULATORY SUPPORT AT CHUAC

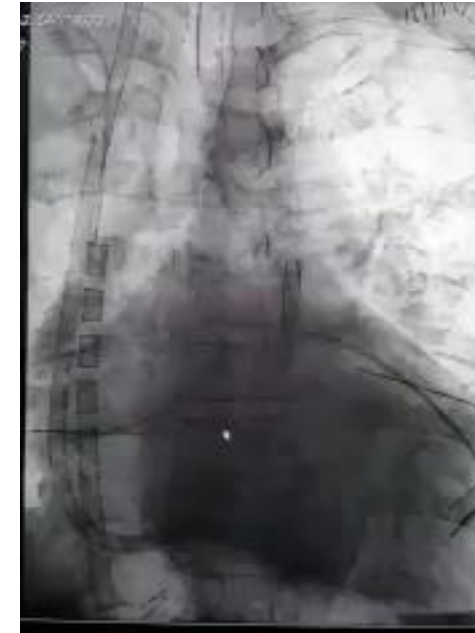
- MANAGING RIGHT VENTRICULAR FAILURE PERCUTANEOUSLY



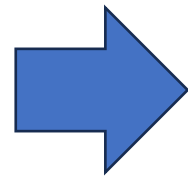
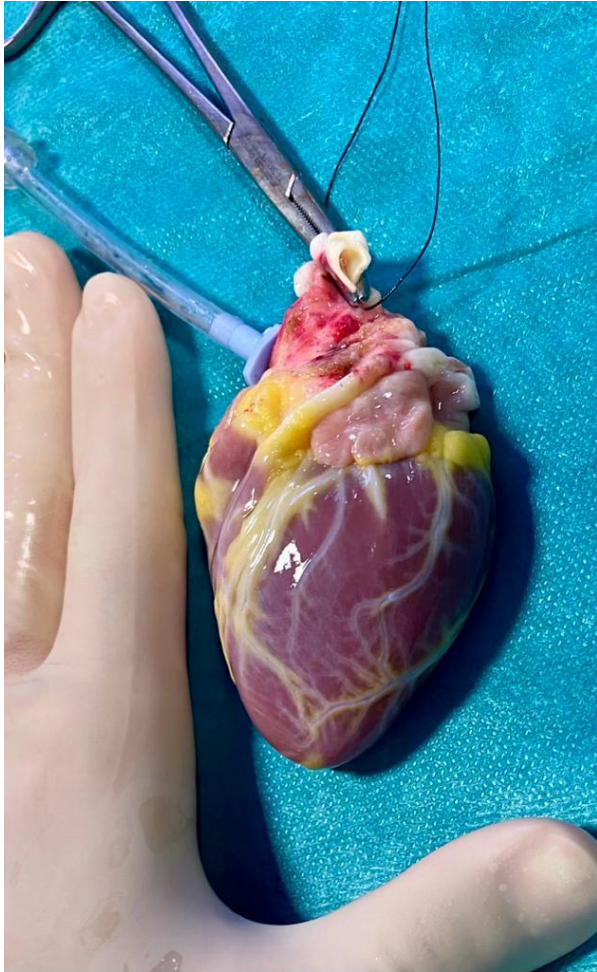
IMELLA RP



PROTEKDUO CANNULA



CENTRIMAG
(PERIPHERAL CANNULATION)



MUCHAS GRACIAS