

# What is Heart Failure ?



**PD Dr Philippe Meyer**  
Cardiology Service  
HUG

**Dr Nana Poku**  
Cardiology Service  
HUG

# Disclosures

- Participation in advisory boards and seminars organized by **AstraZeneca, Novartis, Abbott, Vifor, Bayer, Servier, Boehringer Ingelheim**
- Education grants (congresses) from Vifor, Boehringer Ingelheim, Abbot and Novartis
- **No personal fee**
- Honoraria paid entirely to a private research foundation of the cardiology Service of the University of Geneva (**Gecor foundation**) since 2018

# Plan

- Clinical vignette #2: “when all goes from bad to really bad”.
- Advanced stages of Heart Failure (HF).
  - Definition
  - Recognizing the transition phase (the sliding HF patient)
  - INTERMACS classification
- When to consider referral to a specialized HF center.
- New concepts in HF : going beyond EF classification.

# Clinical vignette: Mr A. D 1974 – From May 2005

## CV risk factors

- positive family history, Smoking 1 pack/day (sometimes cannabis),dyslipidaemia
- Worked in a railway company until 2000, then as a labourer in the local community

## Past medical history

- **At the age of 31 years :**
  - Cardiac arrest, with ventricular fibrillation
  - **Anterior STEMI with occlusion of the proximal LAD** (plaque rupture), treated by angioplasty and implantation of 2 active stents (1 vessel disease)
  - **Cardiogenic choc with LVEF at 30%** with a large area of akinesia in the LAD territory (anterior, septal and apical regions)
  - In December 2005, implantation of a defibrillator
- **From 2005-2015 : Chronic HF medication, LVEF 30%, NYHA 0-I**
  - Professionally active, married with 3 children
- In 2015
  - Symptomatic HF (NYHA II-III) with progression of QRS duration to a complete LBB
  - HF medical optimization and then **upgrade to CRT-D.**
- In 2017
  - 2<sup>nd</sup> ACS (NSTEMI) due to the acute thrombotic occlusion of M2 treated by angioplasty and implantation of 1 active stent infection 01.2017
  - Also, progression to 2 vessel disease (LAD and CX) with intermediary restenosis of the LAD overlapping on D1 (bifurcation lesion)

# Clinical vignette: Mr A. D 1974 – Turning point in 2018

## Evolution of HF

- Referral from the general cardiologist in June 2018 for specialized HF care:
  - Acute HF with worsening HF symptoms : dyspnoea, paroxysmal nocturnal dyspnoea
  - Fatigue and loss of appetite
- Increasing NT-proBNP despite medical treatment
- Increasing LV size, functional MR
- Down titration of prognostic medication due to symptomatic arterial hypotension

## Medication

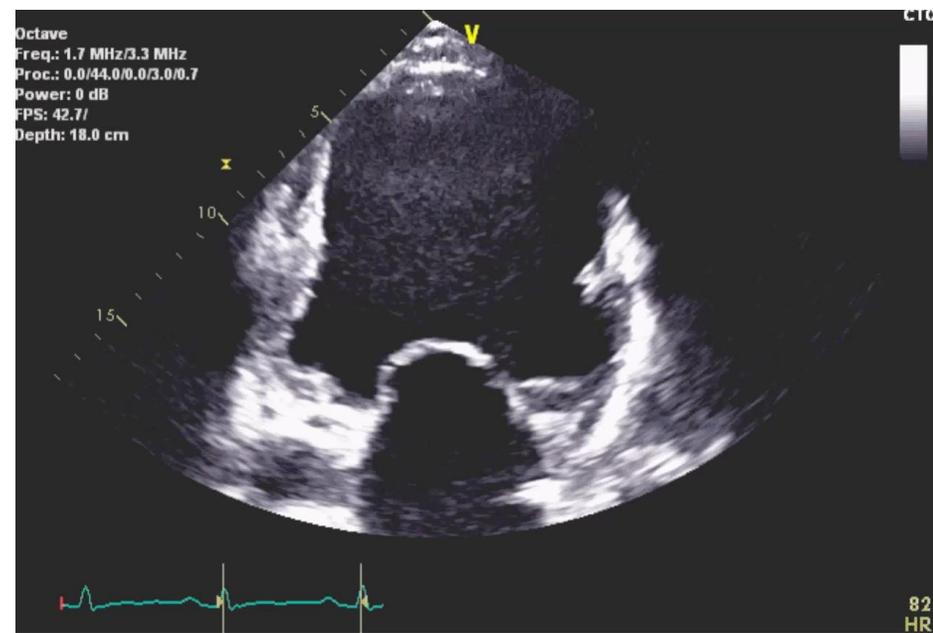
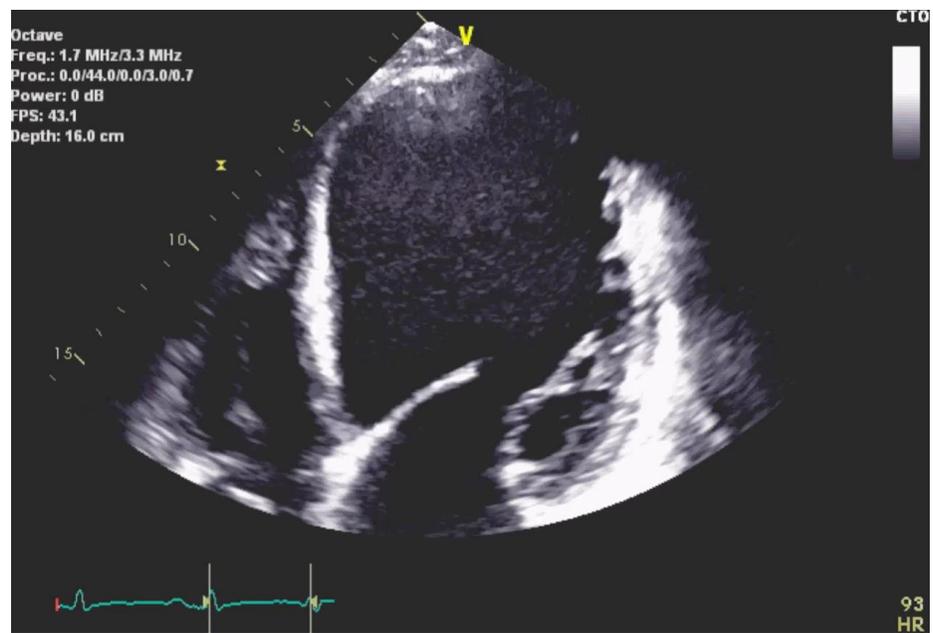
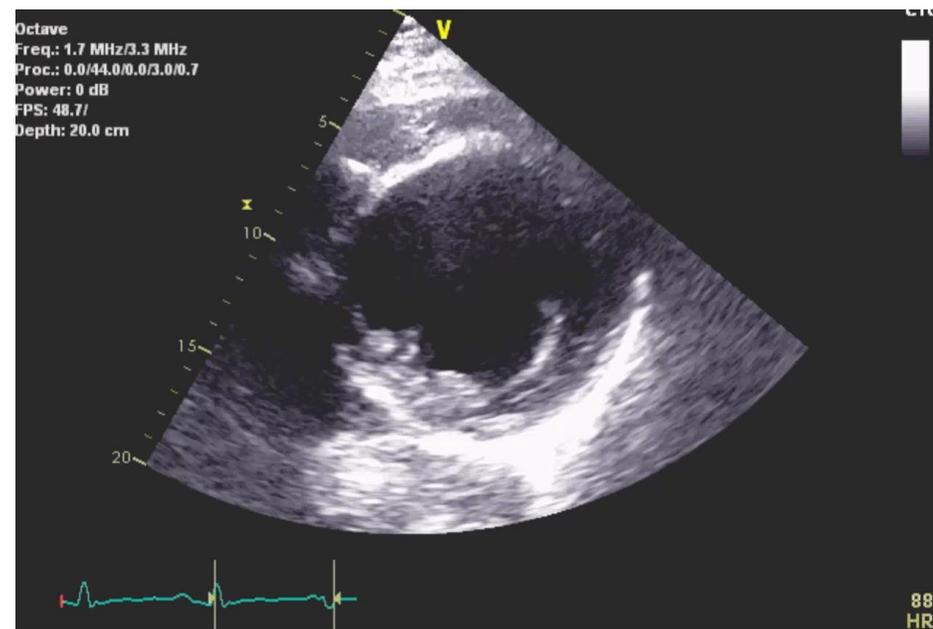
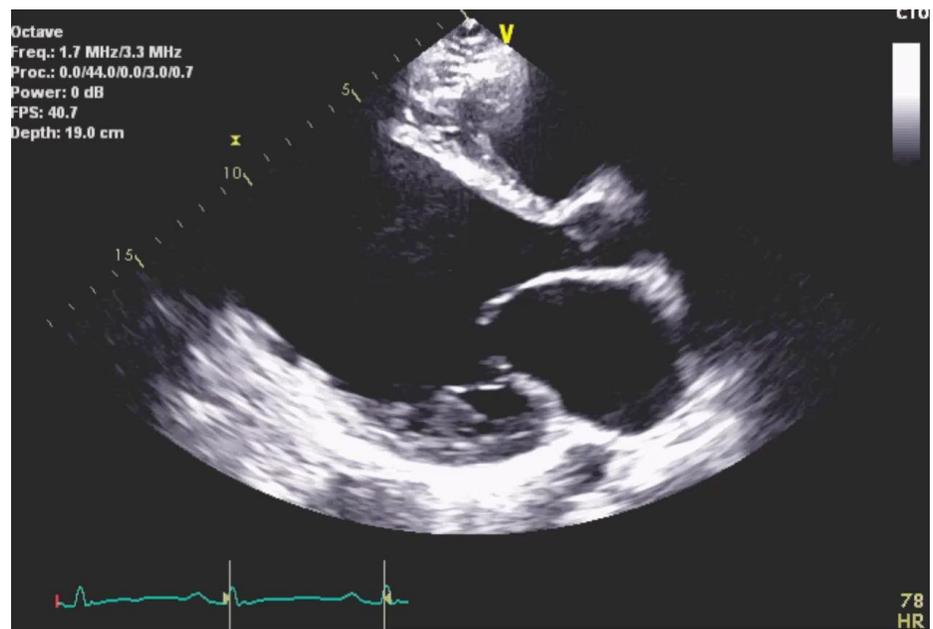
- DAPT : Aspirine cardio 100mg 1-0-1 and Ticagrelor 90mg 1-0-1
- Sacubitril/Valsartan 100 mg 1-0-1
- Metoprolol 200mg 1-0-1
- Rosuvastatine 20mg 0-0-1
- Ezetemibe 10mg 0-0-1

## Vital signs and physical examn

- 106/80 mmHg, 80/min
- cold and clammy skin, not too wet

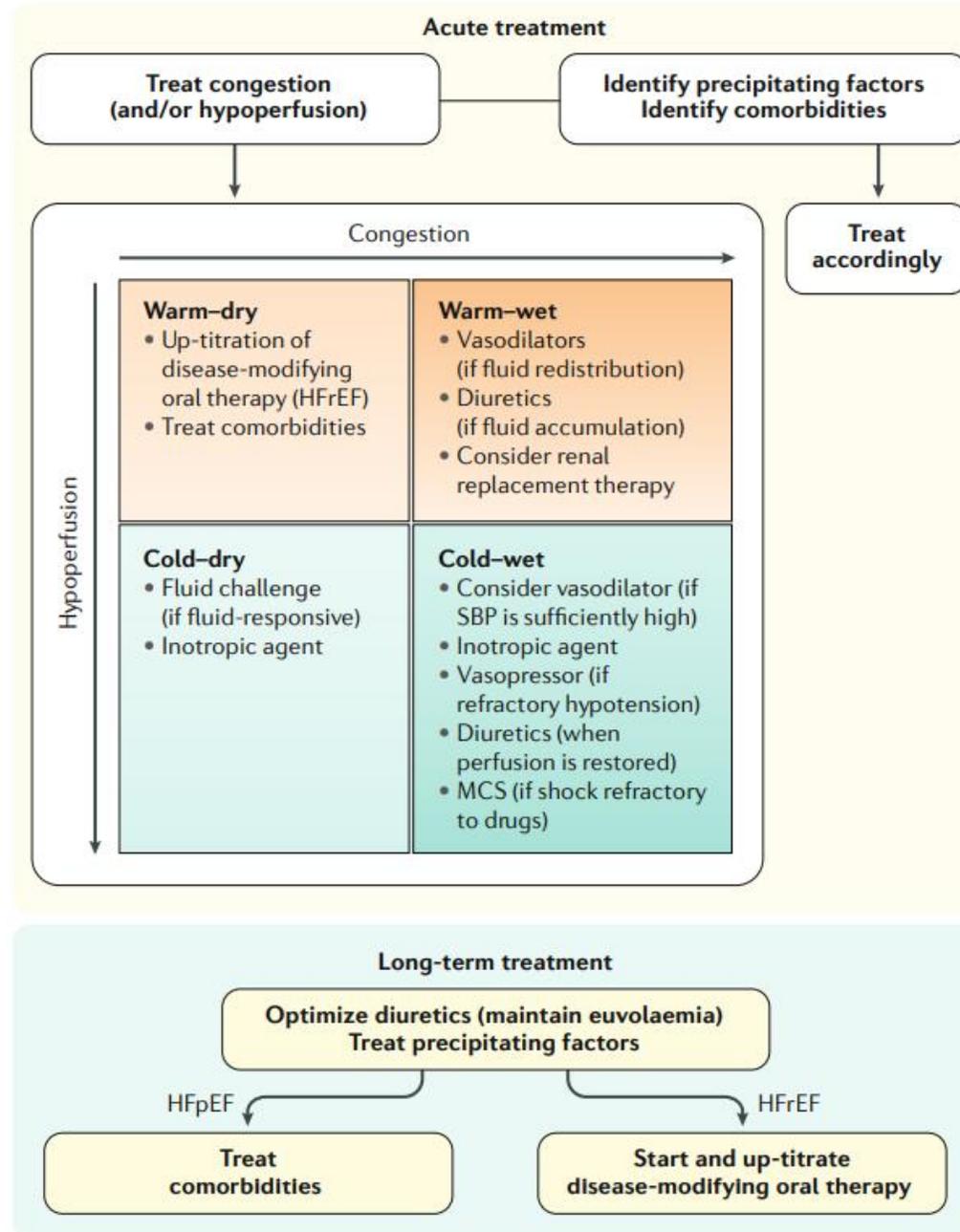
## Biology

- NT-pro BNP at 8777ng/l
- No major organ dysfunction



## Congestion

- pulmonary rales
- distended jugular veins and peripheral oedema
- evidence of organ congestion on chest X-ray radiography or lung ultrasonography
- elevated filling pressures on invasive monitoring (or echo)



## Abnormal peripheral perfusion

- cold and clammy skin
- oliguria
- altered mental status
- other evidence of altered oxygen transport
  - increased blood lactate
  - low central venous or mixed venous oxygen saturation.

# Stages in heart failure

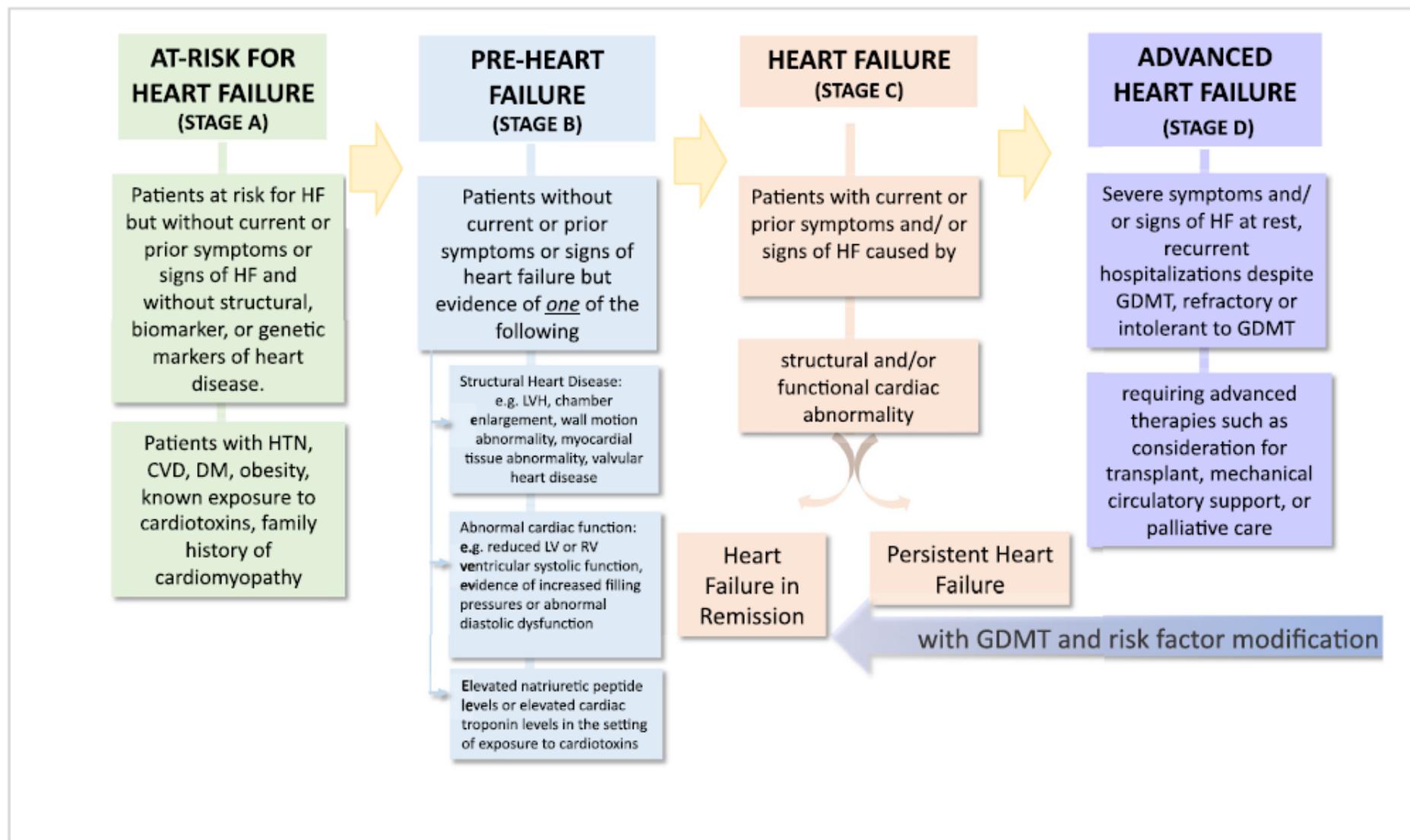


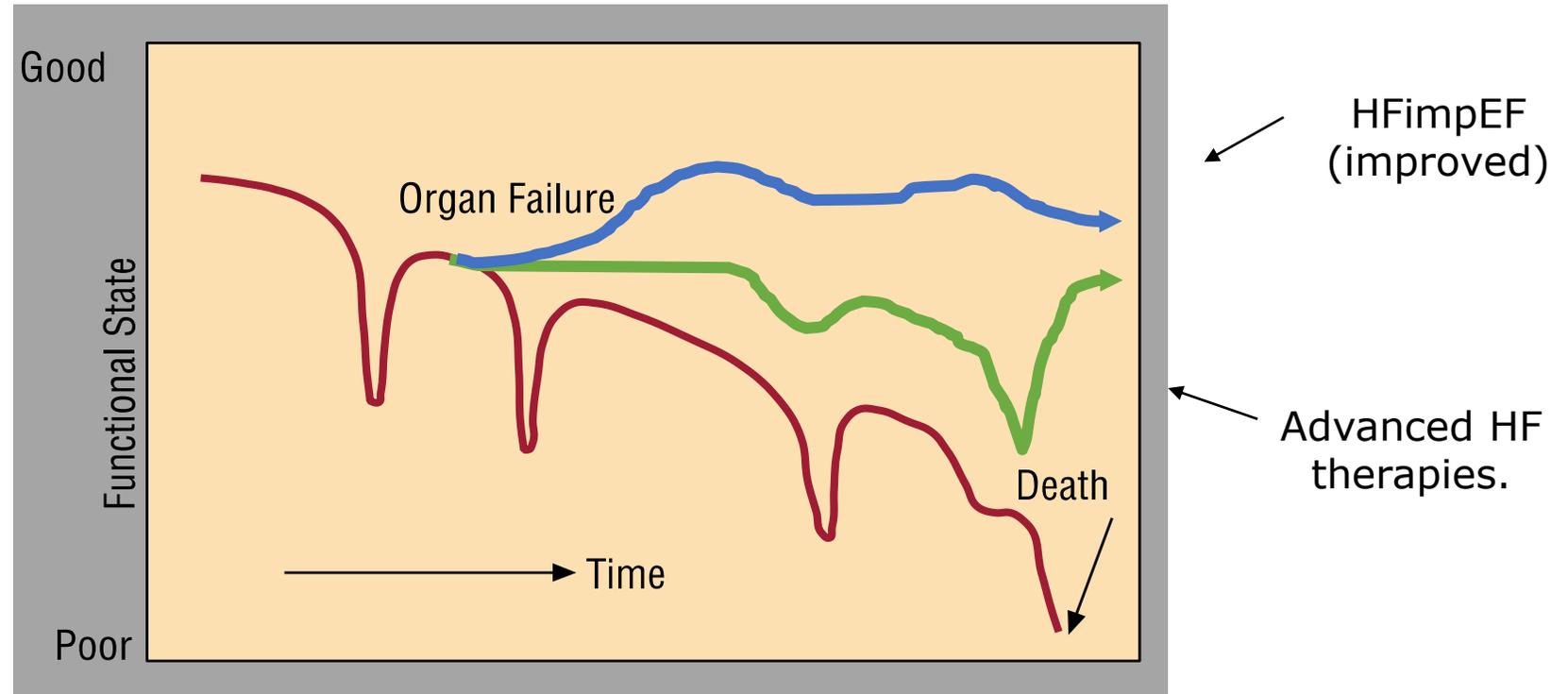
Figure 2. Stages in the development and progression of HF. CVD, cardiovascular disease; DM, diabetes mellitus; HTN, hypertension;

# What does this case illustrate ?

- HF is a clinical syndrome with a continuous spectrum of disease stages
- The dynamic nature of HF involves changing trajectories

## Reasons for the changing trajectories:

- ✓ Improvement in diagnostic strategies
- ✓ Implementation of disease modifying prognostic medication
- ✓ Increased awareness of the burden of comorbidities and their management
- ✓ Improvement of advanced HF therapeutics



Adapted from Tuppin P et al. Arch Card Dis 2014;107:158–168.

- The importance of evaluating disease severity on a regular basis whether in the chronic or acute setting.
- The importance of identifying patients that progress, despite optimal HF medication, into advanced stages in order to consider advanced therapies of HF.

---

# Advanced heart failure: a position statement of the Heart Failure Association of the European Society of Cardiology

**Maria G. Crespo-Leiro<sup>1\*</sup>, Marco Metra<sup>2</sup>, Lars H. Lund<sup>3</sup>, Davor Milicic<sup>4</sup>, Maria Rosa Costanzo<sup>5</sup>, Gerasimos Filippatos<sup>6</sup>, Finn Gustafsson<sup>7</sup>, Steven Tsui<sup>8</sup>, Eduardo Barge-Caballero<sup>1</sup>, Nicolaas De Jonge<sup>9</sup>, Maria Frigerio<sup>10</sup>, Righab Hamdan<sup>11</sup>, Tal Hasin<sup>12</sup>, Martin Hülsmann<sup>13</sup>, Sanem Nalbantgil<sup>14</sup>, Luciano Potena<sup>15</sup>, Johann Bauersachs<sup>16</sup>, Aggeliki Gkouziouta<sup>17</sup>, Arjang Ruhparwar<sup>18</sup>, Arsen D. Ristic<sup>19</sup>, Ewa Straburzynska-Migaj<sup>20</sup>, Theresa McDonagh<sup>21</sup>, Petar Seferovic<sup>22</sup>, and Frank Ruschitzka<sup>23</sup>**

---

# Updated HFA-ESC criteria for defining advanced heart failure

All the following criteria must be present despite optimal guideline-directed treatment:

- 1. Severe and persistent symptoms** of heart failure (NYHA class III or IV)
- 2. Severe cardiac dysfunction** defined by a reduced LVEF  $\leq 30\%$ , isolated RV failure (e.g. ARVC) or non-operable severe valve abnormalities or congenital abnormalities or persistently high (or increasing) BNP or NT-proBNP values and data of 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 hospitalization in the last 12 months
- 4. Severe impairment of exercise capacity** with inability to exercise or low 6MWT ( $<300$  m) or  $pVO_2$  ( $<12-14$  mL/kg/min), estimated to be of cardiac origin

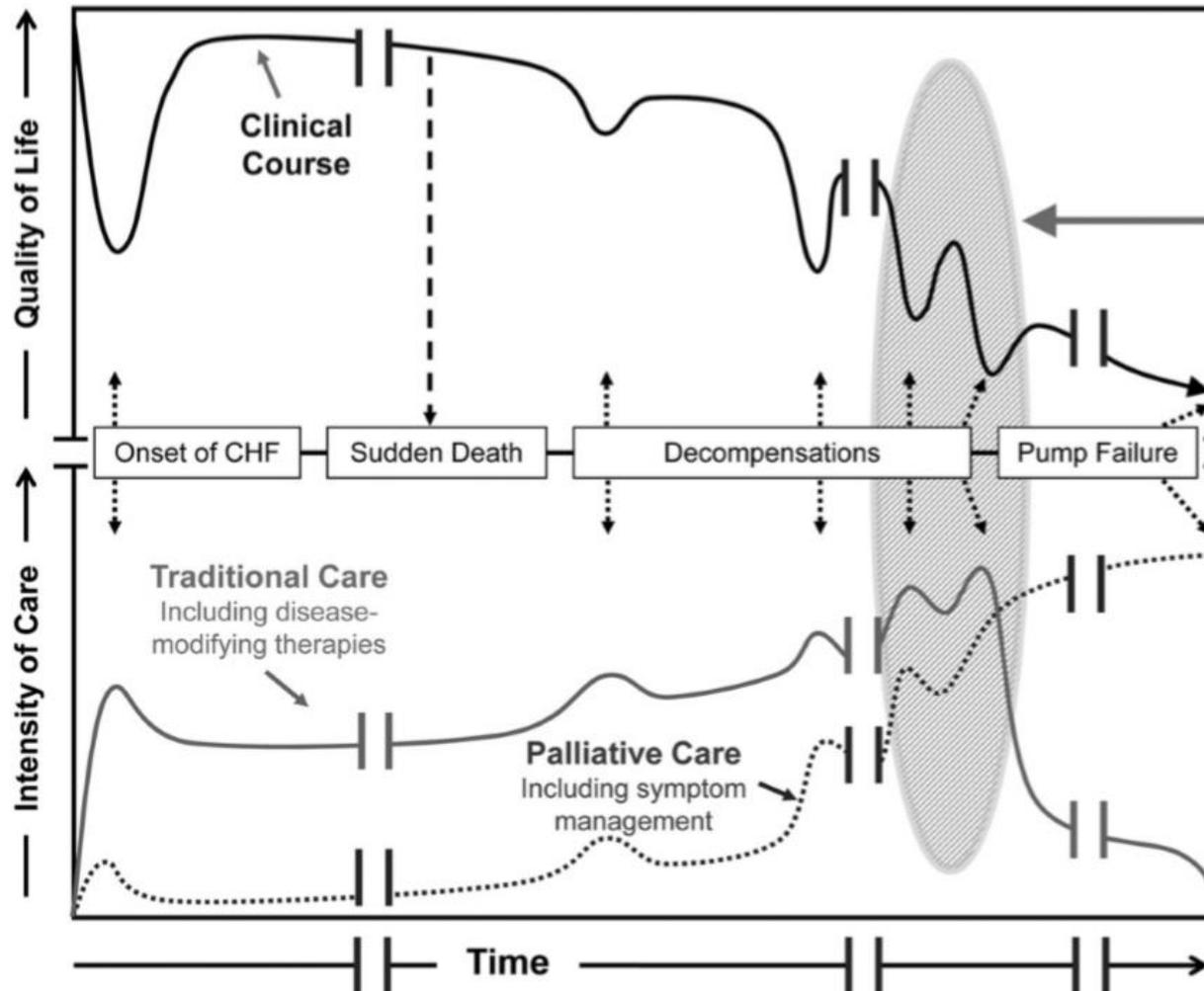
# INTERMACS : Interagency Registry for Mechanically Assisted Circulatory Support Class Definitions, Prevalence, and Outcomes

**Table 3.** INTERMACS Class Definitions, Prevalence, and Outcomes

New York Heart Association Class	IV						III
INTERMACS	1	2	3	4	5	6	7
Clinical status	Critical cardiogenic shock	Progressive decline	Stable but inotrope dependent	Resting symptoms	Exertion intolerant	Exertion limited	Advanced class III
	Inotropy			Ambulatory			
Possible modifiers	Arrhythmia or temporary circulatory support			Arrhythmia or frequent flier			Arrhythmia
Implantation, %	14.3	36.4	29.9	18.4			1.0
1-year survival, %	74	82		84			
6-month readmission, %	57	42		61 to 80			

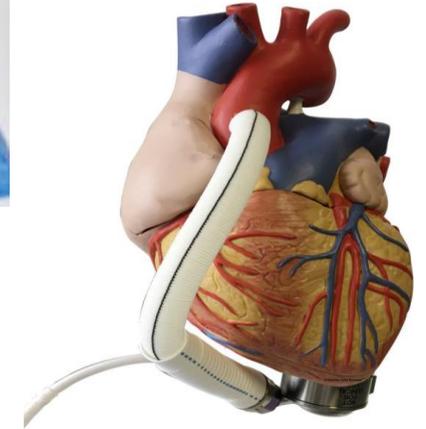
Statistics were derived from the 8th annual INTERMACS report. INTERMACS indicates Interagency Registry for Mechanically Assisted Circulatory Support; and NYHA, New York Heart Association.

# Therapeutic options in advanced HF



## Transition to Advanced Heart Failure:

- Oral therapies failing
- A time for many major decisions
- Consider MCS and/or transplantation, if eligible
- Consider inversion of care plan to one dominated by a palliative approach, which may involve formal hospice

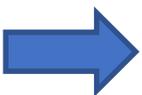
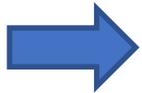


# Therapeutic options in advanced HF



EUROPEAN SOCIETY OF CARDIOLOGY®

<b>Bridge to decision (BTD)/ Bridge to bridge (BTB)</b>	Use of short-term MCS (e.g. ECLS or ECMO) in patients with cardiogenic shock until haemodynamics and end-organ perfusion are stabilized, contra-indications for long-term MCS are excluded (brain damage after resuscitation) and additional therapeutic options including long-term VAD therapy or heart transplant can be evaluated.
<b>Bridge to candidacy (BTC)</b>	Use of MCS (usually LVAD) to improve end-organ function in order to make an ineligible patient eligible for heart transplantation.
<b>Bridge to transplantation (BTT)</b>	Use of MCS (LVAD or BiVAD) to keep patient alive who is otherwise at high risk of death before transplantation until a donor organ becomes available.
<b>Bridge to recovery (BTR)</b>	Use of MCS (typically LVAD) to keep patient alive until cardiac function recovers sufficiently to remove MCS.
<b>Destination therapy (DT)</b>	Long-term use of MCS (LVAD) as an alternative to transplantation in patients with end-stage HF ineligible for transplantation or long-term waiting for heart transplantation.



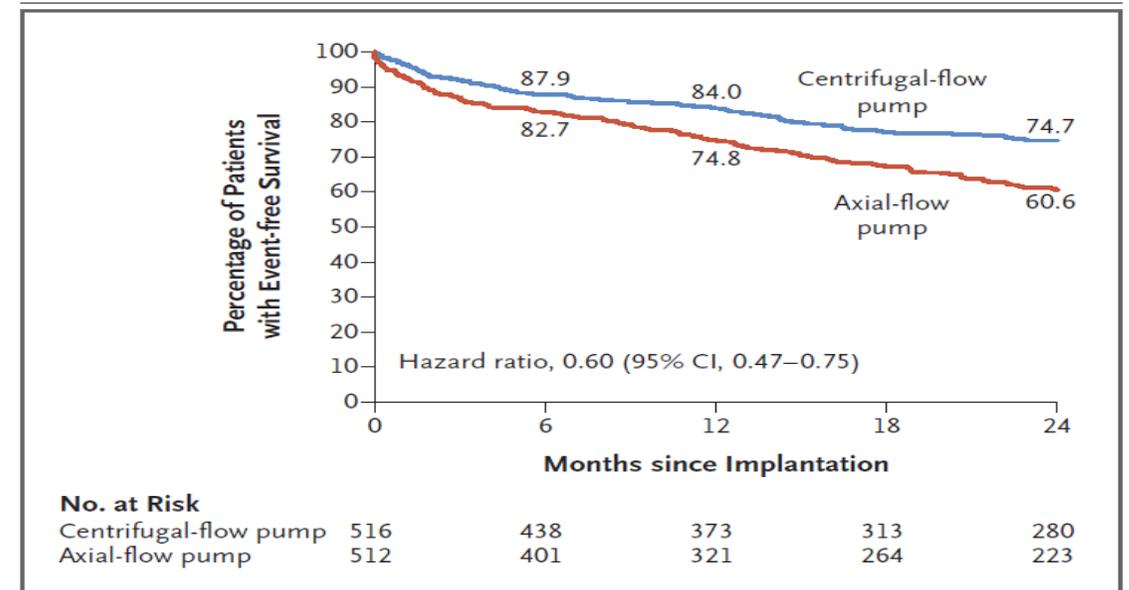
ESC Guidelines on Acute and Chronic Heart Failure, *EHJ* (2016) 37 (27):2129-2200 - <https://doi.org/10.1093/eurheartj/ehw128>

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

## A Fully Magnetically Levitated Left Ventricular Assist Device — Final Report

M.R. Mehra, N. Uriel, Y. Naka, J.C. Cleveland, Jr., M. Yuzefpolskaya, C.T. Salerno, M.N. Walsh, C.A. Milano, C.B. Patel, S.W. Hutchins, J. Ransom, G.A. Ewald, A. Itoh, N.Y. Raval, S.C. Silvestry, R. Cogswell, R. John, A. Bhimaraj, B.A. Bruckner, B.D. Lowes, J.Y. Um, V. Jeevanandam, G. Sayer, A.A. Mangi, E.J. Molina, F. Sheikh, K. Aaronson, F.D. Pagani, W.G. Cotts, A.J. Tatrooles, A. Babu, D. Chomsky, J.N. Katz, P.B. Tessmann, D. Dean, A. Krishnamoorthy, J. Chuang, I. Topuria, P. Sood, and D.J. Goldstein, for the MOMENTUM 3 Investigators\*



# Recognizing patients sliding into advanced HF is not always easy

- Signs and symptoms may be less typical in advanced CHF.

## Typical symptoms

Breathlessness  
Orthopnea  
Paroxysmal nocturnal dyspnea  
Reduced exercise tolerance  
Fatigue, tiredness  
Ankle swelling  
Inability to exercise  
Swelling of parts of the body other than ankles  
Bendopnea

## Less typical symptoms

Nocturnal cough  
Wheezing  
Bloated feeling  
Postprandial satiety  
Loss of appetite  
Decline in cognitive function, confusion (especially in the elderly)  
Depression  
Dizziness, syncope

## More specific signs

Elevated jugular venous pressure  
Third heart sound\*  
Summation gallop with third and fourth heart sounds  
Cardiomegaly, laterally displaced apical impulse  
Hepatojugular reflux  
Cheyne Stokes respiration in advanced HF

## Less specific signs

Peripheral edema (ankle, sacral, scrotal)  
Pulmonary rales\*  
Unintentional weight gain (>2 kg/week)  
Weight loss (in advanced HF) with muscle wasting and cachexia  
Cardiac murmur  
Reduced air entry and dullness to percussion at lung bases suggestive of pleural effusion  
Tachycardia, irregular pulse  
Tachypnea  
Hepatomegaly/ascites  
Cold extremities  
Oliguria  
Narrow pulse pressure

## More common in CHF and advanced stages

### Symptoms

- Fatigue, tiredness
- Bloated feeling
- Postprandial satiety
- Decline in cognitive function, confusion (especially in the elderly)
- Dizziness, syncope

### Signs :

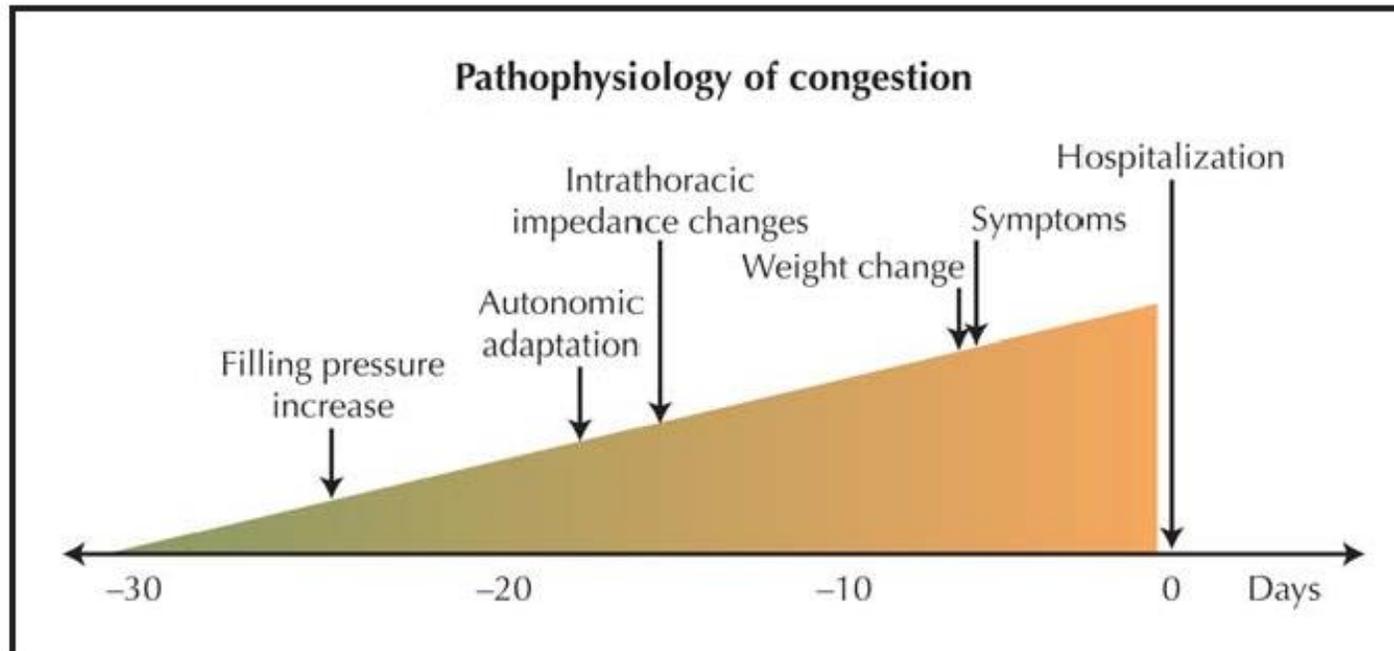
- Cheyne Stokes respiration in advanced HF
- Cold extremities

### Overall:

Poor correlation between hemodynamic and clinical congestion in CHF and advanced stages of HF

# Recognizing patients sliding into advanced HF is not always easy

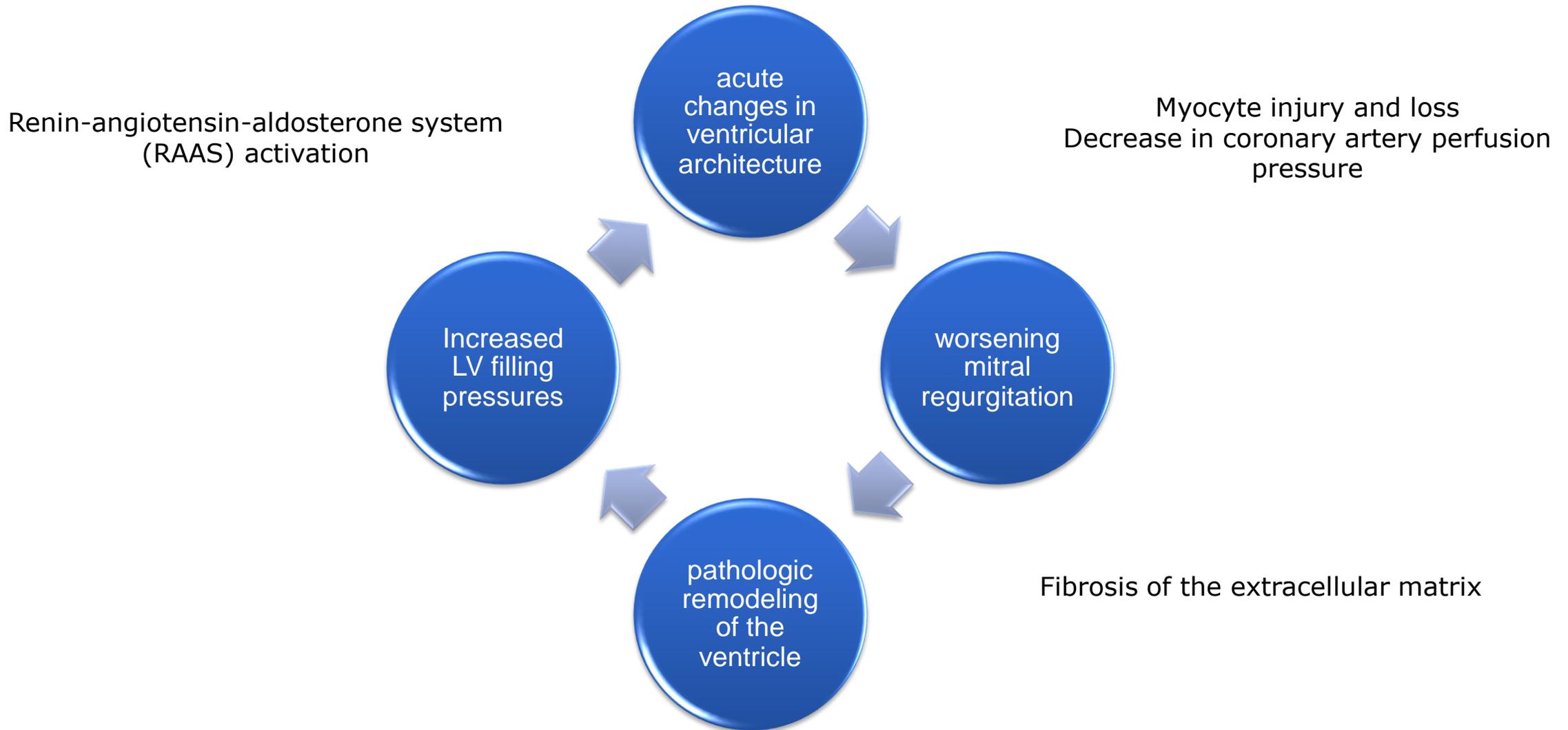
- Signs and symptoms may be less typical in advanced CHF.
- Patients adapt towards a more sedentary lifestyle and might be falsely pauci-symptomatic.



Adamson PB, and al, Curr Heart Fail Rep. 2009

- Hemodynamic congestion is always present in CHF and is poorly correlated with clinical congestion in advanced stages of HF.

# Hemodynamic congestion is enough to contribute to progression of HF



# When should one consider referral to a specialized HF center ?

Chronic HF with high-risk features.

**Remember acronym to assist in decision making for referral to advanced heart failure specialist:**

**I-NEED-HELP** (also see *Table 6*)

**I:** IV inotropes

**N:** NYHA IIIB/IV or persistently elevated natriuretic peptides

**E:** End-organ dysfunction

**E:** Ejection fraction  $\leq 35\%$

**D:** Defibrillator shocks

**H:** Hospitalizations  $>1$

**E:** Edema despite escalating diuretics

**L:** Low blood pressure, high heart rate

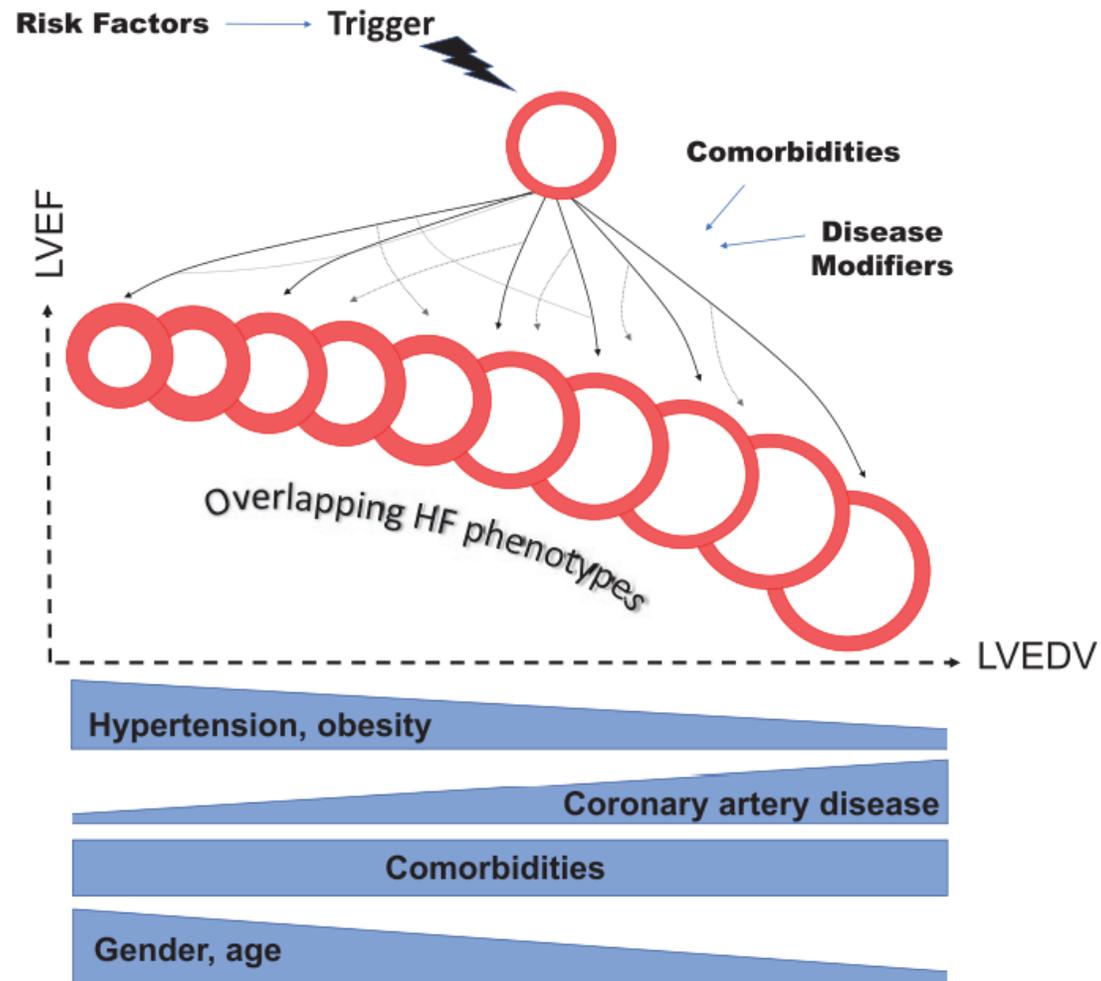
**P:** Prognostic medication – progressive intolerance or down-titration of GDMT



Going beyond EF classification

# Moving beyond EF classification : the continuous HF spectrum

## The Heart Failure Spectrum



## Consensus Statement

---

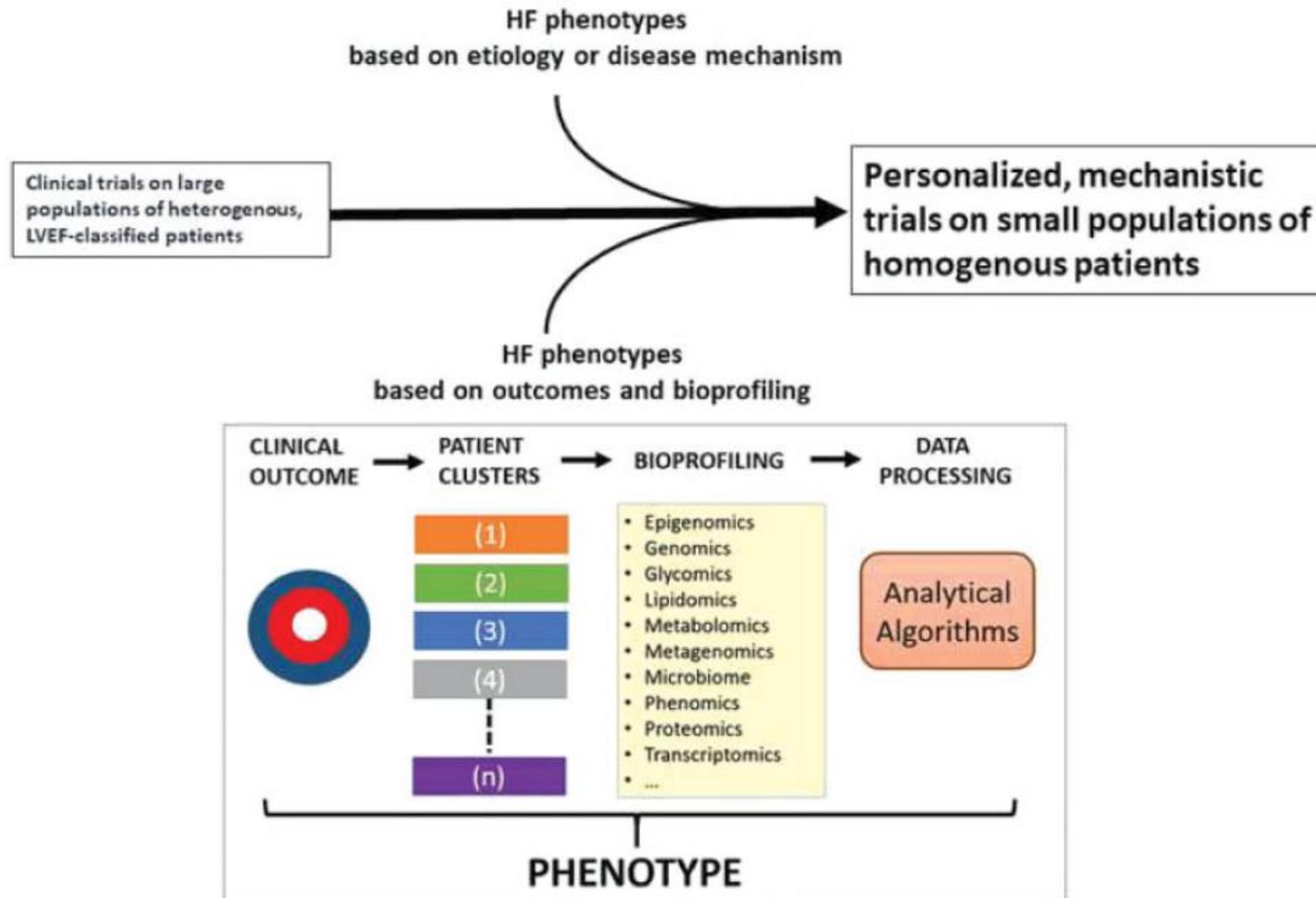
# **Universal Definition and Classification of Heart Failure**

A Report of the Heart Failure Society of America, Heart Failure Association of the European Society of Cardiology, Japanese Heart Failure Society and Writing Committee of the Universal Definition of Heart Failure

*Endorsed by Canadian Heart Failure Society, Heart Failure Association of India, the Cardiac Society of Australia and New Zealand, and the Chinese Heart Failure Association*

BIYKEM BOZKURT, MD, PhD, Chair, ANDREW JS COATS, DM, DSC, Co-Chair, HIROYUKI TSUTSUI, MD, Co-Chair, MAGDY ABDELHAMID, MD, STAMATIS ADAMOPOULOS, MD, NANCY ALBERT, PhD, CCNS, CHFNP, CCRN, NE-BC, STEFAN D. ANKER, MD, PhD, JOHN ATHERTON, MBBS, PhD, MICHAEL BÖHM, MD, JAVED BUTLER, MD, MPH, MBA, MARK H. DRAZNER, MD, MSc, G. MICHAEL FELKER, MD, MHS, GERASIMOS FILIPPATOS, MD, GREGG C. FONAROW, MD, MONA FIUZAT, PharmD, JUAN-ESTEBAN GOMEZ-MESA, MD, PAUL HEIDENREICH, MD, TERUHIKO IMAMURA, MD, PhD, JAMES JANUZZI, MD, EWA A. JANKOWSKA, MD, PhD, PRATEETI KHAZANIE, MD, MPH, KOICHIRO KINUGAWA, MD, PhD, CAROLYN S.P. LAM, MBBS, FRCP, PhD, YUYA MATSUE, MD, PhD, MARCO METRA, MD, TOMOHITO OHTANI, MD, PhD, MASSIMO FRANCESCO PIEPOLI, MD, PhD, PIOTR PONIKOWSKI, MD, PhD, GIUSEPPE M.C. ROSANO, MD, PhD, YASUSHI SAKATA, MD, PhD, PETAR SEFEROVIĆ, MD, PhD, RANDALL C. STARLING, MD, MPH, JOHN R. TEERLINK, MD, ORLY VARDENY, PharmD, MS, KAZUHIRO YAMAMOTO, MD, PhD, CLYDE YANCY, MD, MSc, JIAN ZHANG, MD, PhD, AND SHELLEY ZIEROTH, MD

# A step closer to better outcome trials and personalized medicine



# Clinical vignette: Mr A. D 1974 – From 2018 to date

## Evolution of HF

- 24h administration of levosimendan with a clear improvement of symptoms
- **No treatable causes or precipitating factors were identified**
- **Worsening HF symptoms was due to progression on the underlying myocardial dysfunction**
- Pre-transplantation work up
  - => no contra-indication was found
- 2 options were considered:
  - Transplantation in «super urgent listing»
  - LVAD in a «bridge to transplantation» strategy
- Implantation of Heartmate III on the 23.07.2018 and put on the transplant list

## Currently

- On transplant list since July 2018
- No major organ dysfunction to date
- Refractory AF => ablation of the His bundle on the 06.08.2018
- Driveline infection requiring surgical drainage and systemic antibiotics

# Take Home Messages

- HF is a **dynamic clinical syndrome** characterised by changing clinical stages and trajectories
  - First attempt at creating a universal definition that is both easy to use and clinically relevant
- This dynamic evolution is due to several factors :
  - Improvement in diagnostic strategies
  - Implementation of disease modifying prognostic medication
  - Increased awareness of the burden of comorbidities and their management
- It is of paramount importance to recognize disease severity and repeat evaluation regularly integrating :
  - Clinical functional status (symptoms, burden of hospitalisations/consultations, exercise capacity and QuOL)
  - Severity of myocardial dysfunction
  - Degree of end-organ dysfunction
- In a patient with “worsening HF”, the absence of precipitating factors or treatable causes, should prompt re-evaluation of disease severity (and stage) in order to identify refractory HF patients.
- In refractory HF patients, options include not only advanced therapy (inotropes, mechanical assist devices and heart transplantation), but also palliative care.

# Invitation

## Advanced Heart Failure

### A Swiss Webinar series



Every last Tuesday of the month (or almost), take an hour to exchange with Swiss heart failure experts. In a friendly format, you will meet experts from all over Switzerland for a dive into the state of the art of current HF-management. Come and join us!

Program 2021 18 – 19h, Zoom-Sessions in English

April 27	<b>Setting the ground – What is Heart Failure</b> PD Dr. Philippe Meyer & Dr. Nana Poku, Hôpitaux Universitaires de Genève
May 25	<b>Optimal treatment of Heart Failure</b> PD Dr. Patrick Yerly, Centre Hospitalier Universitaire Vaudois, Lausanne
June 29	<b>Post-discharge risk factors for hospital readmission</b> tbd
August 24	<b>Management Strategy of HFrEF patients with worsening HF</b> PD Dr. Mattia Arrigo, Stadtspital Waid und Triemli, Zürich und Universität Zürich
September 28	<b>Latest Guidelines in Advanced HF</b> Prof. Dr. Andreas Flammer, Universitätsspital Zürich, Zürich
October 26	<b>Cardiac Amyloidosis: underestimated cause of Adv. HF</b> tbd
November 30	<b>Regaining Quality of Life – the devices opportunities</b> tbd



The end !