

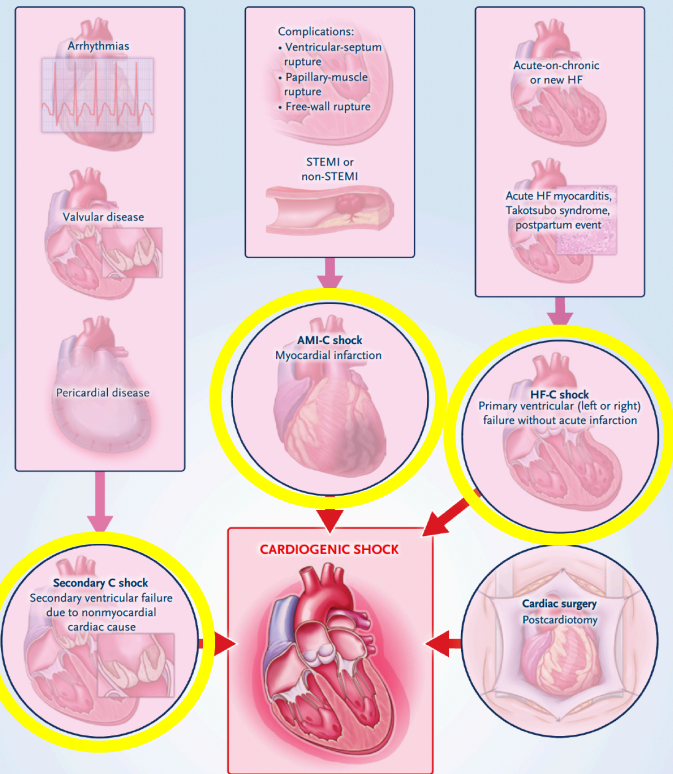
Managing Complexity: MCS in HRPCI & CGS

HOW SHOULD I TREAT CARDIOGENIC SHOCK

OPZIONI TERAPEUTICHE

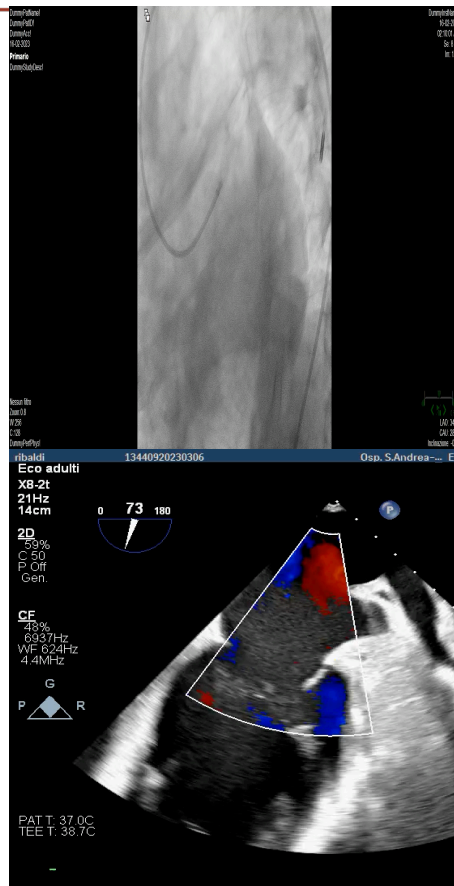
EMILIO D'AVINO

**UOC Anestesia e Rianimazione
Dip.to Cardio Toraco Vascolare
AOSP SAN CAMILLO FORLANINI
ROMA**



Cath-lab

Echo-lab



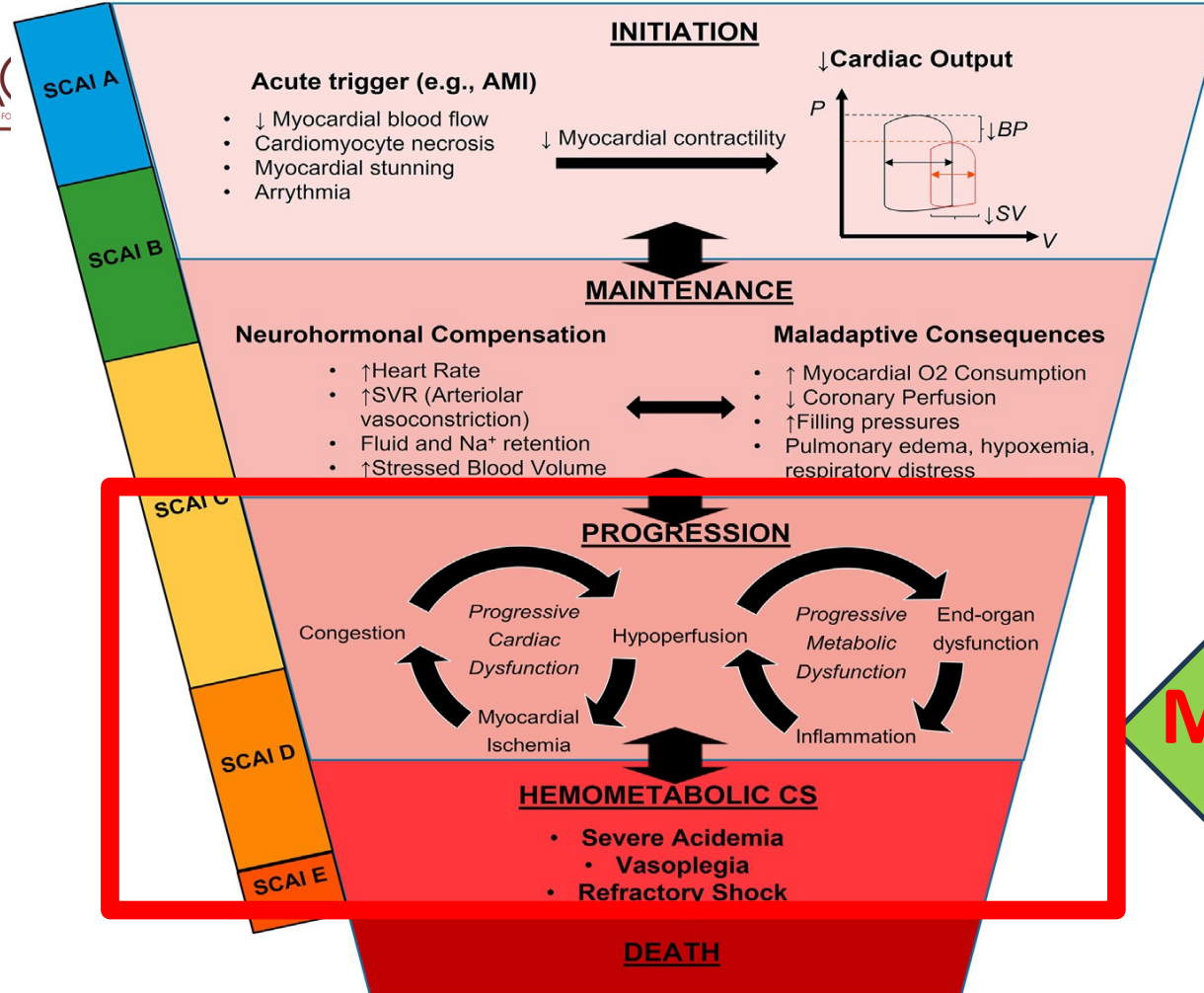
Clinical-lab



Figure 2. Causes of Cardiogenic Shock.

AMI-C shock denotes acute myocardial infarction-related cardiogenic shock, C shock cardiogenic shock, HF heart failure, HF-C shock heart failure-related cardiogenic shock, and STEMI ST-segment elevation myocardial infarction.





MCS THERAPY



CONSIDER **ESCALATING** SUPPORT

Increasing requirement of
pressors or inotropes

PAPi < 1.0

MAPs < 65

Elevated PCWP

Unable to clear lactate

CPO < 0.6

Cardiac index < 2.2

ESCALATION

MCS

DE-ESCALATION

Cardiac index > 2.2

CPO > 0.6

Stable MAPs

PAPi > 1.0

No pressors or inotropes

Normal lactate

Stable PCWP
and CVP

CONSIDER **WEANING** SUPPORT

INOTROPES: *bridge to decision*

RESEARCH

Open Access



Critical Care 2016 20; 208

Current real-life use of vasopressors and inotropes in cardiogenic shock - adrenaline use is associated with excess organ injury and mortality

... combinations should be favored
in the early management

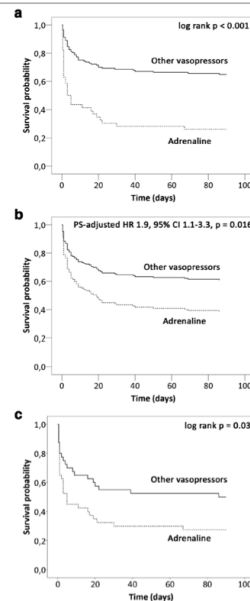
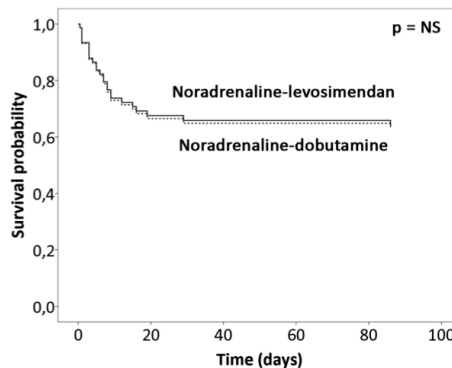


Fig. 2 (See legend on next page.)

Mechanical circulatory support: when, how, and for whom

Jacob Eifer Møller ^{1,2,*}, Holger Thiele ³, David Morrow ⁴,
Jesper Kjærgaard ^{1,5}, and Christian Hassager ^{1,5}



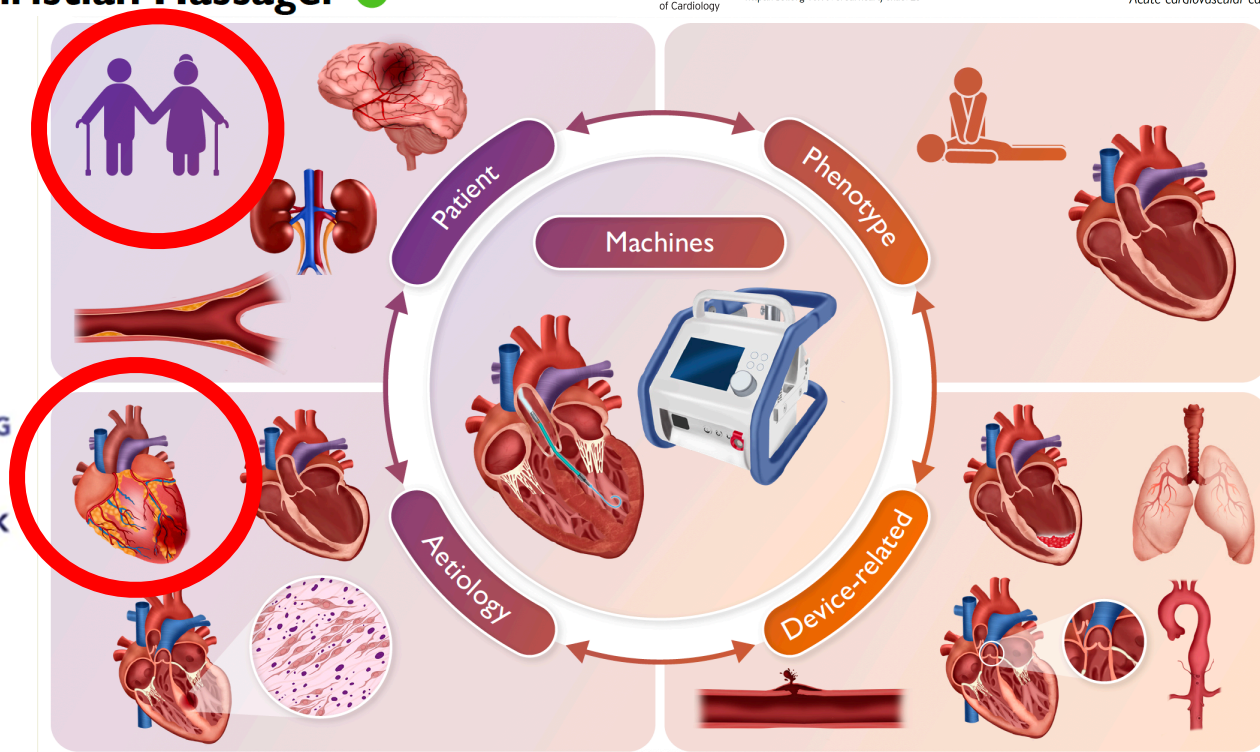
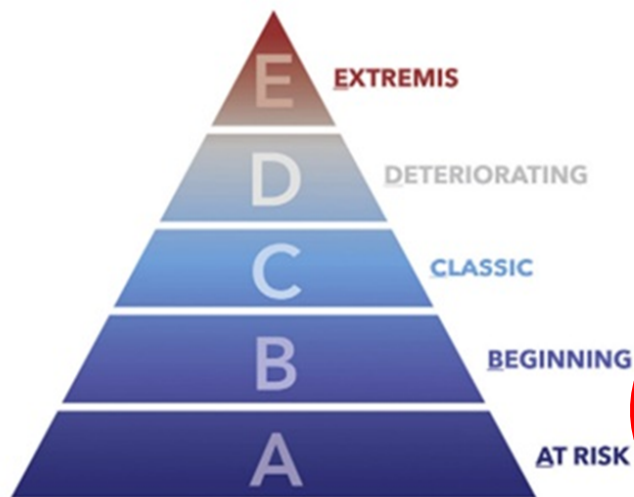
ESC

European Society
of Cardiology

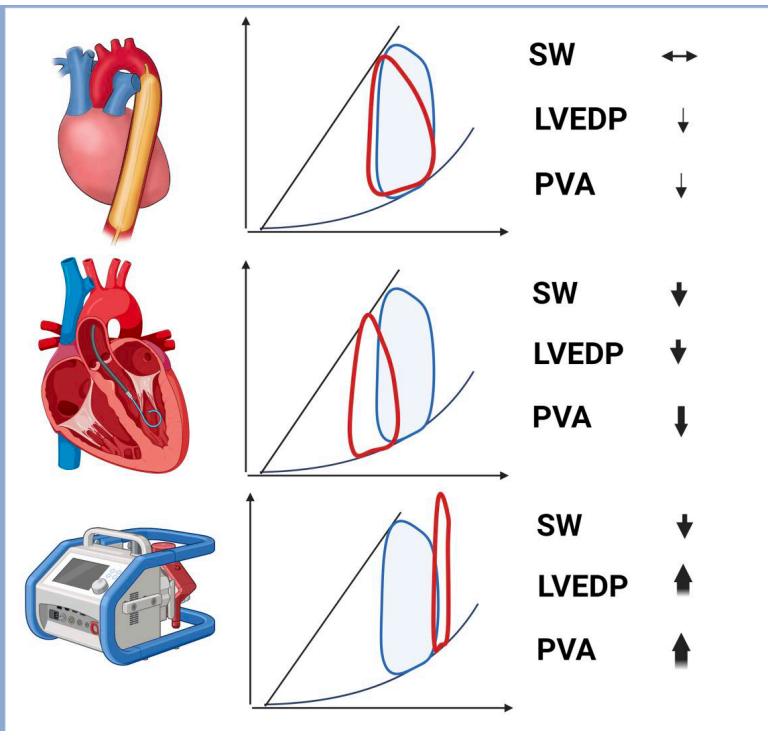
European Heart Journal (2024) 00, 1–13
<https://doi.org/10.1093/eurheartj/ehae925>

STATE OF THE ART REVIEW

Acute cardiovascular care



Mechanical Circulatory Support: what options'?



- **IABP** : ampiamente declassato (III;b); indicato per lo più nei difetti meccanici; è ancora uno dei sistemi più utilizzati nell'AMI-Shock;
- **p-VAD**: tecnologia innovativa in continua evoluzione (2,5, CP, 5.0, 5,5, r-VAD); molto efficace nei modelli sperimentali; gravata da complicanze (emolisi, emorragia, ischemie); gestione multidisciplinare;
- **V-A ECMO**: supporto completo cardiopolmonare; indicato per disfunzione biventricolare ed ECLS; richiede «expertise» e personale dedicato; non scevro di complicanze maggiori;





IABP



ECMO



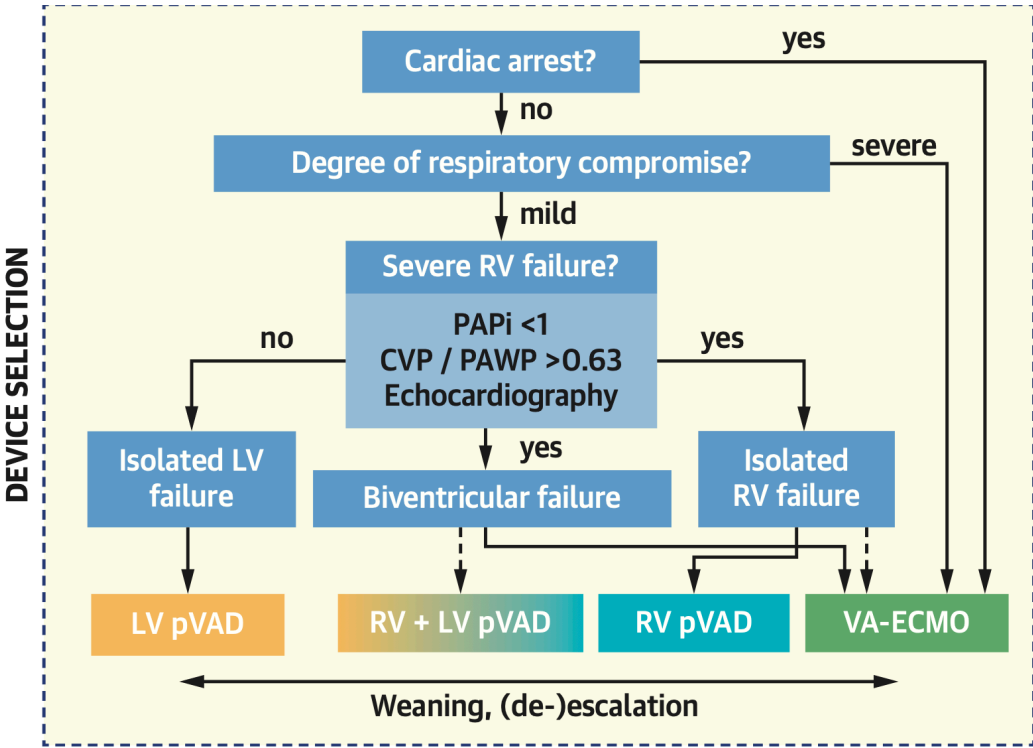
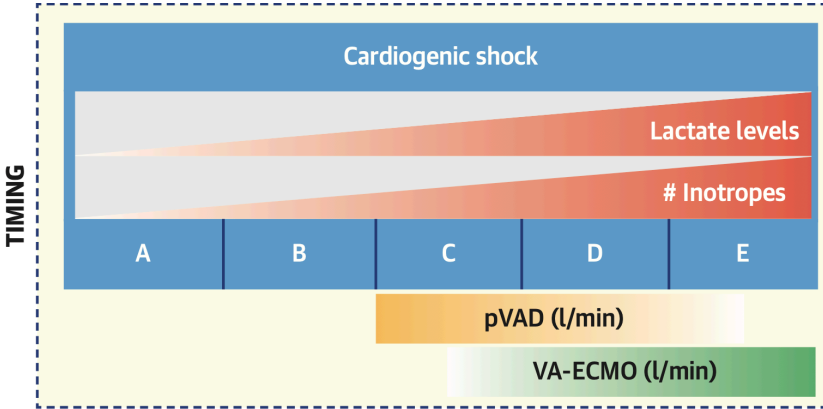
IMPELLA

	IABP-SHOCK II	ECLS-SHOCK	DanGer-Shock
Device	IABP	V-A ECMO	Impella CP
Control	Best medical therapy	Best medical therapy	Best medical therapy, protocolized MCS escalation
No. of treatment arms	2	2	2
Participants (N)	600	420	360
Enrolment period	2009–12	2019–22	2013–23
Setting (no. of centres)	Multicentre (37)	Multicentre (44)	Multicentre (14)
Main inclusion criteria	AMI-CS (STEMI or NSTEMI) Planned revascularization Age > 18 years	AMI-CS (STEMI or NSTEMI) Planned revascularization lactate > 3 mmol/L Age: 18–80 years	AMI-CS (STEMI) Planned revascularization lactate > 2.5 mmol/L LVEF < 45% Age: > 18 years
Main exclusion criteria	CPR: duration > 30 min Mechanical infarct complications Onset of shock more than 12 h before screening	CPR: duration > 45 min Mechanical infarct complications	Mechanical infarct complications CPR before the arrival of EMS with GCS < 8 after ROSC RV failure

Protocol for ICU management	No	No	Yes	
				
	<i>IABP</i>	<i>ECMO</i>		<i>IMPELLA</i>
Main characteristic				
Age, years	67.4 ± 12.5	62.8 ± 9.6, n = 417	67.1 ± 11.5, n = 355	
Male sex	69% (413/598)	81% (339/417)	79% (281/355)	
Cardiac arrest	45% (270/598)	78 (324/417)	20% (72/355)	
Multi-vessel disease	79% (463/589)	67% (249/403)	72% (256/354)	
Lactate mmol/L	3.9 (2.2–7.8) ^a	7.6 ± 3.8, n = 412	5.7 ± 3.2, n = 355	
SBP, mmHg	90 (80–108) ^a	101 ± 30, n = 337	83 ± 15, n = 351	
LVEF, %	35 (25–45) ^a	30 ± 13, n = 280	24 ± 10, n = 355	
Crossover between interventions	No IABP in intervention group 13/301 (4.3%); IABP in control group 30/298 (10.1%)	No ECLS in intervention group 17/209 (8.1%); ECLS in control group 26/208 (12.5%)	No mAFP in intervention group 3/179 (1.7%); mAFP in control group 3/176 (1.7%)	
Active MCS in the control group	7.4% (22/299)	25.6% (54/208)	21.0% (37/176)	
Primary outcome	All-cause 30-day mortality	All-cause 30-day mortality	All-cause 6-month mortality	
Sample size assumptions	Mortality: 56% control vs. 44% with IABP, Alpha .05; Power: 80%	Mortality: 49% control vs. 35% with V-A ECMO, Alpha .05; Power: 80%	Mortality: 60% control vs. 42% Impella CP Alpha .05; Power: 80%	

Managing Patients With Short-Term Mechanical Circulatory Support

JACC Review Topic of the Week



Mechanical circulatory support: when, how, and for whom

Jacob Eifer Møller ^{1,2,*}, Holger Thiele ³, David Morrow ⁴,
Jesper Kjærgaard ^{1,5}, and Christian Hassager ^{1,5}

CONTROINDICAZIONI

e

COMPLICANZE

ASSOLUTE ECMO

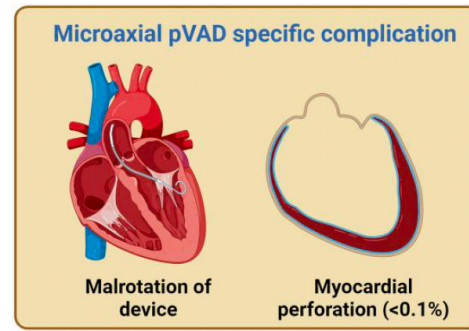
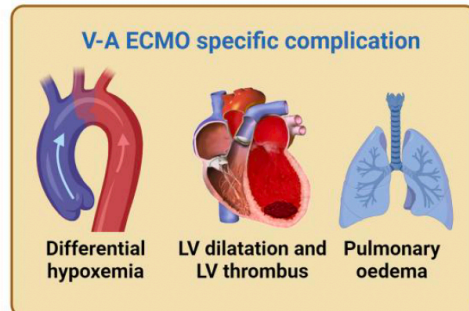
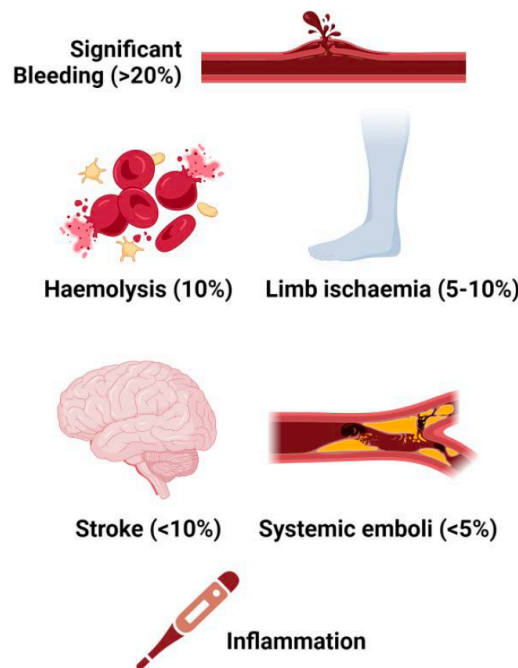
- Insufficienza Aortica
- Dissezione Aortica
- Vasculopatia Periferica

ASSOLUTE p-VAD

- Valvola Aortica Meccanica
- Endocardite su V.A.
- Trombo in ventricolo sinistro
- Protesi endovascolari in aorta (acc.fem.)

RELATIVE p-VAD

- Stenosi Aortica
- Rottura LV
- Tamponamento Cardiaco
- TAVR



Cardiogenic Shock

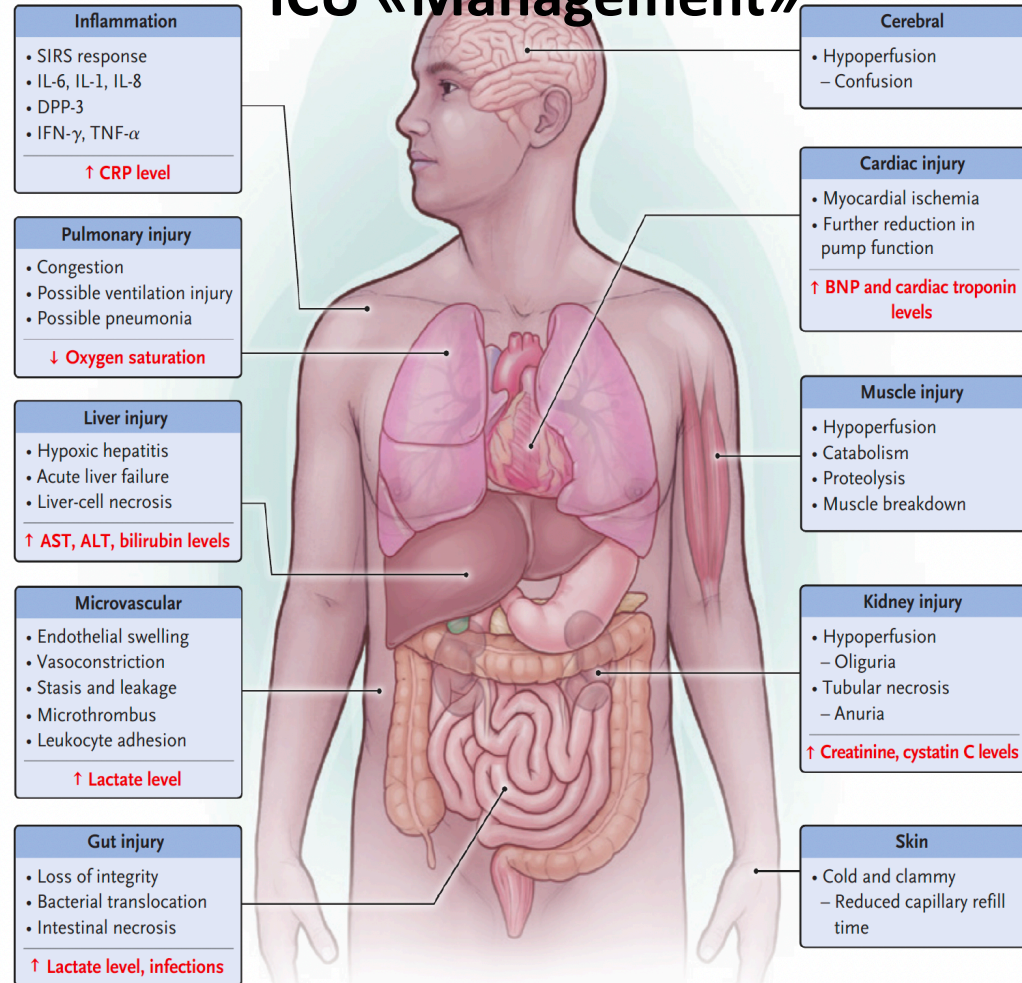
Holger Thiele, M.D.,^{1,2} and Christian Hassager, M.D.^{3,4}

guideline-recommended supportive approaches

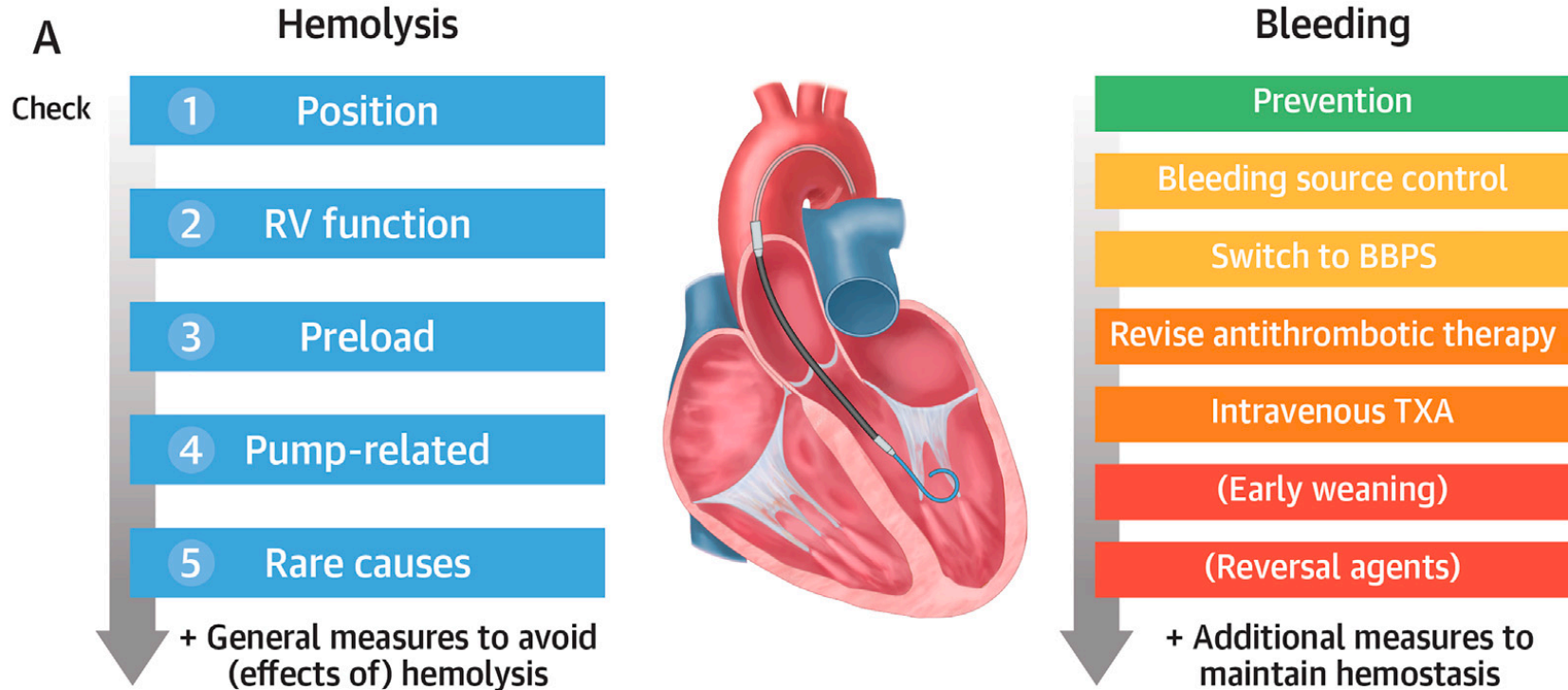
- *Blood glucose level control;*
- *Lactate measurements (every hour);*
- *Oxygen delivery;*
- *Thromboprophylaxis;*
- *Stress-ulcer prophylaxis;*
- *Early enteral feeding;*
- *Vasoactive medication intravenously;*
- *MV with lung-protective strategies (TV 6 to 8 ml per kg);*
- *Urinary volume and Cr clearance;*
- *CRRT if necessary;*

B

ICU «Management»



Management and Time Course of Hemolysis and Bleeding During Microaxial pVAD Support



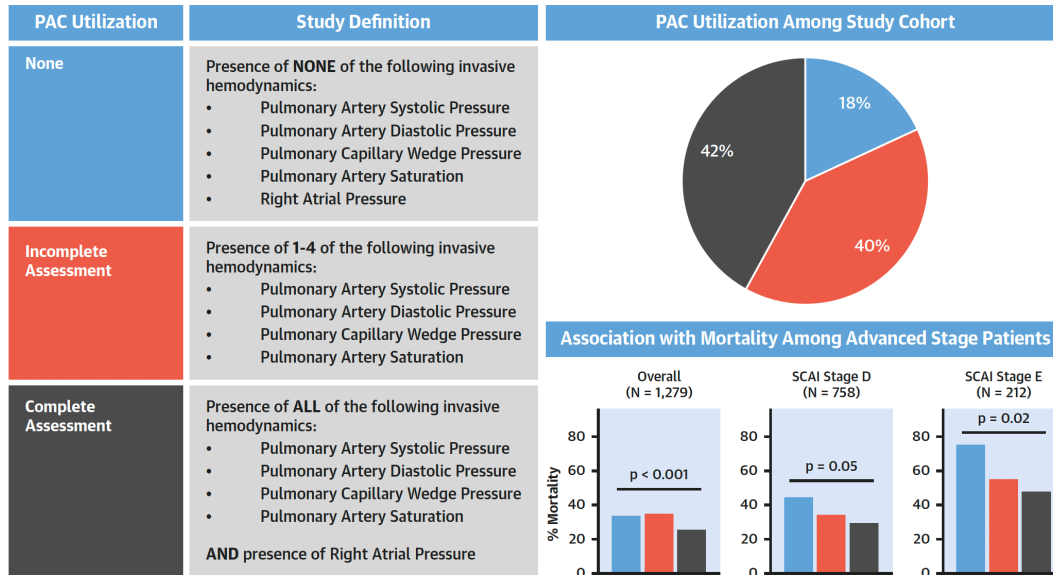


- LDH
- Aptoglobina
- Reticolociti
- pFHb (lab, Hemcheck, EGA ?)
- Anti-Xa basso ➡ pred. Trombosi
- aPTT alto ➡ pred. Emorragia



Complete Hemodynamic Profiling With Pulmonary Artery Catheters in Cardiogenic Shock Is Associated With Lower In-Hospital Mortality

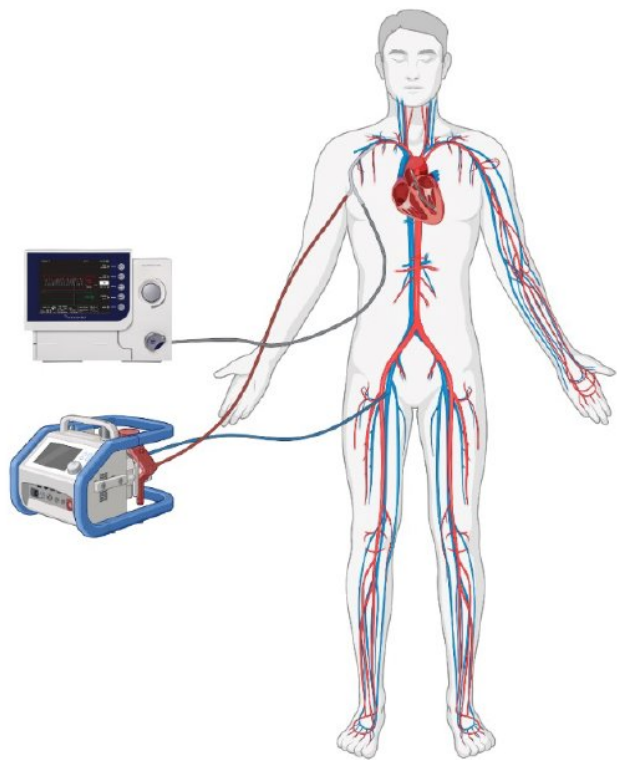
CENTRAL ILLUSTRATION Frequency of Mortality Among PAC Use Overall and by SCAI Stage



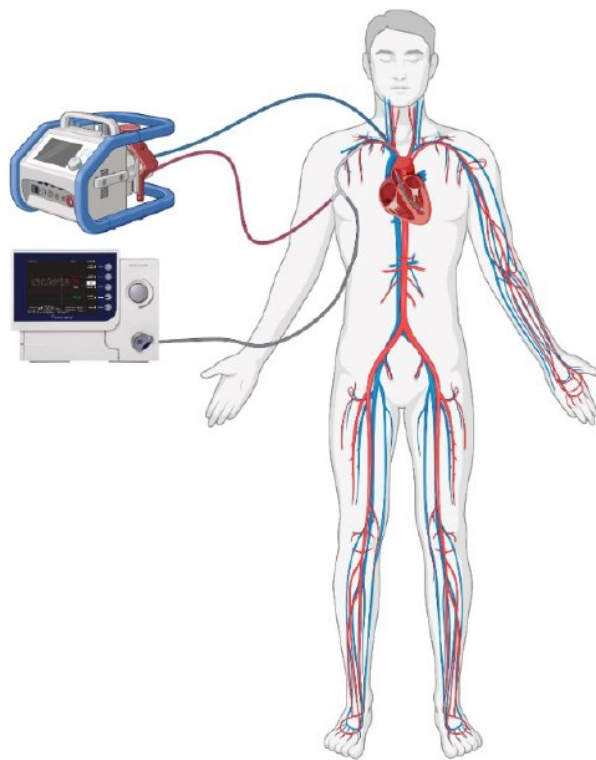
Garan, A.R. et al. J Am Coll Cardiol HF. 2020;8(11):903-13.



ECMO + IMPELLA (ECMELLA 2.0)



ECMELLA 2.0 (axillo-femoral cannulation)



ECMELLA 2.1 (axillo-jugular cannulation)

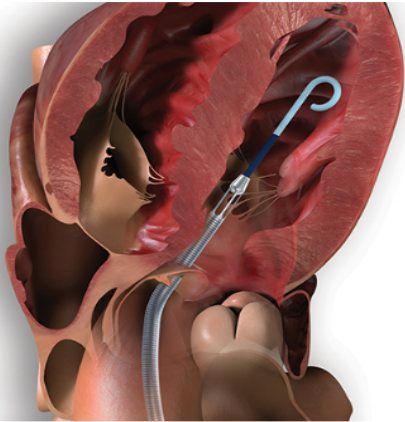
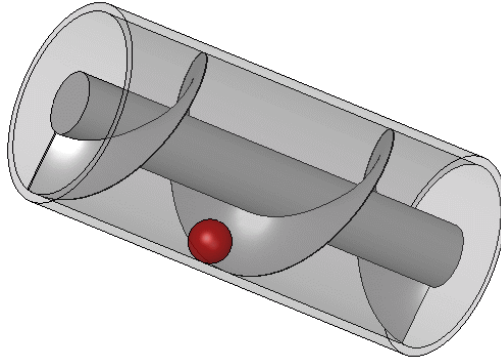
BI-VENTRICULAR
FAILURE



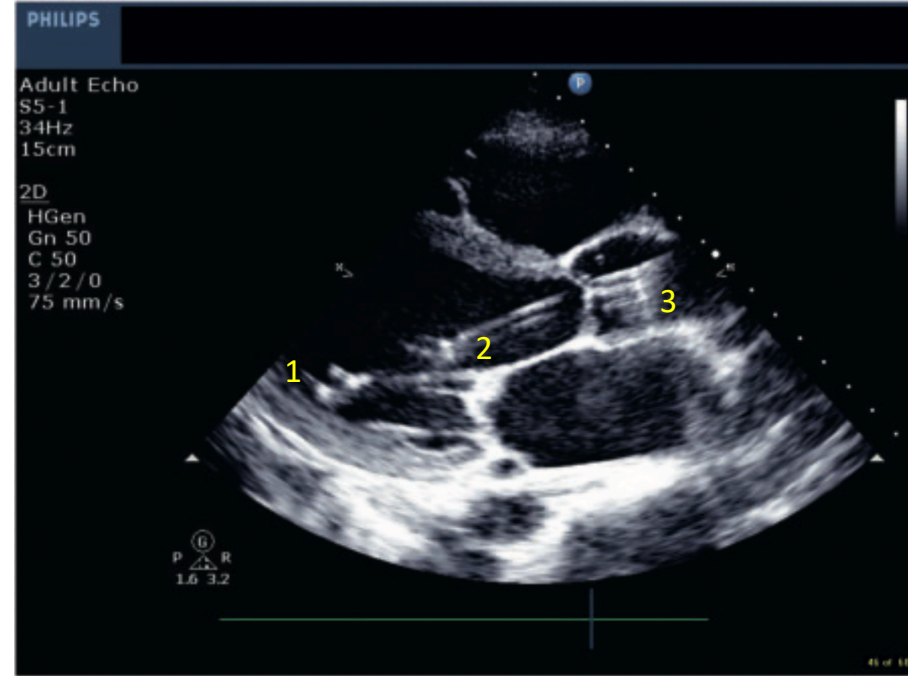
LV FAILURE



P-VAD Impella



IMPELLA CP (3,6-3,7 l/min)
> 45.000 rpm
IMPELLA 5,5 (5,5 l/min)
> 30.000 rpm



- 1) Pig-Tail
- 2) Teardrop/Sito o cestello di drenaggio
- 3) Curvatura/Sito di eiezione

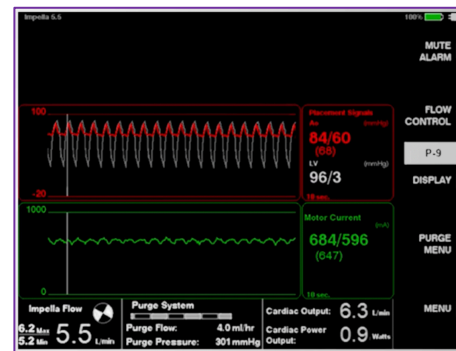
IMPELLA 5,5



- **LVAD MINIATURIZZATO**
- **POMPA MICROASSIALE**
- **INFLOW VENTRICOLO SINISTRO**
- **OUTFLOW AORTA ASCENDENTE**
- **21 Fr , PUMP FLOW 5,5 l/min.**
- **IMPIANTO CON GUIDA 0,018**
- **FLUOROSCOPIA/ETE-ETT**
- **DURATA CERTIFICATA 30 gg**

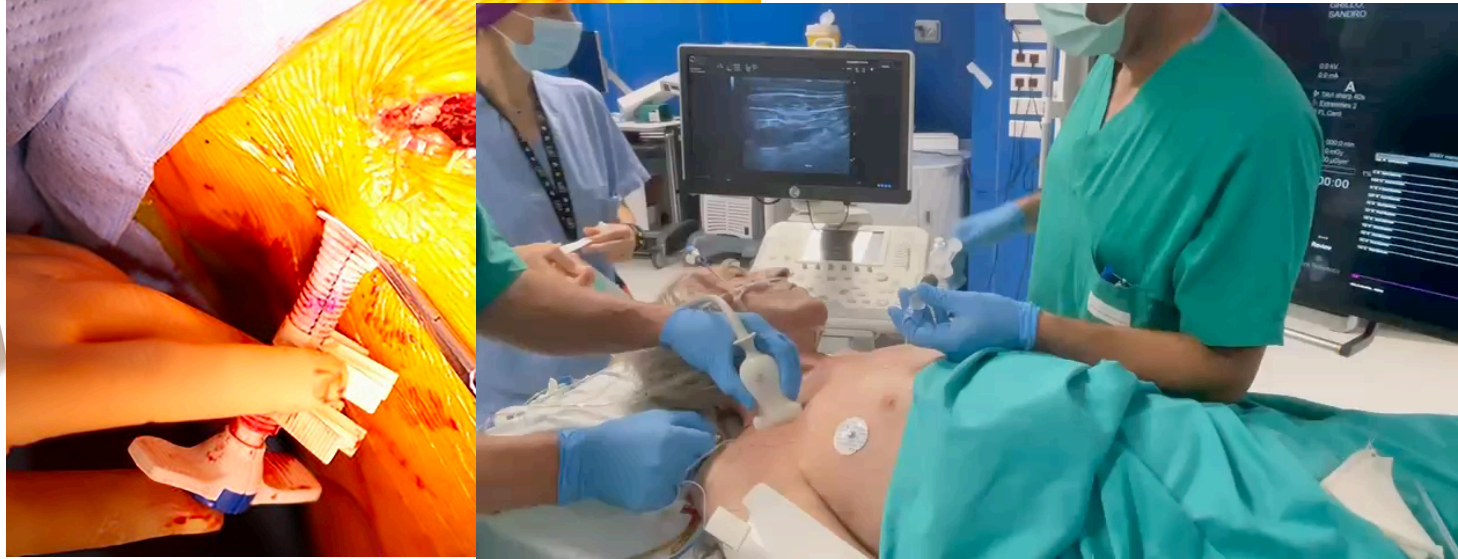
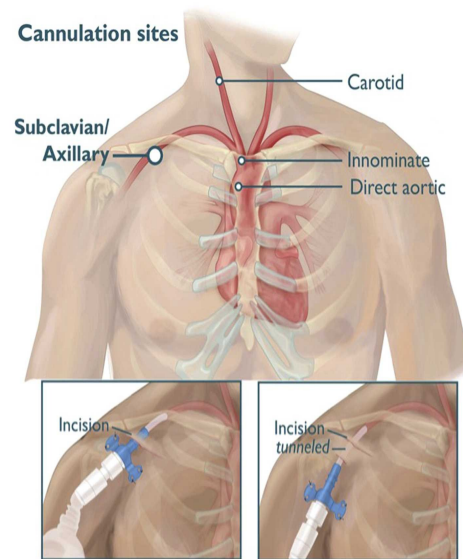


IMPELLA 5,5 SMART ASSIST – i primi 17 casi

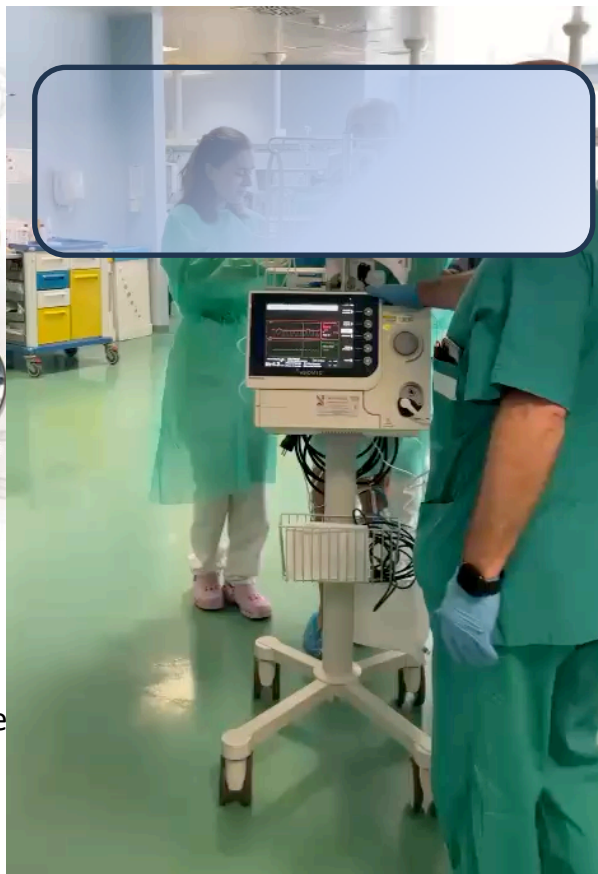


- Per via ascellare o transaortico
- Alto flusso che consente il ristoro degli organi
- Minore incidenza di emolisi rispetto al CP
- Ben tollerato dal paziente che può riabilitarsi in modo efficace
- Si inserisci nel percorso di
 - **Escalation** (da device con flusso minore come IABP/Impella CP) oppure come
 - **Descalation** (da ECMO+ Impella CP) in caso di recupero dalla disfunzione biventricolare;
- Utile nella fase Bridge to Decision (passare a LVAD o HTX)
- Considerare sempre la «risposta» della funzione ventricolare dx

Clinical management of the Impella 5.5 pump

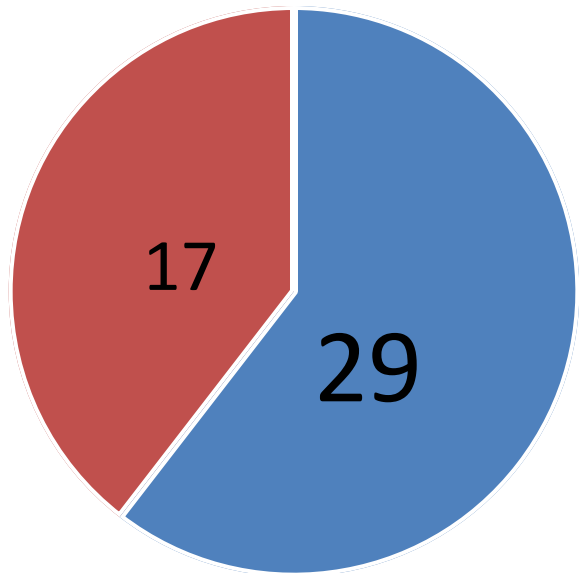


Clinical management of the Impella 5.5 pump

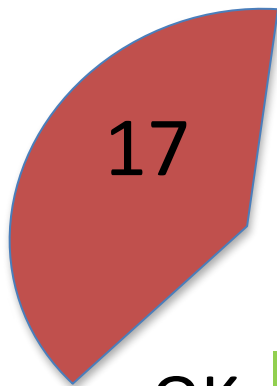


IMPELLA ULTIMI 3 ANNI

IMPELLA TOT 46



● CP ● 5,5



OK

11

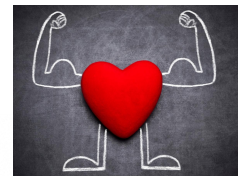
6 RECOVERY



2 VAD LT



3 THX



Assistenza meccanica e trapianti

