New and Emerging Technologies in Cardiac Assist Devices

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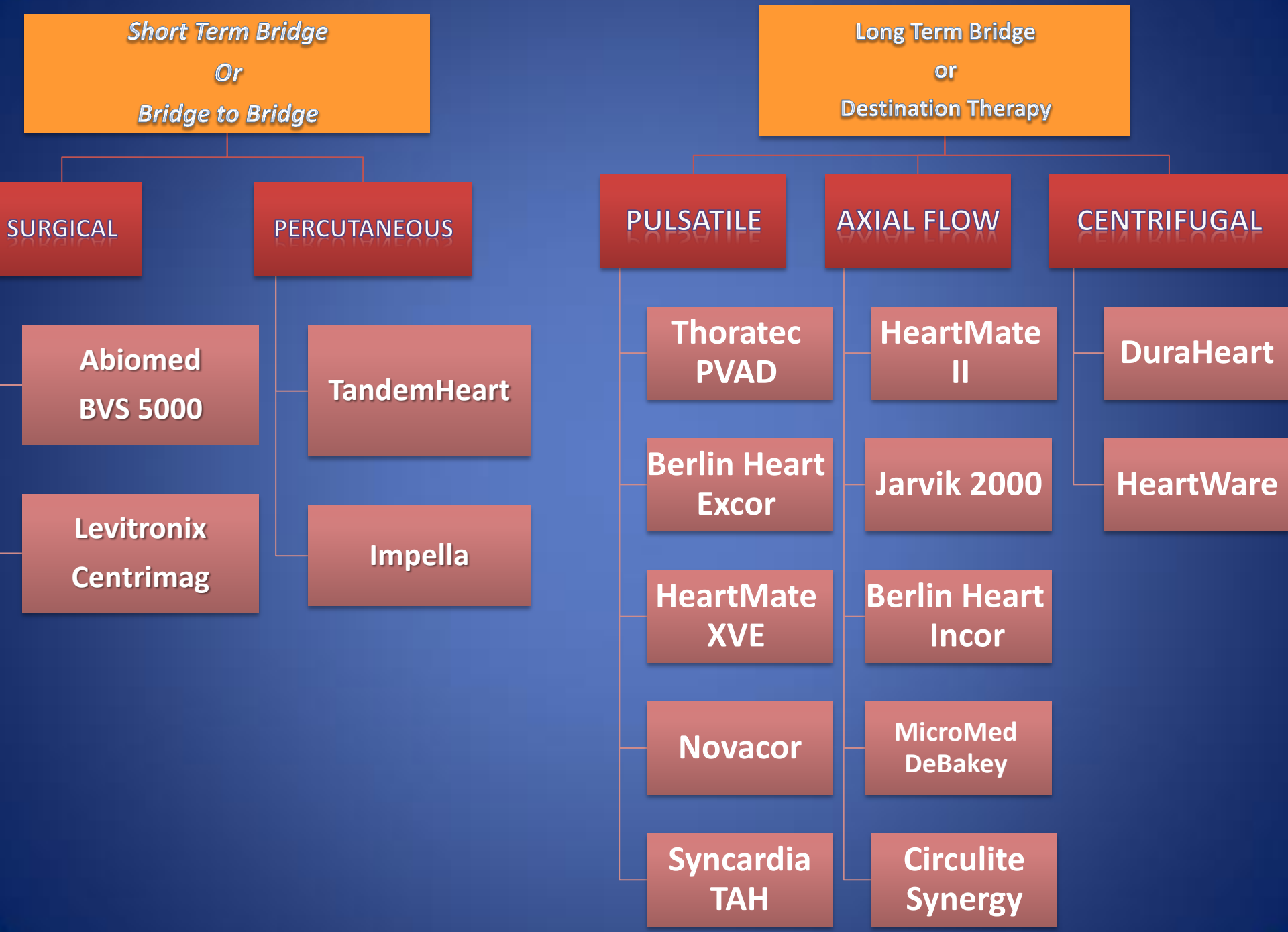
Sheba Medical Center

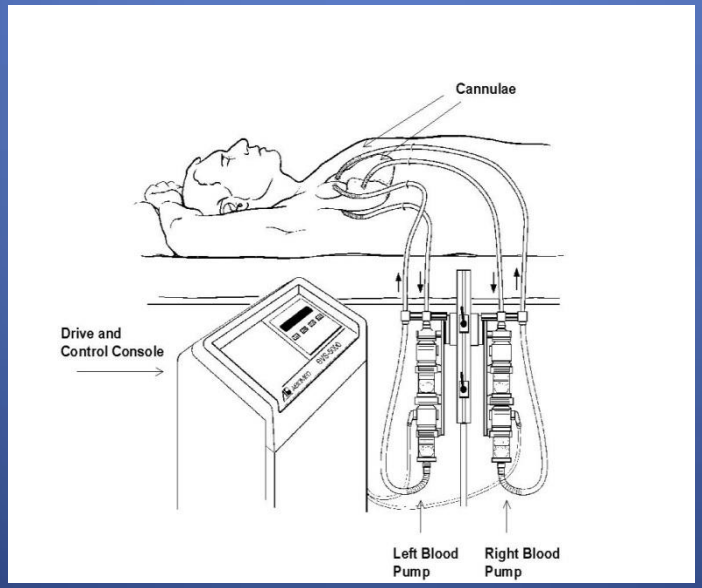
20/03/2014

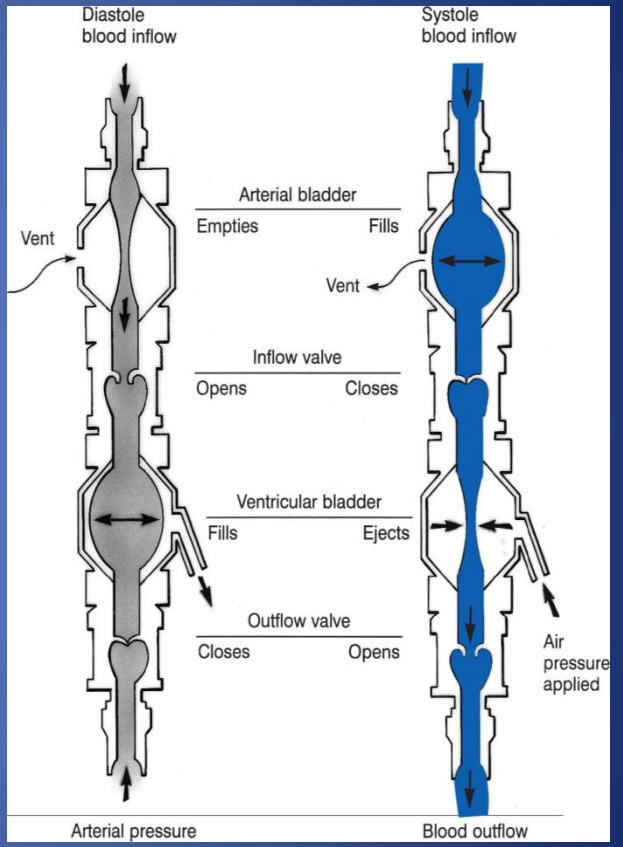
Improvement? Evolution? Revolution?

- Miniaturization
- Mode of Action
- New Ideas / Technologies
- Partial Flow Concept
- TAH (Total Artificial Heart) Concept
- TET (Transcutaneous Energy Transfer)

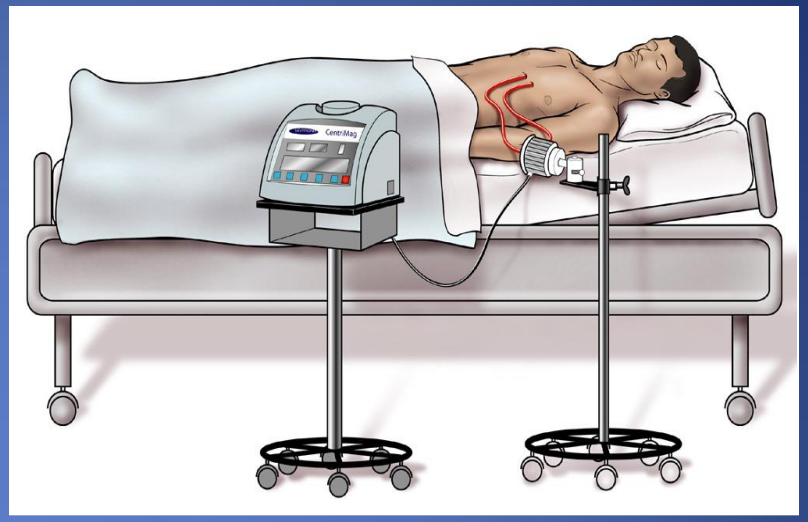

Short Term Bridge
Or
Bridge to Bridge
SURGICAL
PERCUTANEOUS
Abiomed
BVS 5000
Levitronix
Centrimag
TandemHeart
Impella
Long Term Bridge
or
Destination Therapy
PULSATILE
AXIAL FLOW
CENTRIFUGAL
Thoratec
PVAD
Berlin Heart
Excor
HeartMate
XVE
Novacor
Syncardia
TAH
HeartMate
II
Jarvik 2000
Berlin Heart
Incor
MicroMed
DeBakey
Circulite
Synergy
DuraHeart
HeartWare

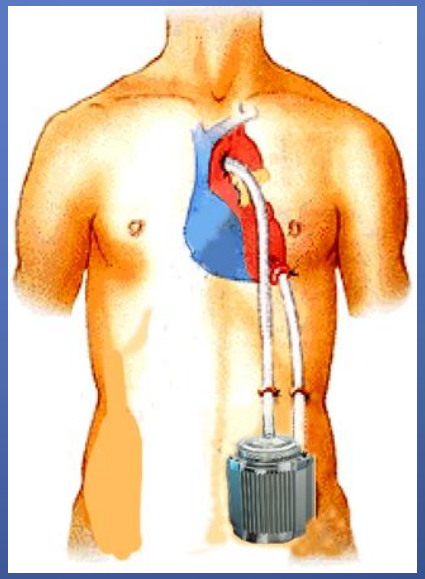
Abiomed BVS 5000

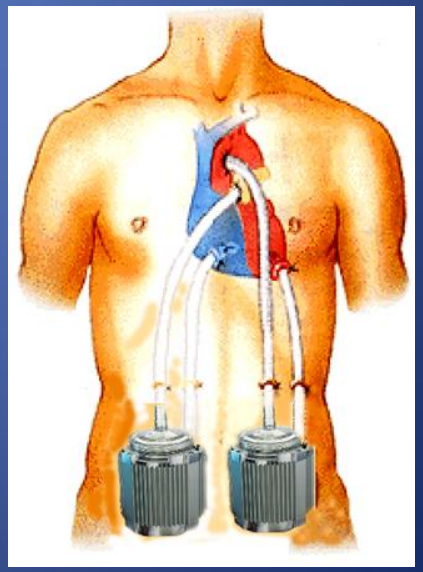


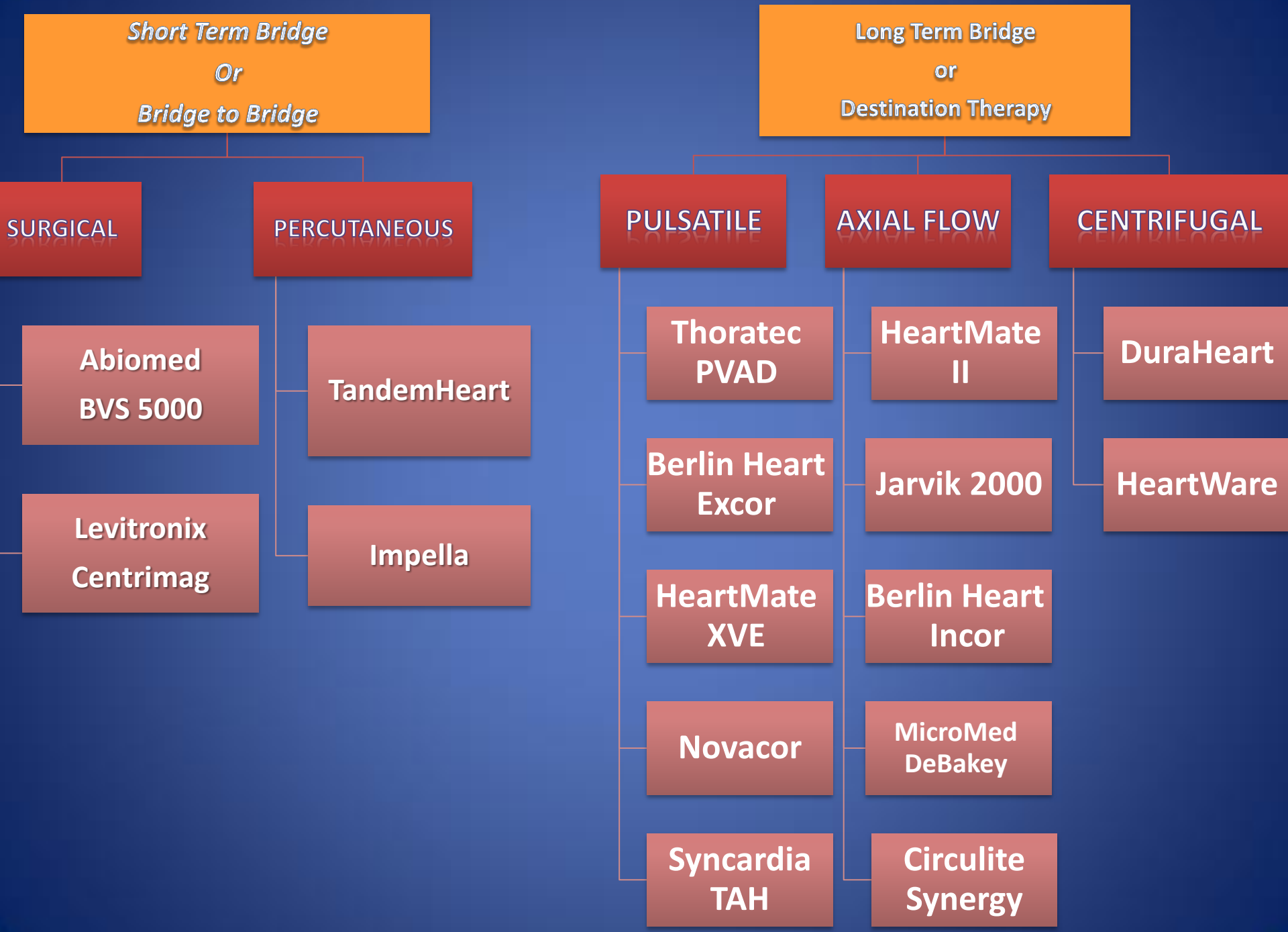


Levitronix CentriMag





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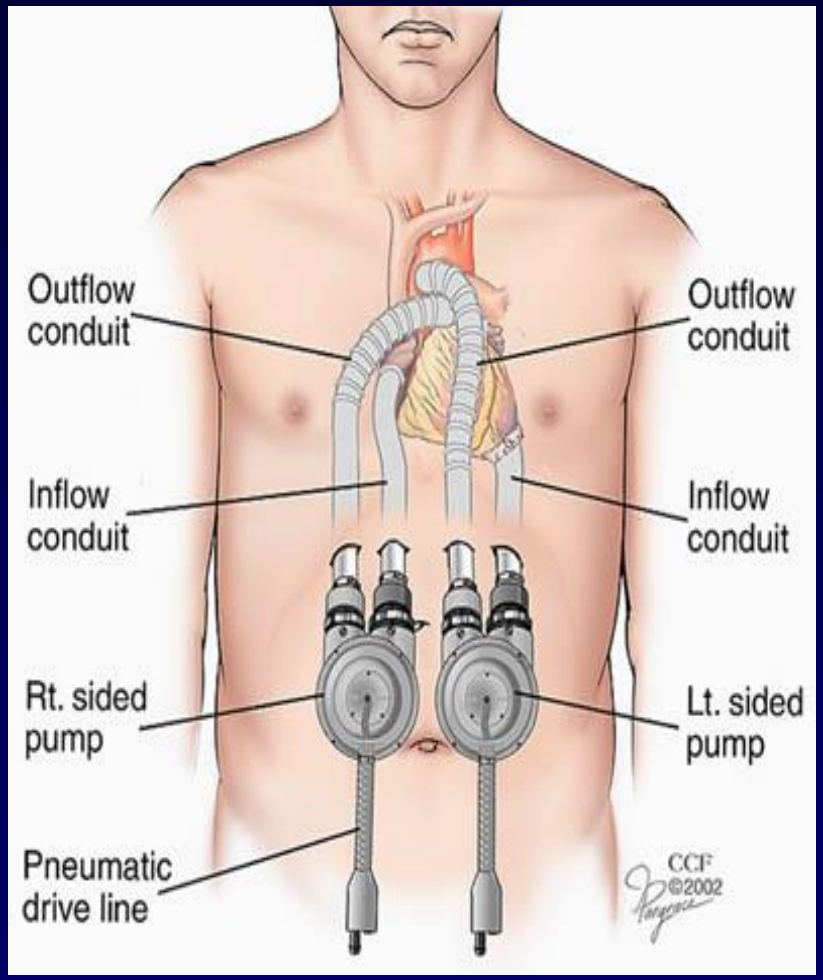
DuraHeart
HeartWare

THORATEC Pneumatic Bi-VAD

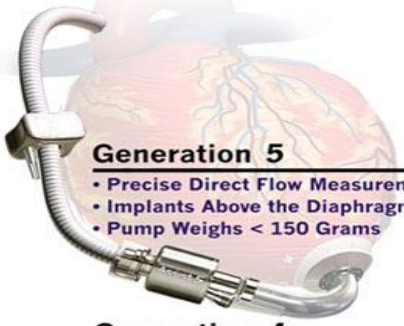


The Five VAD Functional Generations™*

Full Support Ventricular Assist Devices

Only the HeartAssist 5™

features an exclusive flow probe with remote monitoring and a miniature pump weighing just 92 grams



Generation 5
- Precise Direct Flow Measurement System
- Implants Above the Diaphragm
- Pump Weighs < 150 Grams

HeartAssist 5
Exclusive Flow Probe and Pump

HEART Assist 5™
www.micromedcv.com

Generation 4
- Implants Above the Diaphragm
- Pump Weighs < 150 Grams

HVAD
145 grams

HeartAssist 5
92 grams

Generation 3
Centrifugal Flow

Levacor
440 grams

DuraHeart
540 grams

VentrAssist
298 grams
[discontinued]

Generation 2
Axial Flow

INCOR - 200 grams

HeartMate II - 281 grams

Gen 1
Large Devices

HeartMate XVE
1150 grams

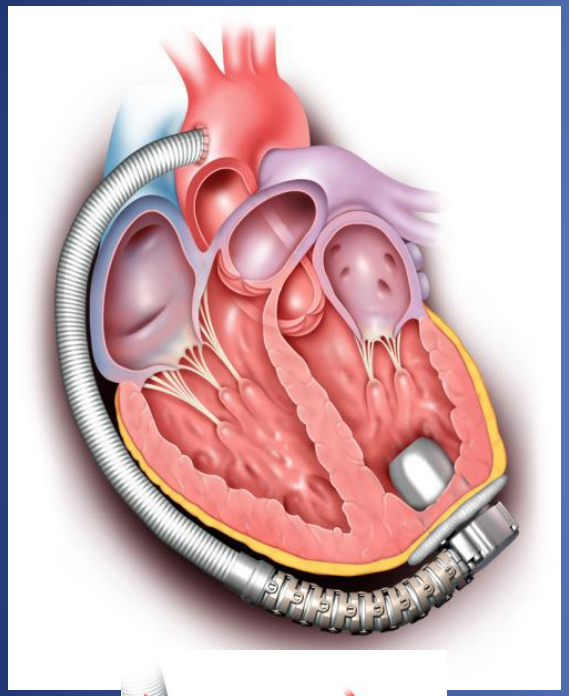
Novacor
1000 grams
[discontinued]

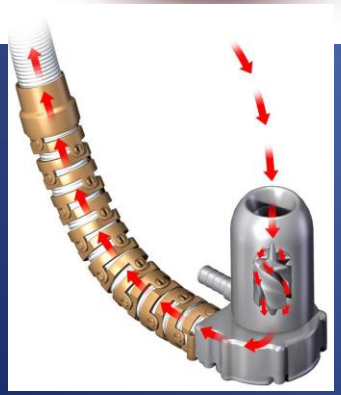
VAD Pump Weights

Weights listed on the Pyramid are for VAD pumps only. Additional weights for the cannulae, percutaneous lead, etc. are not included.

FUTURE DEVICES

HeartWare MVAD





Thoratec HeartMate X

WorldHeart MiFlow

Micromed HeartAssist 5


Jarvik Child and Infant Hearts
26 mm
17.8 mm
12 mm

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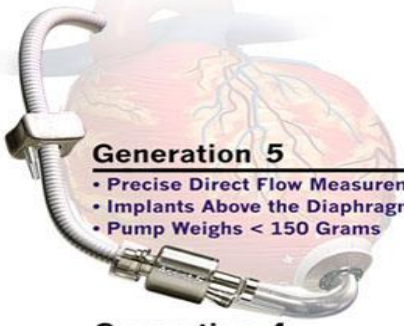

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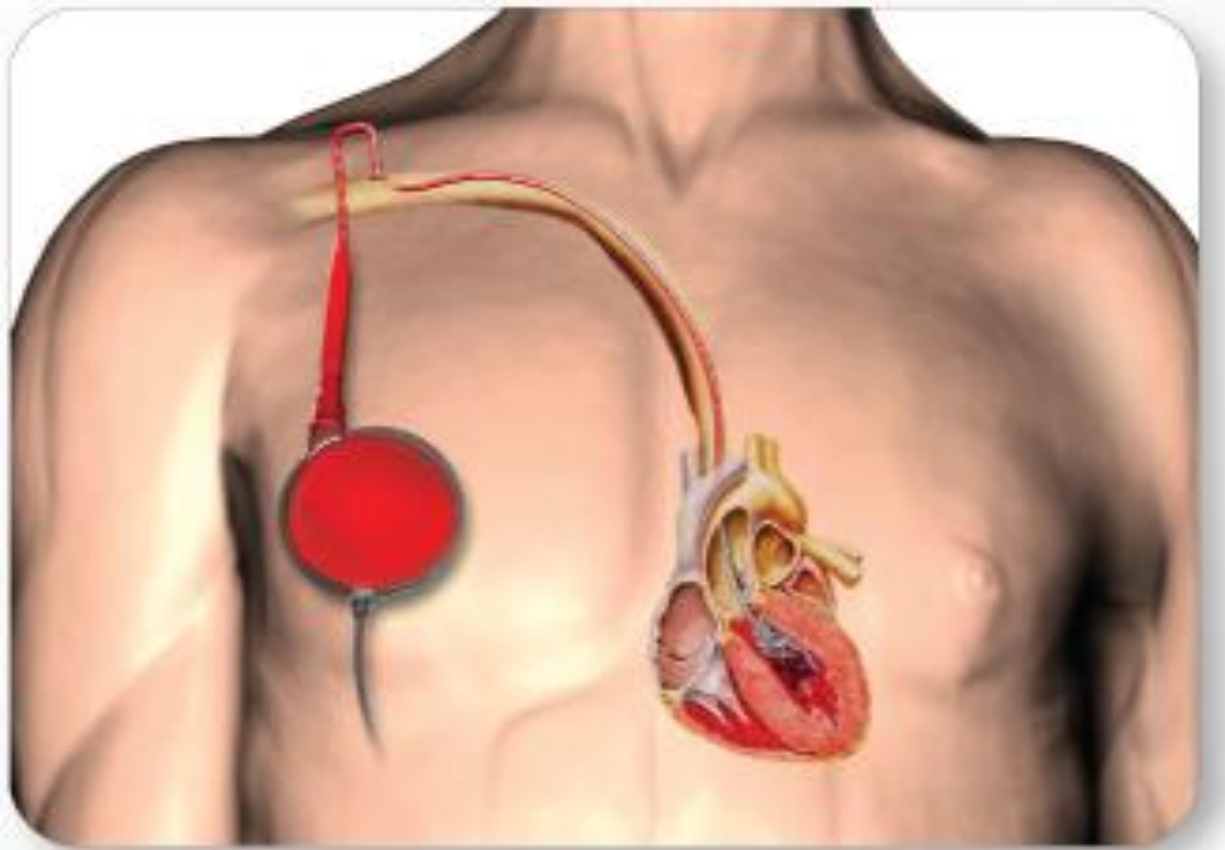
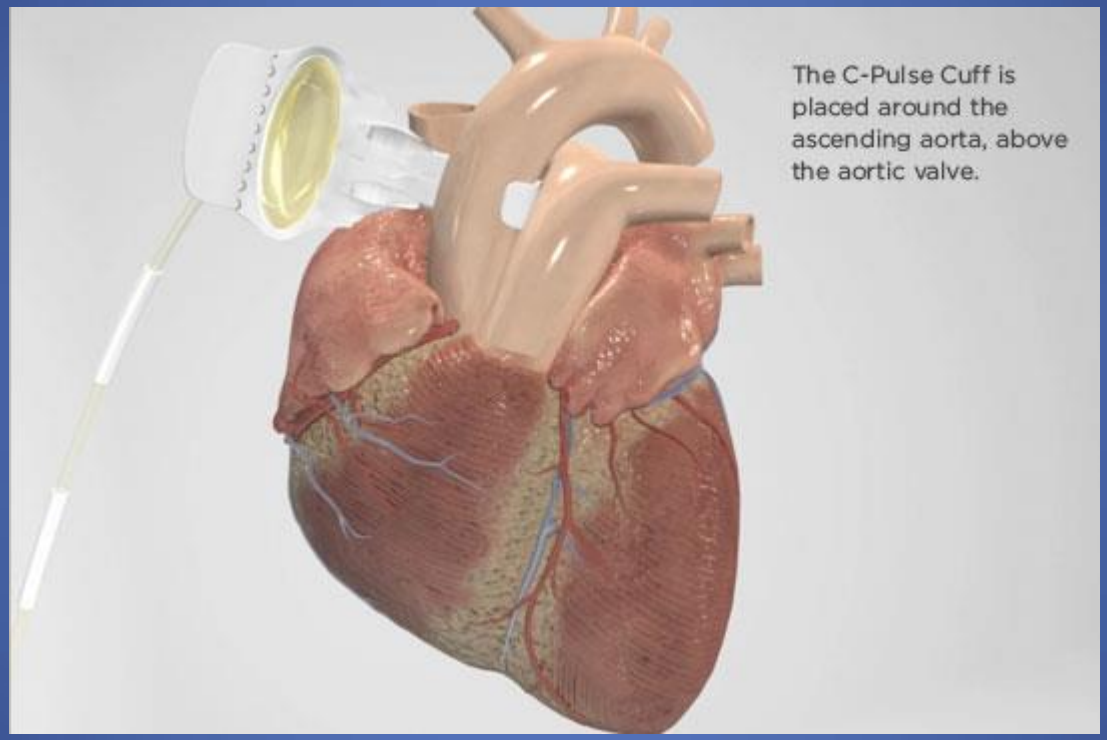
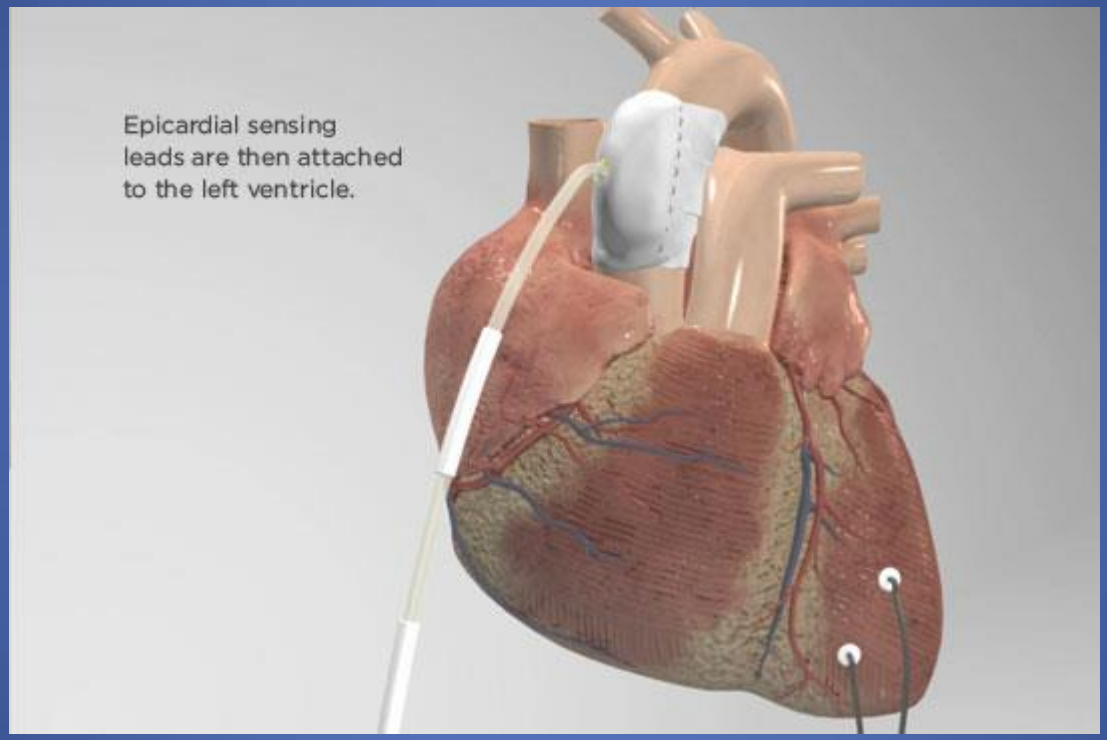
HEART
Assist 5

PulseCath



Sunshine Heart




Epicardial sensing
leads are then attached
to the left ventricle.

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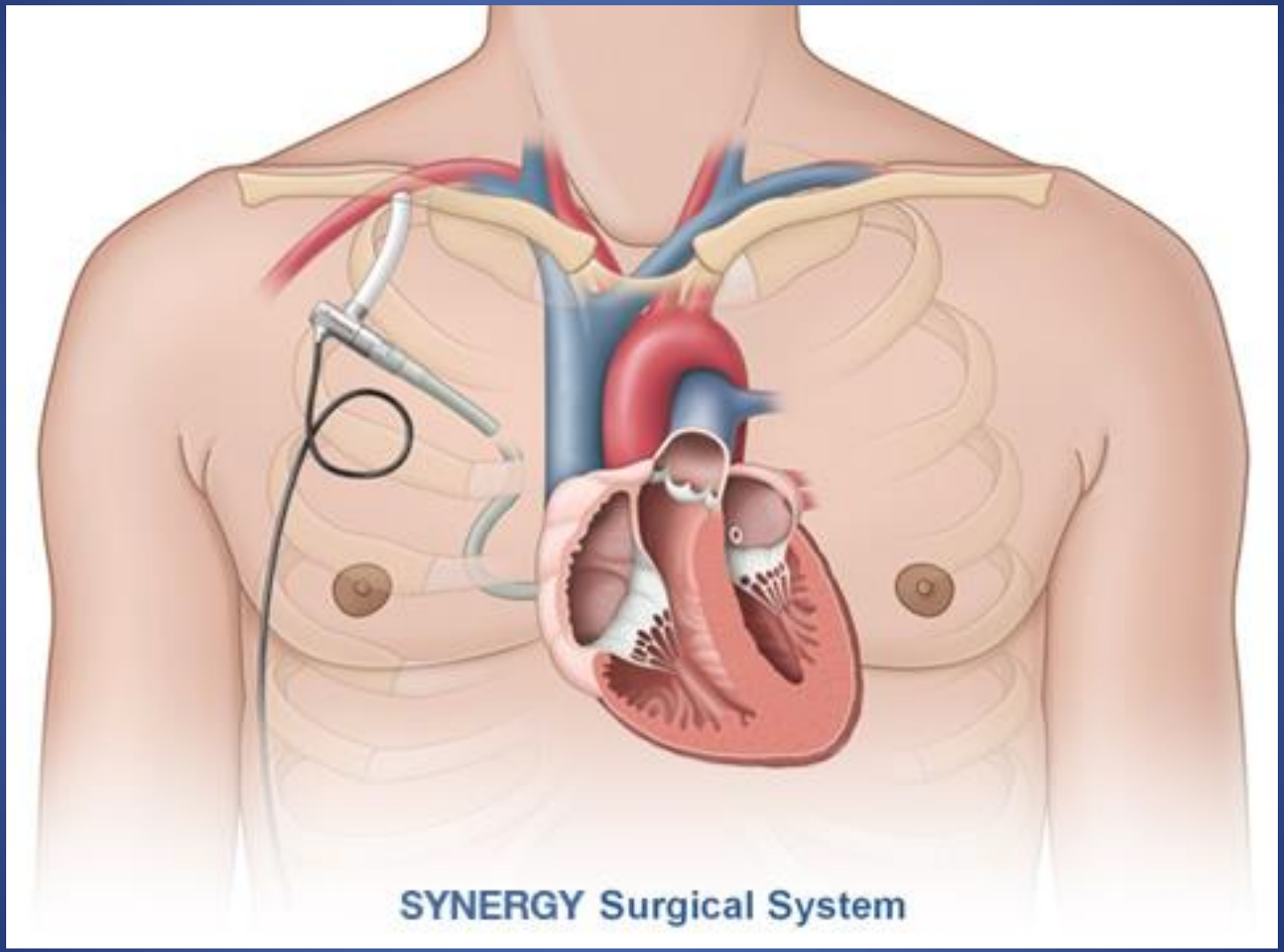
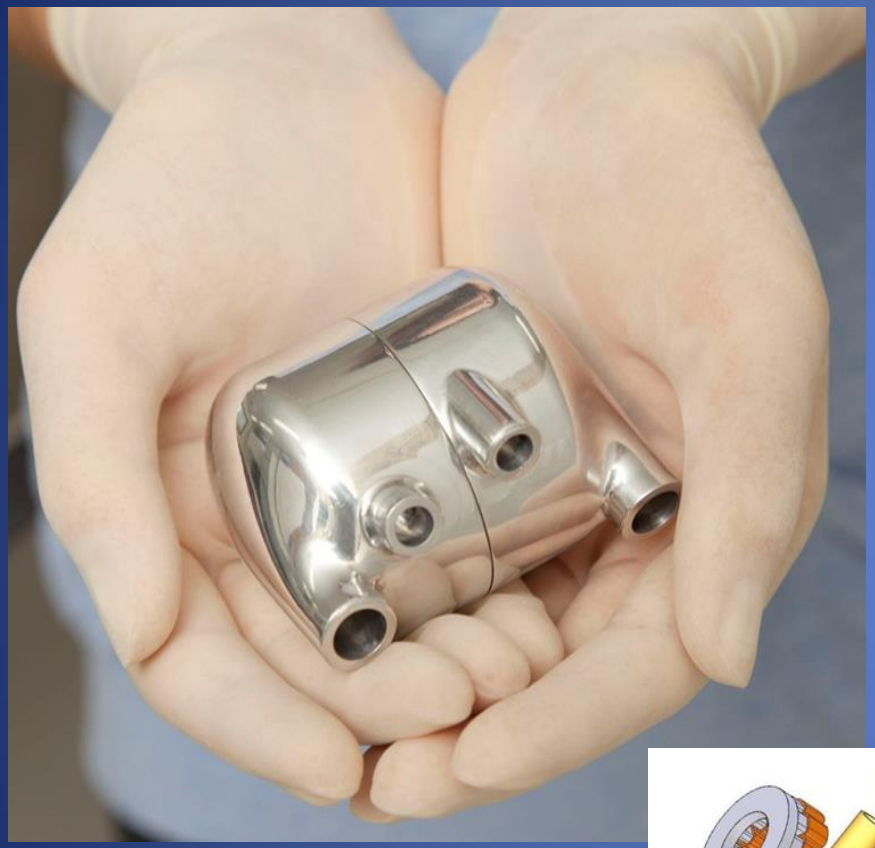
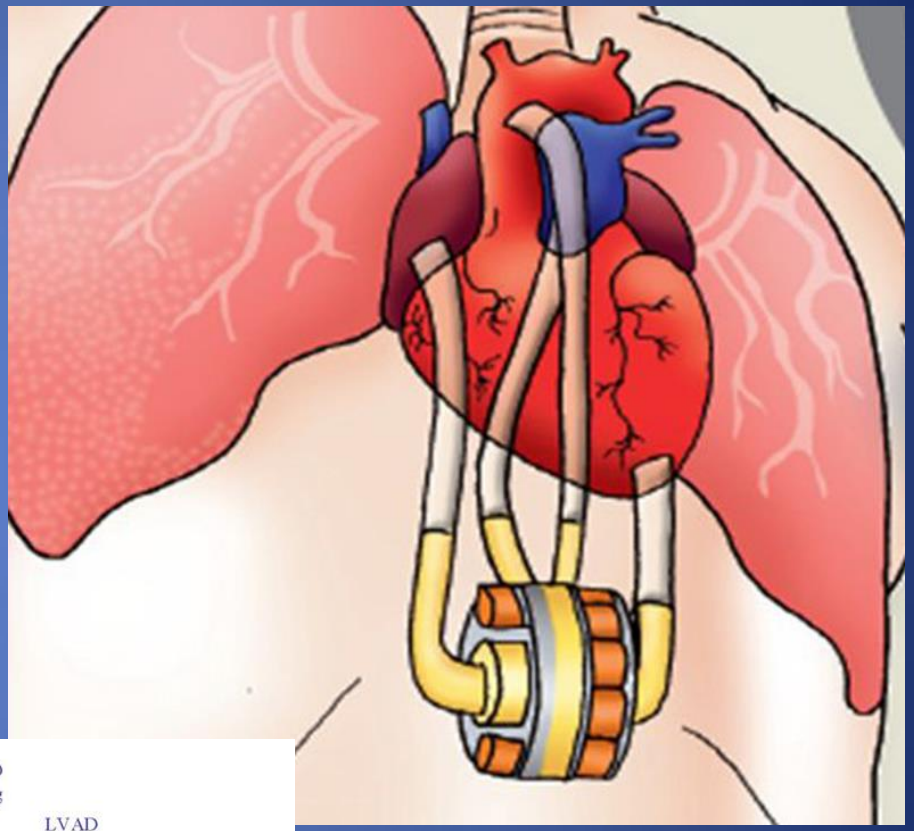

SYNERGY Surgical System

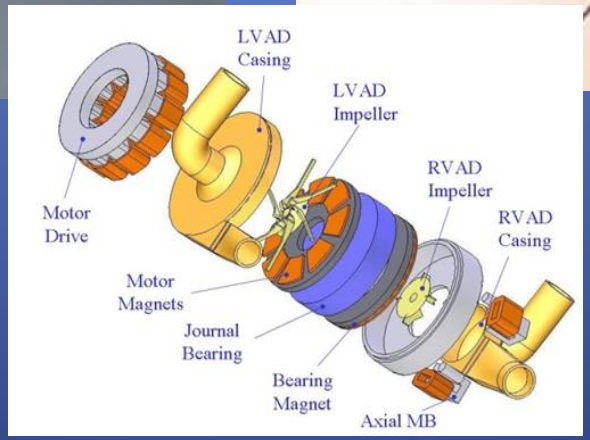
CardioWest TAH (Syncardia)

AbioCor Total Artificial Heart

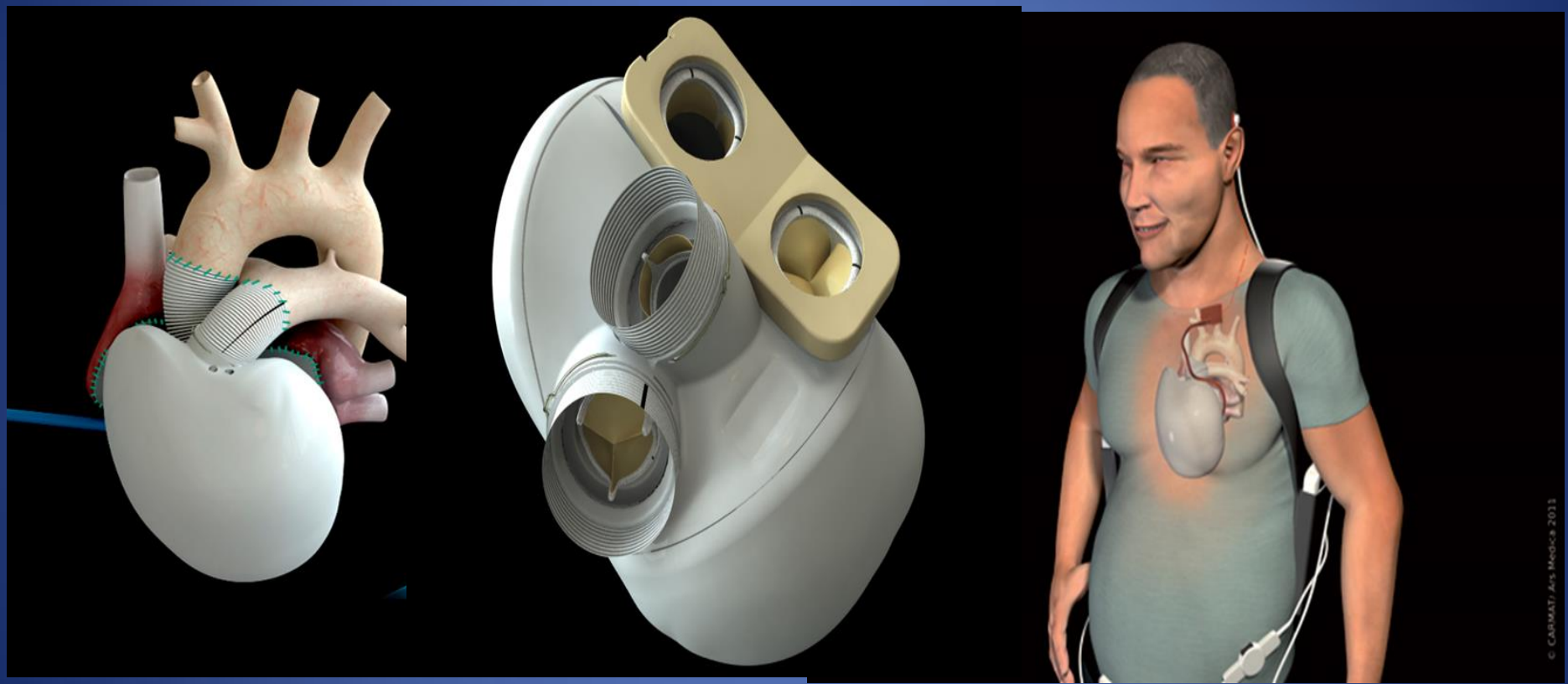
BiVACOR Total Artificial Heart



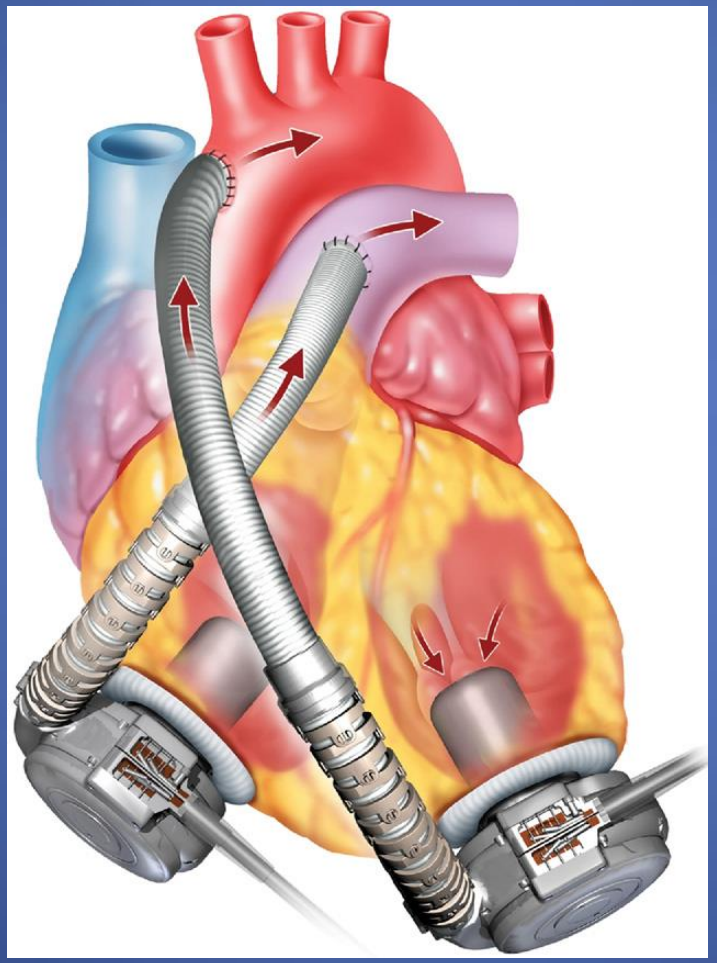


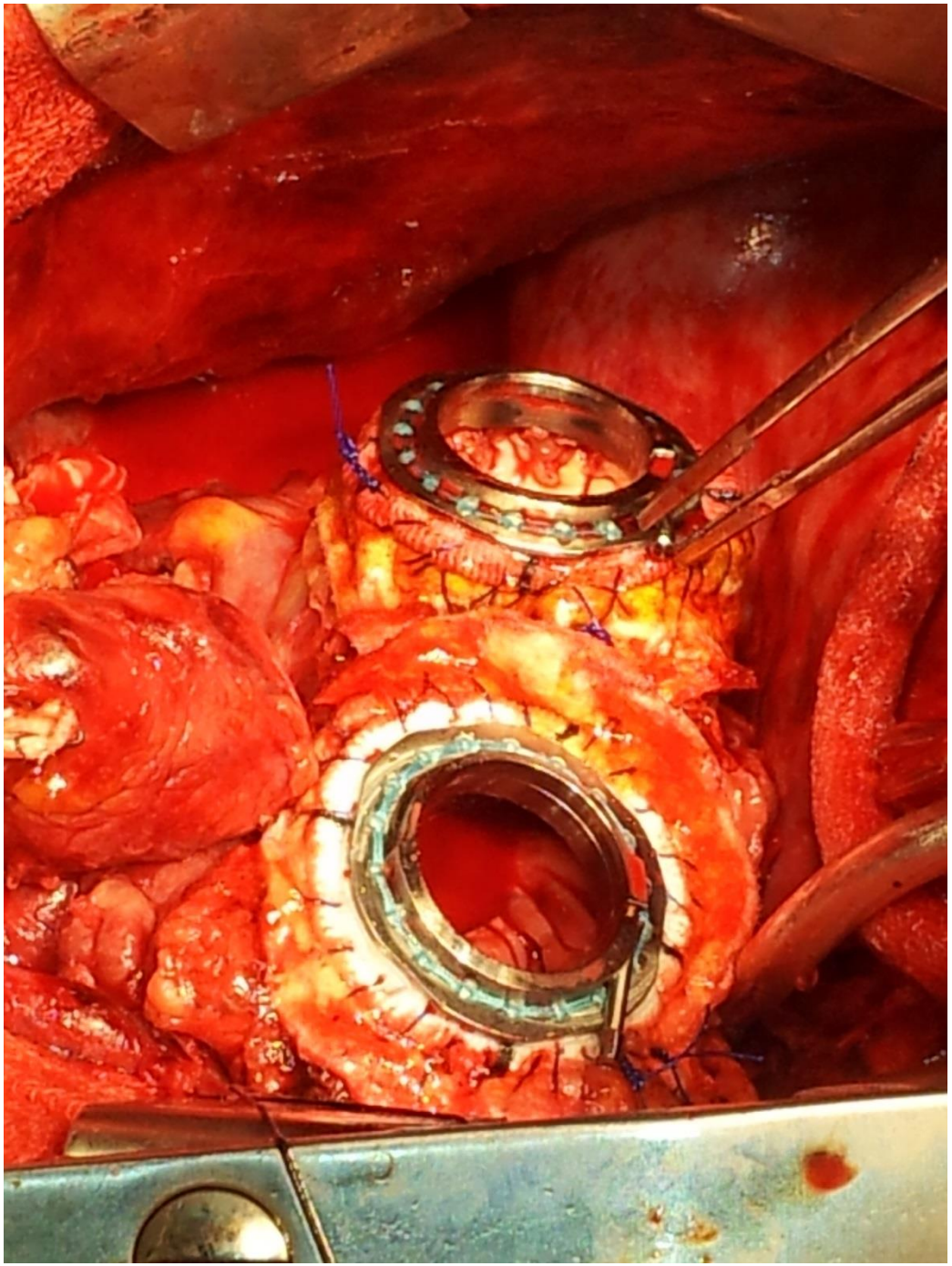


CARMAT Total Artificial Heart



HeartWare BiVAD





HeartWare BiVAD as Total Artificial Heart

"Holy great mother of God, I've been cloned!"

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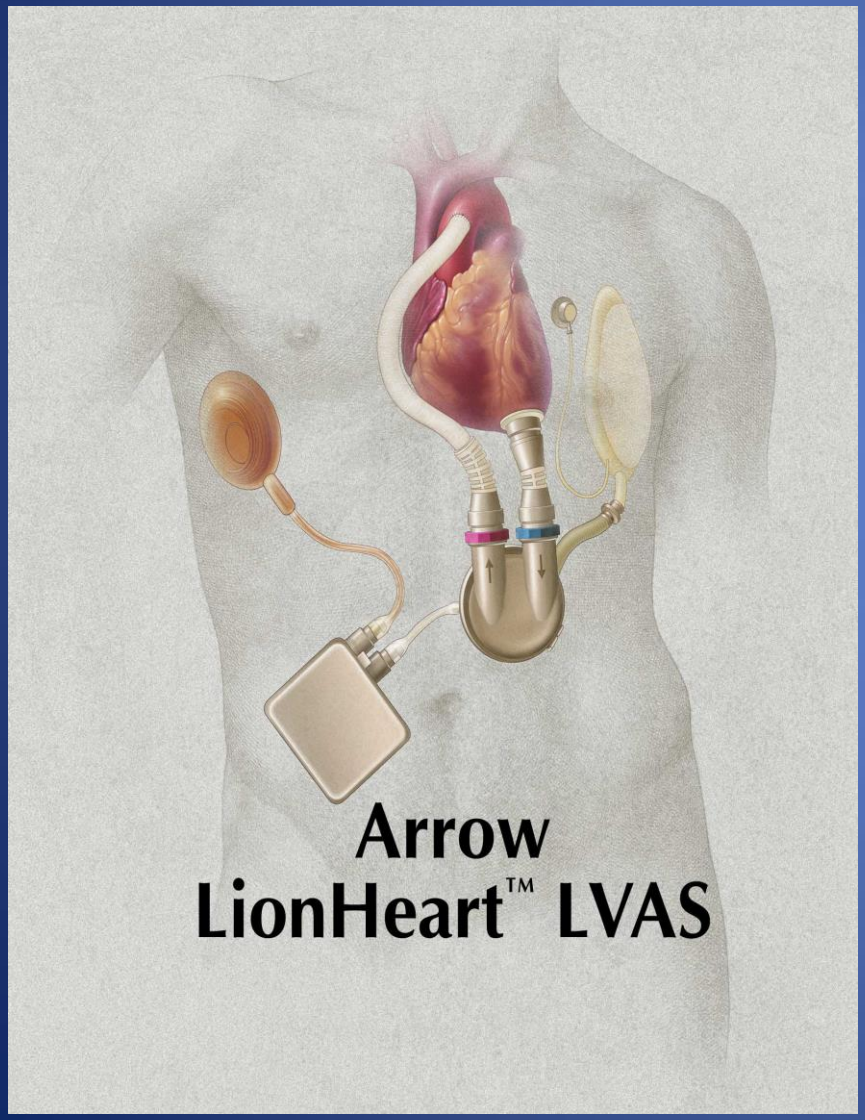
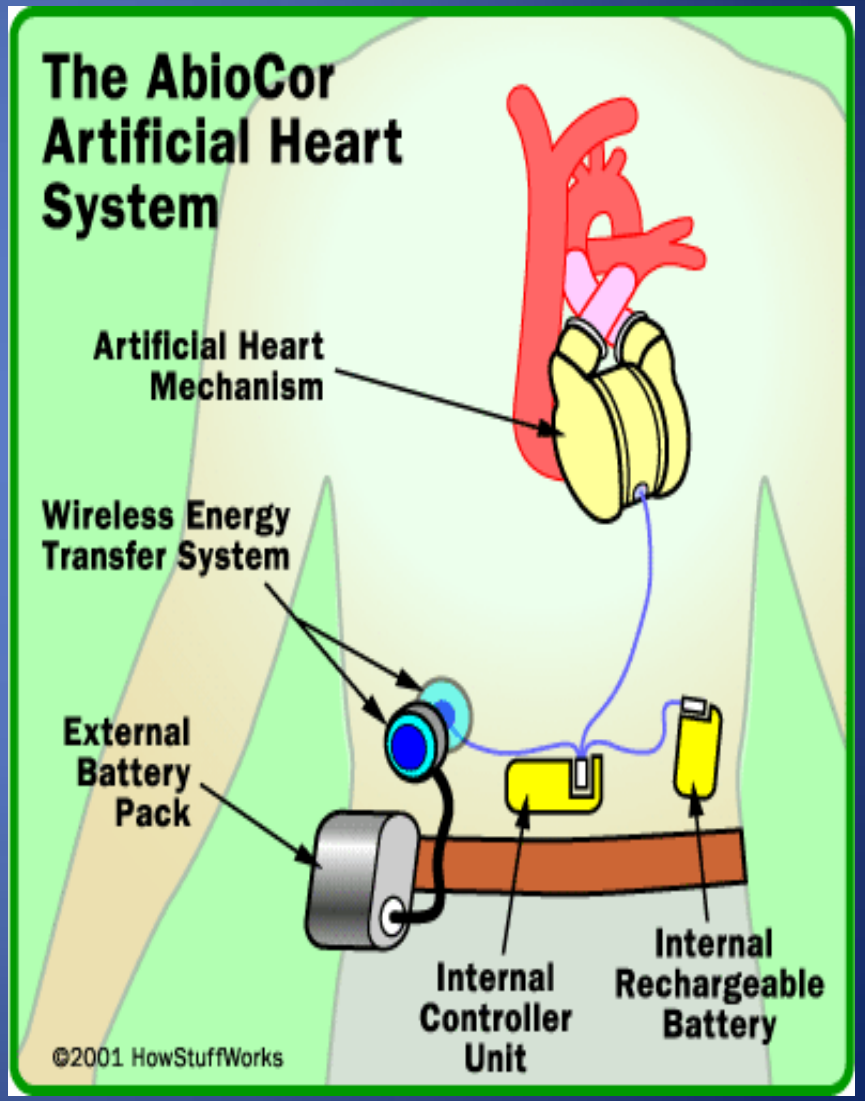
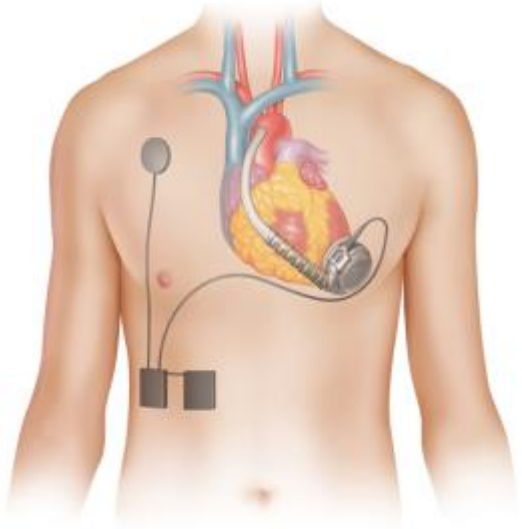
Transcutaneous Energy Transmission System (TETS)



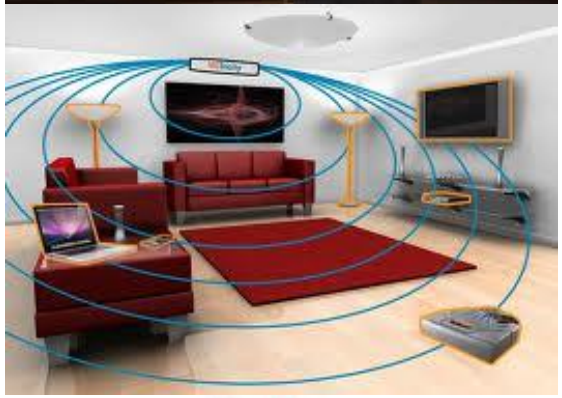


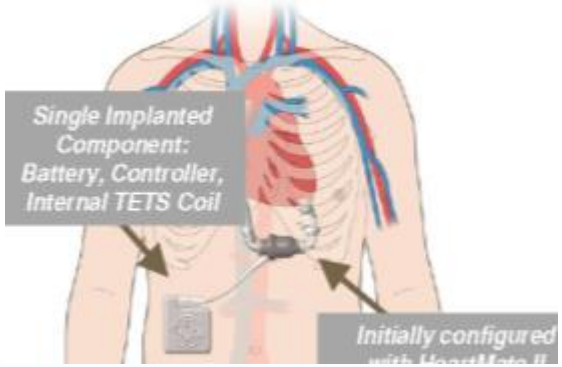
HeartWare (Dualis Medtech)



- TET base solution
- Estimation – 10 to 20W
- Alignment sensitive
- Battery location

Thoratec (WiTricity)



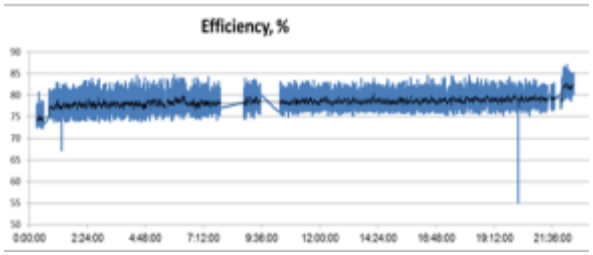


- WiTricity
  - RF transition with high Q coils
  - Technology invited for consumer electronic (Laptops, Speakers)
- Sensitive to motion, Metal
- Battery location
  - fully implanted, one unit

Leviticus Cardio CET

Full Operative Prototype

5 Commercial VADs Integrated



IP - 7

Patents App

cirtec MEDICAL SYSTEMS

(12) **United States Patent**
Zilbershlag et al.

(10) **Patent No.: US 8,075,472 B2**
(45) **Date of Patent: Dec. 13, 2011**

(54) PERMANENT VENTRICULAR ASSIST DEVICE FOR TREATING HEART FAILURE

(75) Inventors: **Michael Zilbershlag**, Givat Shmuel (IL); **Moshe Levy**, Tel Mond (IL)

(73) Assignee: **Leviticus-Cardio Ltd.**, Givat Shmuel (IL)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 49 days.

(21) Appl. No.: **12/527,098**

(22) PCT Filed: **May 4, 2008**

(86) PCT No.: **PCT/IL2008/000604**
§ 371 (c)(1),
(2), (4) Date: **Aug. 18, 2009**

(87) PCT Pub. No.: **WO2008/135980**
PCT Pub. Date: **Nov. 13, 2008**

(56) **References Cited**

U.S. PATENT DOCUMENTS

FOREIGN PATENT DOCUMENTS

OTHER PUBLICATIONS

* cited by examiner

Primary Examiner — George Manuel
Assistant Examiner — Robert Wieland

(57) **ABSTRACT**

QUALLION
Powering Life

CET – External Belt

CET Technology - Description

External

M.D. Remote Tablet

Transmission Belt

Controller

Battery

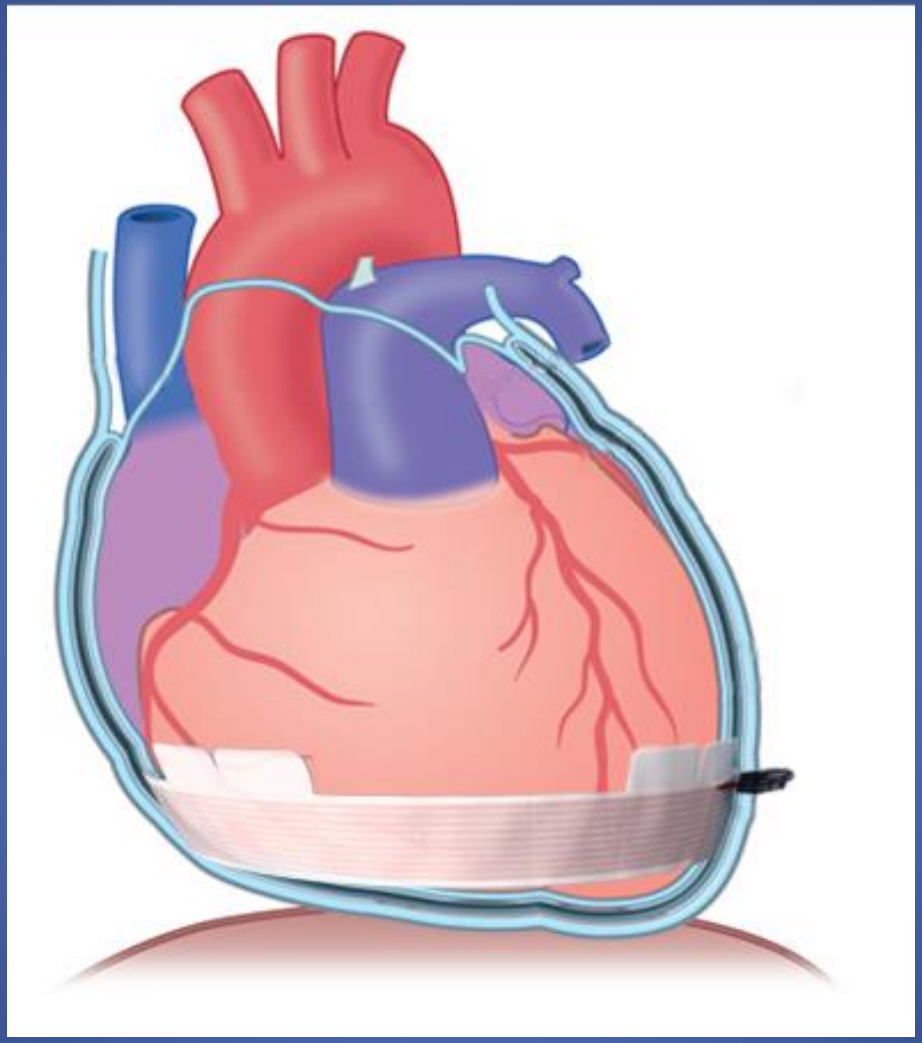
Patient Smart Watch

Comm

Implant

Receiver Ring

Internal Controller + Battery




It is a bit freaky with this wireless technology
COPYRIGHT : MORTEN INGEMANN

Summary

- Smaller, yet highly reliable devices
- Minimally invasive surgery
- Wireless technology

Probably will enable us to use future assist devices earlier, maybe as early as the time of acute heart failure event