

CHU BDX CENTRE HOSPITALIER UNIVERSITAIRE BORDEAUX

Insuffisance Cardiaque Avancée

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Insuffisance cardiaque : définition

3.1 Definition of heart failure

Heart failure is not a single pathological diagnosis, but a **clinical syndrome** consisting of cardinal symptoms (e.g. breathlessness, ankle swelling, and fatigue) that may be accompanied by signs (e.g. elevated jugular venous pressure, pulmonary crackles, and peripheral oedema). It is due to a **structural and/or functional abnormality of the heart** that results in **elevated intracardiac pressures and/or inadequate cardiac output at rest and/or during exercise**.

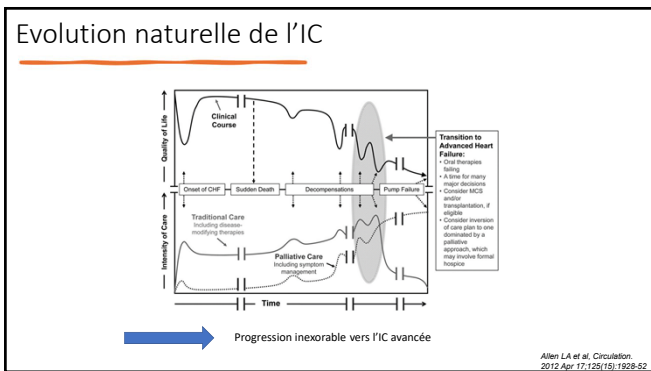
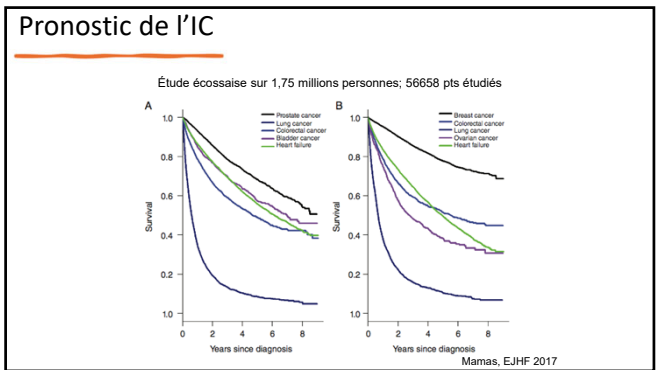
Table 3 Definition of heart failure with reduced ejection fraction, mildly reduced ejection fraction and preserved ejection fraction

Type of HF	HFwEF	HFmrEF	HFpEF
1	Symptoms ± Signs ^a	Symptoms ± Signs ^a	Symptoms ± Signs ^a
2	LVEF <40%	LVEF 41–49% ^b	LVEF >50%
3	–	–	Objective evidence of cardiac structural and/or functional abnormalities consistent with the presence of LV diastolic dysfunction/raised LV filling pressures, including raised natriuretic peptides

ESC 2021

Etiologies

Examples of presentations	Infective	Viral myocarditis
CAD Myocardial infarction Angina or "angina-equivalent"	Chagas disease HIV Lyme disease	
Hypertension Heart failure with preserved systolic function Malignant hypertension/acute pulmonary oedema	Drug-induced Antiarrhythmics Tricazone VEGF inhibitors Immune checkpoint inhibitors Proton-pump inhibitors RAF/MEK inhibitors	
Valve disease Primary valve disease e.g., aortic stenosis Secondary valve disease, e.g. functional regurgitation Congenital valve disease	Infiltrative Amyloid	
Arrhythmias Atrial tachyarrhythmias Ventricular arrhythmias	Sarcoidosis Neoplastic	
CHFs All Dilated Hypertrophic Restrictive ARVC Peripartum Takotsubo syndrome	Storage disorders Hemochromatosis Fabry disease Glycogen storage diseases	
Toxins: alcohol, cocaine, iron, copper	Endomyocardial disease Radiotherapy Endomyocardial fibrosis/eosinophilia Carcinoid	
Congenitally corrected/transposed of great arteries Shunt lesions Repaired tetralogy of Fallot Bicuspid aortic valve	Pericardial disease Calcification Inflammatory	
	Metabolic Endocrine disease Nutritional disease (thiamine, vitamin B1 and selenium deficiencies) Autoimmune disease	
	Neuromuscular disease Friedreich's ataxia Muscular dystrophy	



IC Avancée : définition

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

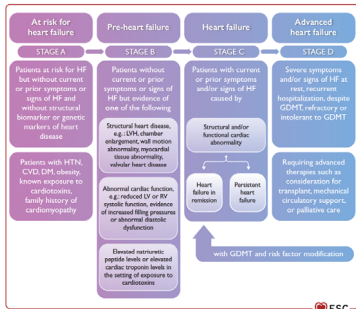
Table 13 Criteria for definition of advanced heart failure

All the following criteria must be present despite optimal medical treatment:

- Severe and persistent symptoms of heart failure (NYHA class III (advanced) or IV)
- Severe cardiac dysfunction defined by at least one of the following:
 - LVEF <30%
 - Isolated RV failure (e.g., ARVC)
 - Non-operable severe valve abnormalities
 - Non-operable severe congenital abnormalities
 - Persistently high (or increasing) BNP or NT-proBNP values and severe LV diastolic dysfunction or structural abnormalities (according to the definitions of HFES).
- Episodes of pulmonary or systemic congestion requiring high-dose i.v. diuretics (or diuretic combination) or episodes of low output requiring inotropes or vasoactive drugs or malignant arrhythmias causing >1 unplanned visit or hospitalization in the last 12 months.
- Severe impairment of exercise capacity with inability to exercise or low 6MWT distance (<300 m) or pVO₂ <12 mL/kg/min or <50% predicted value, estimated to be of cardiac origin.

The updated HFA-ESC 2018 criteria for the definition of advanced HF are reported in Table 12.¹⁸ A severely reduced LVEF is common but not required for a diagnosis of advanced HF as it may develop in patients with HFpEF as well. **In addition to the reported criteria, extra-cardiac organ dysfunction due to HF (e.g. cardiac cachexia, liver or kidney dysfunction) or type II pulmonary hypertension may be present, but are not required for the definition of advanced HF.**

Définition : différents stades



Grandes lignes de la prise en charge

Déjà mis en place et insuffisant

- Ttt médicamenteux
- Ttt électrique
- Ttt structurel
- Réadaptation

Projet de LVAD/ de transplantation

Prise en charge palliative :

- Poursuite ttt méd.
- Dialyse palliative
- Inotropes palliatifs

The flowchart outlines treatment goals for heart failure, categorized by patient population and treatment type:

- To reduce mortality - for all patients:** ACE-I/ARNI, BB, MRA, SGLT2i.
- To reduce HF hospitalization/mortality - for selected patients:**
 - Value method:**
 - Diuretics:**
 - Low dose (200-300 mg) or low dose (1000-1500 mg) of furosemide.
 - High dose (320-480 mg) of furosemide.
 - Non-diuretic diuretic:**
 - Acetazolamide, Topiramate, Furosemide, Bumetanide, Torsemide.
 - Other:**
 - Acetazolamide, Topiramate, Furosemide, Bumetanide, Torsemide.
 - For selected advanced HF patients:**
 - Heart transplantation
 - LVAD
 - Transcatheter aortic valve replacement (TAVI)
 - Structural heart disease (SHD) treatments
 - Exercise rehabilitation**
 - Multidisciplinary disease management**

IC avancée : « I NEED HELP »

Supplementary Table 14 'I Need Help' markers of advanced heart failure

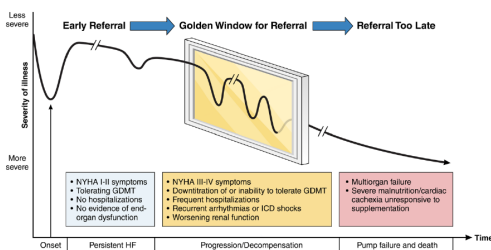
Letter	Marker	Description
I	Inotropes	Previous or ongoing requirement for dobutamine, milrinone, dopamine, or levosimendan
N	NYHA class/IV	Persisting NYHA class III or IV and/or persistently high BNP or NT-proBNP
E	End-Organ Dysfunction	Worsening renal or liver dysfunction in the setting of HF
E	Ejection Fraction	Very low EF <20%
D	Defibrillator shocks	Recurrent appropriate defibrillator shocks
H	Hospitalizations	More than 1 hospitalization with HF in the last 12 months
E	Edema/Escalating diuretics	Persisting fluid overload and/or increasing diuretic requirement
L	Low blood pressure	Consistently low blood pressure with SBP <90 to 100 mmHg
P	Prognostic medication	Inability to up-titrate (or need to decrease/cease) ACE-I, beta-blockers, ARNI, or MRA

Enjeu +++ du timing d'adressage

- Alération progressive état général :
 - Cachexie
 - Défaillances d'organes cibles (rein +++, foie)
 - Gravité de l'atteinte cardiaque : IM, HTP, VD
- Transplantation = TTT de choix de l'IC Avancée mais :
 - Bilan pré-thérapeutique parfois long
 - Durée d'attente sur liste « aléatoire »
 - Parfois nécessité de passer par le LVAD
- Moins bons résultats de la greffe et de l'assistance en contexte aigu



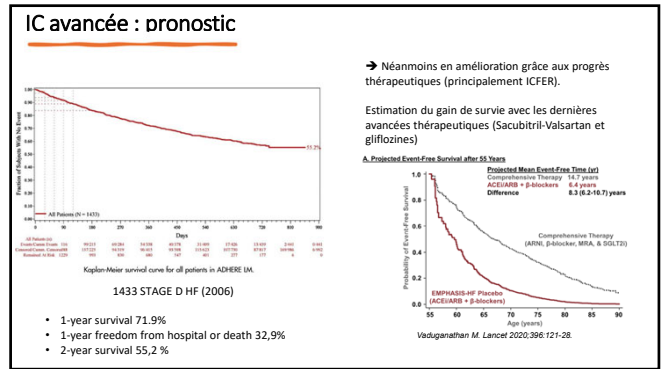
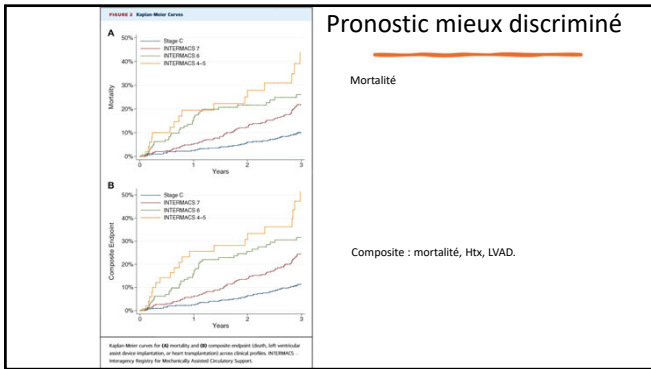
Quand adresser le patient ?



Profile	Time frame for intervention
Profile 1. Critical cardiogenic shock Patients with life-threatening hypotension despite rapidly escalating inotropic support, critical organ hypoperfusion, often confirmed by worsening lactates and/or lactate kinetics. Urgent referral	Definitive intervention needed within hours.
Profile 2. Progressive decline Patients with declining function despite inotropic support may be manifest by worsening renal function, nutritional depletion, inability to tolerate volume balance. Urgent referral Also describe declining status in patients unable to tolerate inotropic therapy.	Definitive intervention needed within few days.
Profile 3. Stable on inotropic or inotropic-dependent Patients with stable blood pressure, organ function, nutrition, and symptoms on continuous inotropic support (or a temporary circulatory support device) or both but demonstrating repeated failure to wean from support due to recurrent symptoms, hypotension or renal dysfunction. Urgent referral	Definitive intervention decline over a period of weeks to few months.
Profile 4. Frequent P/epi Patients can be stabilized close to normal volume status but experience daily symptoms of congestion at rest or during activities of daily living. Doses of diuretics generally fluctuate at very high levels. More intensive management and surveillance strategies should be considered, which may in some cases reveal poor compliance that would compromise outcomes with any therapy. Some patients may shuttle between 4 and 5.	Definitive intervention decline over a period of weeks to few months.
Profile 5. Resistant/dependent Comorbidity at rest and with activities of daily living but unable to engage in any other activity, being predominantly within the house. Patients are comfortable at rest without congestive symptoms, but may have underlying refractory elevated volume status, often with renal dysfunction. If underlying nutritional status and organ function are marginal, patients may be more at risk than INTERMACS 4, and require definitive intervention.	Variable urgency, depends upon maintenance of nutrition, organ function, and activity level.
Profile 6. Resistant limited Patients without evidence of fluid overload, comfortable at rest and with activities of daily living and minor activities outside the home but fatigued after the first few minutes of any meaningful activity. Attribution to cardiac limitation requires careful measurement of peak oxygen consumption, in some cases with hemodynamic monitoring, to confirm severity of cardiac impairment. Urgent referral	Variable. Depends upon maintenance of nutrition, organ function, and activity level.
Profile 7. Advanced NYHA class III symptoms Patients without current or recent episode of systemic hypotension, being comfortably with acceptable fluid balance and renal function.	Heart transplantation or MCS may not be curvally effective.

IC avancée : Intermacs

- ECLS, Impella
- ECLS, Impella, LVAD?, HTX?
- LVAD, HTX.
- LVAD, HTX.
- LVAD, HTX.
- HTX, LVAD?
- HTX, LVAD?



Scores pronostiques existants

Score	Components	Comments
ADHERE TM	<ul style="list-style-type: none"> Prevalence of coronary artery disease Recent heart failure Left ventricular assist device Recent heart procedure Prevalence of intracardiac conduction delay Recent stroke Recent angina Recent hospitalization for HF Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization 	Score is based on a set of nine variables multiplied by defined coefficients. Median score: 10.7 (range 0-18)
HAFT TM	<ul style="list-style-type: none"> Demographics Comorbidities Pharmacology Laboratory data Diagnosis Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization 	Interagency Registry of Mechanically Assisted Circulatory Support (InterMACS) score of 1, 2, and 3-year survival
MEQ TM	<ul style="list-style-type: none"> Age Sex Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization 	Interagency data from the CREW as well as biopsy features
MGCC TM	<ul style="list-style-type: none"> Age Sex Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization Recent HF hospitalization 	Risk model converted into major events. Generalizable to broad spectrum of patients

The 2016 International Society for Heart Transplantation listing criteria for heart transplantation. A 10-year update

5.2. Use of heart failure prognostic scores

Heart failure prognostic scores should be performed along with cardiopulmonary exercise test to determine prognosis and guide listing for transplantation for ambulatory patients. An estimated 1-year survival as calculated by the Seattle Heart Failure Score (SHFS) of < 40% or a Heart Failure Survival Score (HFSS) in the high/medium risk range should be considered as reasonable cut points for listing (Class III, Level of Evidence C).

Listing patients solely on the criteria of heart failure survival prognostic scores should not be performed (Class III, Level of Evidence C).

- Scores dérivés de cohortes mono-centriques anciennes sur pts sélectionnés
- Ne concernent pas des pts en IC avancée
- Pas BNP, rarement DFG !!!
- Fiabilité / Pertinence ???

IC avancée : évaluation fonctionnelle

- TM6' : simple, rapide, fiable pour le suivi.
 - < 300 mètres = mauvais pronostic
- VO2 : élément de sélection des patients, élément de suivi
 - Pic de VO2 < 12 mL/kg/min ou < 50% de la théorique
 - Pente VE/VO2 > 35

Table 10 Criteria for definition of advanced heart failure

1. Recent HF hospitalization (within 30 days) due to HF

2. Recent HF hospitalization (within 30 days) due to HF

3. Recent HF hospitalization (within 30 days) due to HF

4. Recent HF hospitalization (within 30 days) due to HF

5. Recent HF hospitalization (within 30 days) due to HF

6. Recent HF hospitalization (within 30 days) due to HF

7. Recent HF hospitalization (within 30 days) due to HF

8. Recent HF hospitalization (within 30 days) due to HF

9. Recent HF hospitalization (within 30 days) due to HF

10. Recent HF hospitalization (within 30 days) due to HF

Table 11 Comparison of the 2016 and 2018 Guidelines for Section 1 (General Considerations)

2016 guideline recommendation

1.1. Cardiopulmonary exercise testing to guide transplant

1.2. Cardiopulmonary exercise testing to guide transplant

2018 guideline recommendation

1.1. Cardiopulmonary exercise testing to guide transplant

1.2. Cardiopulmonary exercise testing to guide transplant

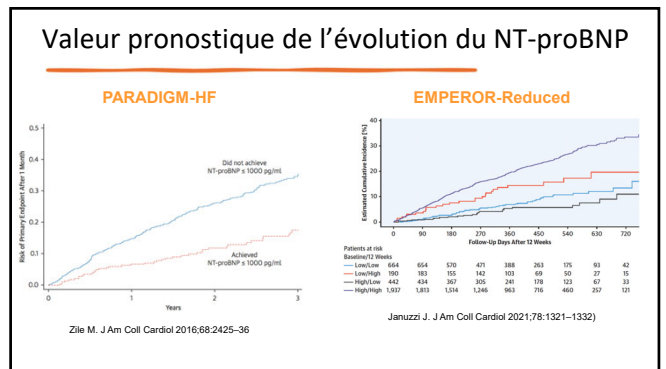
The presence of a 1HF device does not alter the current peak VO2 guideline recommendation (Class I, Level of Evidence B).

IC avancée: marqueurs biologiques

10. Advanced heart failure

Supplementary Table 13 Suggested clinical, laboratory, and echocardiographic criteria to trigger referral to a specialized heart failure or advanced heart failure unit

Clinical	Laboratory	Imaging	Risk score data
<ul style="list-style-type: none"> >1 HF hospitalization in last year NYHA class III-IV Mediators of optimal doses of any GDMT HF drug Increasing diuretic requirement SBP ≤ 90 mmHg Inability to perform CPET 6MWT < 300 m CKT non-responder clinically Cachexia, unintentional weight loss KCCQ decrease ≥5 units 	<ul style="list-style-type: none"> eGFR < 45 mL/min SCr ≥ 1.50 mg/dL K⁺ > 5.2 or < 3.5 mmol/L Hypotension Hb ≤ 120 g/L Persistently elevated high-sensitivity troponin T or NT-proBNP ≥ 1000 pg/mL Abnormal liver function test Low albumin 	<ul style="list-style-type: none"> LV EF ≤ 30% Large area of akinesia/dyskinesia or aneurysm Moderate/severe mitral regurgitation RV dysfunction Systolic PA pressure ≥ 50 mmHg Moderate/severe tricuspid regurgitation Difficult to grade aortic stenosis IVC dilated or without respiratory variation 	<ul style="list-style-type: none"> MGCC predicted survival ≤ 80% at 1 year SHFT predicted survival ≤ 80% at 1 year MECO predicted survival ≤ 80% at 1 year



IC Avancée : évaluation

- **KT droit :**
 - Intérêt diagnostique.
- Pas d'intérêt pour la sélection des patients...
- ...Mais intérêt si discussion de projet

Recommendation	Class
Recommendations for the diagnosis of HF	
Recommendation 1: Echocardiography should be considered in patients with HF thought to be due to coronary artery disease, valvular disease, congenital heart disease, and high clinical suspicion.	IIb
Recommendation 2: Right heart catheterization may be considered in selected patients with HF to confirm the diagnosis.	IIb

Recommendation	Class
Recommendation 3: Echocardiography should be considered in patients with HF being evaluated for heart transplantation or LVAD.	I
Recommendation 4: Echocardiography should be considered in patients with HF being evaluated for heart transplantation or LVAD.	C

Contraindications

- Active infection
- Severe peripheral arterial or cerebrovascular disease
- Unstable hemodynamic status
- Recent or planned surgery should be considered with subsequent re-evaluation of hemodynamic status
- Recent or planned surgery should occur to stratify such patients as to their risk of tumor recurrence
- Contraindications to sedation
- Unreversible renal dysfunction (e.g. creatinine clearance <30 mL/min)
- Systemic disease with malignant course
- Other serious comorbidity with poor prognosis
- Preoperative BP < 90/60 mmHg (unless treated to achieve a BP < 90/60 mmHg)
- Recent stroke or MI < 48 days
- Any patient for whom renal support is deemed insufficient to achieve comfort care in the outpatient setting

1.3. Role of diagnostic right-heart catheterization

Right heart catheterization (RHC) should be performed on all candidates in preparation for listing for cardiac transplantation and annually until transplantation (Class I, Level of Evidence: C).

RHC should be performed at 3- to 6-month intervals in listed patients, especially in the presence of reversible pulmonary hypertension or worsening of heart failure symptoms (Class I, Level of Evidence: C).

A vasodilator challenge should be administered when the pulmonary artery systolic pressure is ≥ 50 mm Hg and either the transpulmonary gradient is ≥ 25 or the pulmonary vascular resistance (PVR) is > 3 Wood units while maintaining a systolic arterial blood pressure > 85 mm Hg (Class I, Level of Evidence: C).

When an acute vasodilator challenge is successful, hospitalization with continuous hemodynamic monitoring should be performed, as often the PVR will decline after 24 to 48 hours of treatment consisting of diuretics, inotropic and vasopressor agents such as inhaled nitric oxide (Class I, Level of Evidence: C).

If medical therapy fails to achieve acceptable hemodynamics, and if the left ventricle cannot be effectively unloaded with mechanical support, including an intra-aortic balloon pump (IABP) and/or left ventricular assist device (LVAD), it is reasonable to consider that the pulmonary hypertension is irreversible. After LVAD, re-evaluation of hemodynamics should be done after 3 to 6 months to assess reversibility of pulmonary hypertension (Class IIA, Level of Evidence: C).

If medical therapy fails to achieve acceptable hemodynamics, and if the left ventricle cannot be effectively unloaded with mechanical support, including an intra-aortic balloon pump (IABP) and/or left ventricular assist device (LVAD), it is reasonable to consider that the pulmonary hypertension is irreversible. After LVAD, re-evaluation of hemodynamics should be done after 3 to 6 months to assess reversibility of pulmonary hypertension (Class IIA, Level of Evidence: C).

Continuing approval without change.

HTP

- PAs > 50 mmHg, RVP > 3 U (ou gradient TP élevé) : faire test de réversibilité (TNT immédiate, si PAS « correcte », ou inotropes sur 24-48h).
- Si échec et HTP post-capillaire pure, discuter LVAD avant la transplantation pour normalisation des pressions pulmonaires.

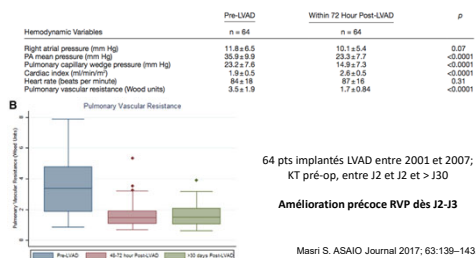
The 2016 International Society for Heart Lung Transplantation Listing criteria for heart transplantation: A 10-year update

Cas clinique KT droit

- Homme de 64 ans, CMI diagnostiquée en 2017.
 - Projet discuté en 2018 : Htx.
 - Passage en FA, dégradation HD malgré ablation et maintien RS.
 - LVAD en bridge to transplantation fin 2018, Htx en 2021.

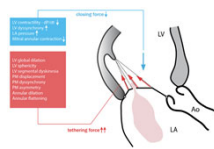
	07/2018	11/2018	11/2018	03/2019
AP	61/34/45	66/30/42	66/28/43	35/10/21
Pcap	37	30	30	10
OD	6	10	6	4
IC	2,5	1,8	2,3	2,8
RVP	1,8	3,8	3,2	2
Test		Levo/furo	TNT 3mg	
Post test			66/23/37, Cap 26, IC 2.1, RVP 3	

Amélioration HTP par LVAD



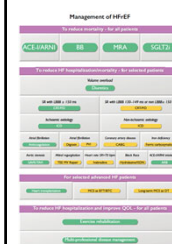
Tournants évolutifs dans l'IC

- Apparition d'arythmies (FA, TV/FV)
- Insuffisance mitrale secondaire
 - Dilatation VG, asynchronisme papillaire et tenting sous valvulaire
 - Élévation POG
- Apparition d'un syndrome cardio-rénal
 - Congestion veineuse +++
 - Bas débit, vasoconstriction artériolaire et activation SRAA
- Altération cardio-hépatique
 - Hépatopathie congestive (cholestase), ischémie hépatique (cytolysse), jusqu'à cirrhose cardiaque
- Hypertension pulmonaire post-capillaire
 - Isolée puis mixte pré et post capillaire (RVP > 3)
- Défaillance VD
 - Élévation PAP et RVP, élévation PVC, altération contractile et IT



Bertrand P. Circ. 2017;135:297-314

IC avancée : que peut-on (encore) faire ?



- TTT médicamenteux ? compliqué car svt TA basse et insuffisance rénale, souvent nécessité de \sim TTT.
- Réadaptation pré-chirurgicale ?
- CRT ? Peu utile en cas de dysfonction VD, d'ATCD d'utilisation d'inotropes ou classe NYHA 4
- **LVAD et/ou transplantation ? Place clairement établie**
- Mitraclip ou nouvelles techniques percutanées de PEC de valvulopathies 2nd ? Place encore à déterminer
- Ultrafiltration ou dialyse péritonéale palliative ?
- **Prise en charge multidisciplinaire palliative ?**

Options chirurgicales

• LVAD

Bridge to decision (BTD)
 Use of short-term PFC (BTD) in patients with end-stage heart failure and hemodynamic and end-organ perfusion are reduced, candidates for long-term PFC are excluded (short-term use after re-evaluation) and address therapeutic options including long-term LVAD therapy or heart transplantation (transplant).
Bridge to candidacy (BTC)
 Use of PFC (LVAD) to improve end-organ function and/or to make an eligible patient eligible for heart transplantation.
Bridge to transplantation (BTX)
 Use of PFC (LVAD, BTD or TAVI) to keep a patient alive who is otherwise at high risk of death before transplantation with a shorter stay in hospital.
Bridge to recovery (BTR)
 Use of PFC (short-term or long-term) to keep a patient alive and cardiac function recovers sufficiently to remove PFC.
Destination therapy (DT)
 Long-term use of PFC (LVAD) as an alternative to transplantation in patients with end-stage HF awaiting for transplantation.

Table 17 Heart transplantation indications and contraindications

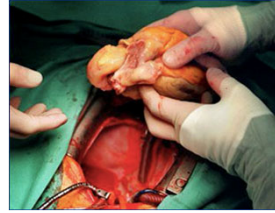
Indications	Class ^a	Level ^b
Advanced HF ^c	I	C
No other therapeutic option except for LVAD or HT ^d	I	C
Contraindications		
Active infection	III	A
Active cancer	III	A
Severe psychiatric disorder or comorbid disease	III	A
Pharmacologic or non-pharmacologic pulmonary hypertension (LVAD should be considered in severe disease/pulmonary vascular resistance treated with other agents or evaluated to establish candidacy)	III	A
Profoundly left ventricular dysfunction in combination with echocardiographic evidence of severe aortic regurgitation (should occur in early stage patient as long as their risk of adverse progression is managed with medical and/or surgical treatment)	III	A
Intolerance for anesthesia (airborne or inhaled) or possible renal dysfunction (eg, creatinine clearance < 30 mL/min/1.73 m ²)	III	A
Concurrent heart failure or heart failure requiring to be considered	III	A
Severe disease with multiple involvement	III	A
Other serious comorbidity with poor prognosis	III	A
Preoperative BUN > 15 mg/dL (single has recommended to achieve a BUN < 10 mg/dL)	III	A
Current alcohol or drug abuse	III	A
Psychological instability that impedes proper follow-up and outcome measurement requires after heart transplantation	III	A
Infectious risk requires to be considered in the recipient (family)	III	A

CI :
 - infectieuses
 - vasculaires
 - oncologiques
 - hémodynamiques
 - organiques (rein, foie,...)
 - obésité (IMC 35)
 - addictologie
 - situation psy, sociale, observance...
 - AGE.

Recommendations for the treatment of patients with advanced heart failure

Recommendation	Class ^a	Level ^b
Device being considered for long-term PFC must have good compliance, appropriate output for desired loading and functional support. ^{1,2,3,4}	I	C
Heart transplantation is recommended for patients with advanced HF, refractory to medical, catheteric therapy and who do not have absolute contraindications.	I	C
Long-term PFC should be considered in patients with advanced HF refractory to optimal medical and device therapy as a bridge to either transplantation or end-of-life therapy, or in patients with advanced HF refractory to optimal medical and device therapy as a bridge to either transplantation or end-of-life therapy, or in patients with advanced HF refractory to optimal medical and device therapy as a bridge to either transplantation or end-of-life therapy.	IIa	C
Concurrent mitral regurgitation and/or aortic regurgitation may be considered in patients with left ventricular dysfunction and evidence of poor hyperplasia as a bridge to PFC or heart transplantation. ^{1,2,3,4}	IIb	C
Utilization may be considered in refractory disease overall compared to device treatment. ^{1,2,3,4}	III	C

Transplantation



- Âge ≤ 65 ans
- Recul > 30 ans
- ≈ 450 /an en France
- Pénurie greffon (1 greffon pour 2 candidats)
- Médiane survie 12 ans (14 si survivant à 1 an)
- Accès au greffon selon score cœur
- Contraintes immunologiques et risque du traitement IS



Transplantation

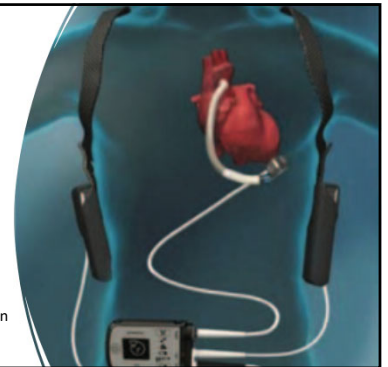
• Nécessité d'éliminer une contre-indication éventuelle

- Infection (CTAP, biologie)
- Cancer (scanner, endoscopies digestives, biologie)
- AOMI (doppler)
- HTP (cathétérisme)
- + autres atteintes d'organe (discussion parfois de greffes-combinées)

➡ **Donc parfois long !**

⇒ Bilan parfois plus restreint quand patient instable et aigu (bio, scanner)

LVAD

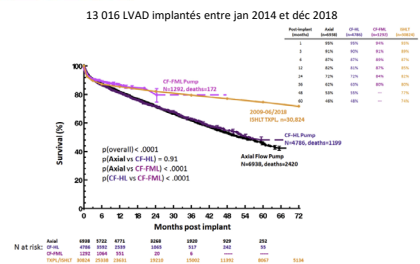


- < 75 ans, BTT/BTD/DT
- Pompe centrifuge à flux continu
- amélioration des résultats avec le temps par amélioration dispositifs (réduction +++ du taux d'AVC, de saignements digestifs et de thromboses pompes)
- Complications spécifiques : infection driveline, IAO, défaillance VD...

Transplantation ou LVAD ?

- Avantages différents :
 - HTx : pas driveline, meilleure qualité de vie, possible si RVAo méca
 - LVAD : post-op moins lourd
- Complications spécifiques de chacune des stratégies :
 - HTx : rejet, cancers, infections, détérioration rénale, coronaropathie, diabète, protocole de suivi strict (biopsies)...
 - LVAD : thrombose de pompe, obstruction canule, défaillance VD précoce et tardive, IAO, infection driveline, hémorragies GI, TDR...
- Pronostic moyen/long terme différent :
 - Résultats précoces assez similaires (= 80% survie à 1 an)
 - LVAD : effet lune de miel 1 à 2 ans avec puis ↗ complications

Survie greffe et LVAD



Transplantation cardiaque

• 2 candidats pour 1 greffon

Tableau C2. Evolution des principaux indicateurs de pénurie en greffe cardiaque

Tableau C2. Evolution des principaux indicateurs de pénurie en greffe cardiaque

	2015	2016	2017	2018	2019	2020
Nouveaux inscrits pour un greffon	1,3	1,2	1,2	1,4	1,4	1,3
Receveurs en attente au 1er janvier pour un greffon*	0,5	0,6	0,5	0,4	0,6	0,7

Tableau C6. Evolution sur les trois premières années du devenir des malades inscrits pour la première fois en liste d'attente cardiaque en 2017 (N=534)

Tableau C6. Evolution sur les trois premières années du devenir des malades inscrits pour la première fois en liste d'attente cardiaque en 2017 (N= 534)

Statut sur liste d'attente (%)	à 3 mois	à 6 mois	à 12 mois	à 18 mois	à 24 mois	à 30 mois	à 36 mois
En liste inactive depuis l'inscription	1,5	0,9	0,9	0,4	0,4	0,4	0,4
En liste inactive	8,2	3,1	3,8	2,6	2,1	2,2	1,1
En liste active	23,8	20,2	13,3	8,8	6,2	5,3	3,4
Greffe	56,2	64,4	70,2	7,4	7,6	76,8	77,7
Décédé en attente	5,6	6,4	7,7	8,8	8,8	8,8	9,2
Sorti de la liste d'attente pour aggravation	1,5	1,3	2,1	2,2	2,4	2,4	2,8
Sorti de la liste d'attente sans aggravation	0,9	1,3	1,9	3	3,9	3,9	4,1
En liste inactive depuis l'inscription et décédé au sorti pour aggravation	0,2	0,2	0,2	0,2	0,2	0,2	0,2

Certaines contre-indications sont communes

- Patient non compliant
- **Instabilité psychologique**, démence ou trouble cognitif ou neurologique significatif
- Infection bactérienne ou fongique active
- **Artériopathie périphérique sévère** ou maladie cérébro-vasculaire invalidante
- **Atteinte sévère d'organe** (foie, rein, hors projet double greffe) ou maladie multi-systémique évoluée
- **Addiction non sevrée : alcool, tabac, drogue**
- Cancer non curable avec espérance de vie < 1 an (LVAD)
- Diabète multi-complicqué avec atteinte irréversible d'organes

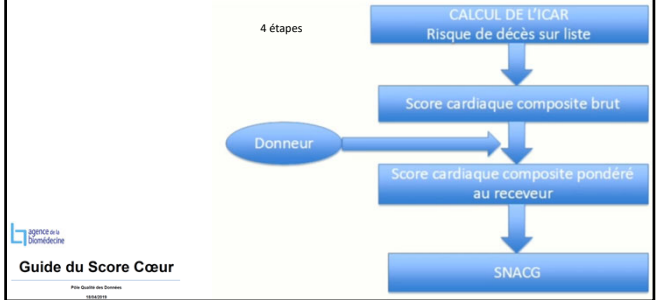
D'autres sont spécifiques

- Transplantation :
 - Cancer en cours ou avec rémission récente
 - Hypertension pulmonaire considérée irréversible
 - Diabète non contrôlé
 - Obésité (IMC > 35 kg/m²)
- LVAD :
 - Valve aortique mécanique ou IAO non traitée
 - Rétrécissement mitral non traité
 - Défaillance droite (VD très altéré, IT)
- Calcification extensive de l'apex VG
- Certaines formes de CMH/CMR/cardiopathies congénitales

Pour Tx :
CI souvent temporaires,
parfois associées, et à
réévaluer régulièrement



Score cœur = Score National d'Attribution des Greffons Cardiaques (SNAGC).



Score cœur : ICAR

Calcul de l'Index de Risque Cardiaque : ICAR

Evaluation du risque de décès sur liste d'attente.

- Assistance de courte durée.
- BNP ou Nt-proBNP.
- DFG par MDRD.
- Bilirubine totale.



Sous inotropes ou assistance : valeurs AVANT implantation ou mise sous inotropes.

MISES A JOUR:

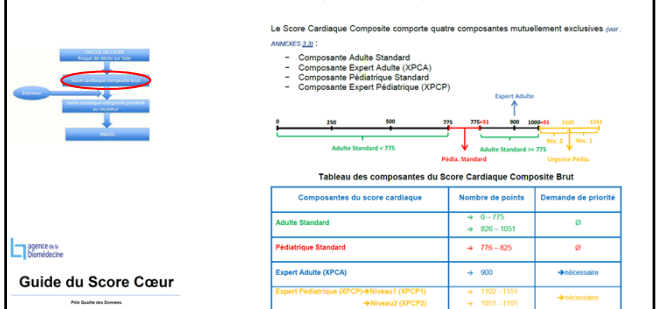
- Tous les 3 jours sous ECLS ou inotropes.
- Tous les 3 mois sinon.



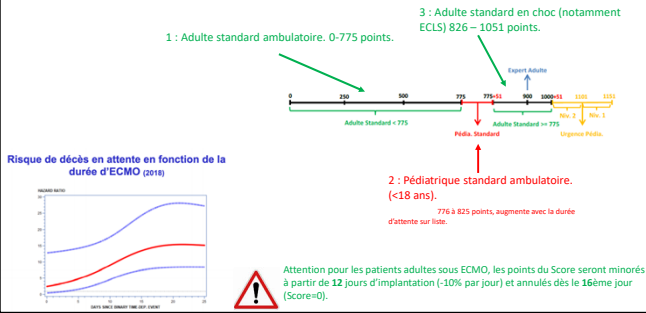
Guide du Score Cœur

Agence Nationale de Santé
MARS 2020

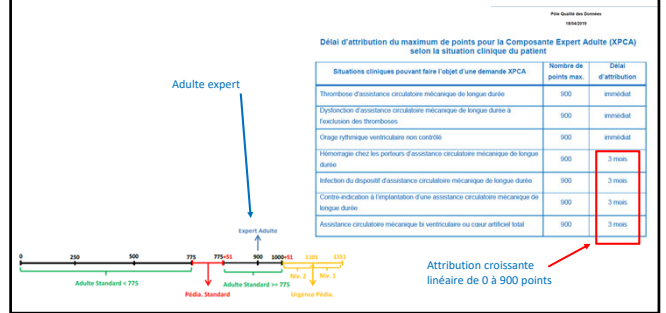
Score cœur: Score Cardiaque Composite Brut



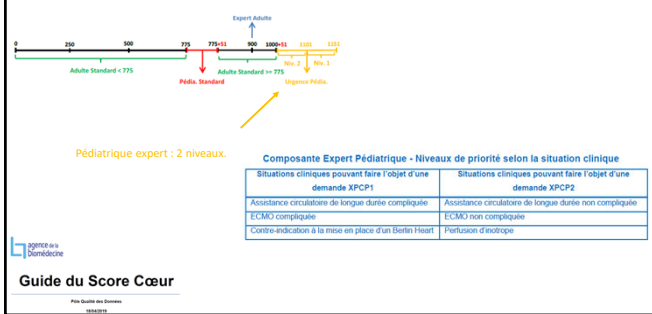
Score CCB : composantes standard



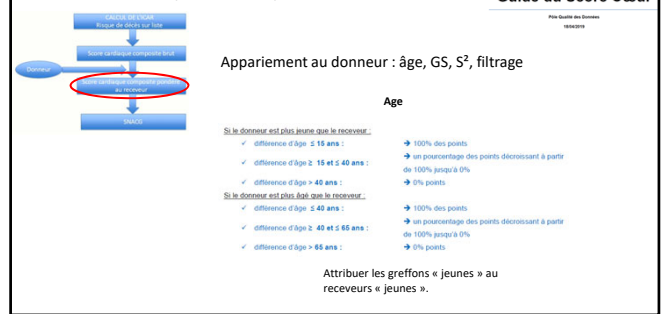
Score CCB : composantes expert



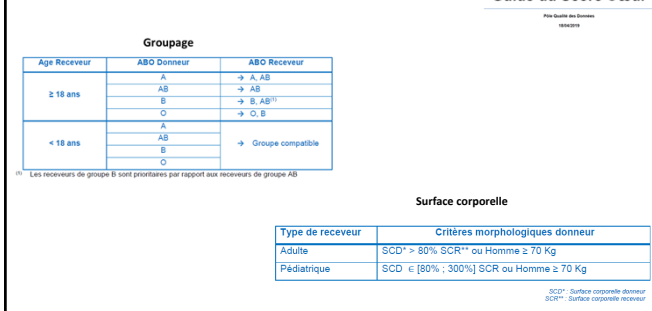
Score CCB : composantes expert



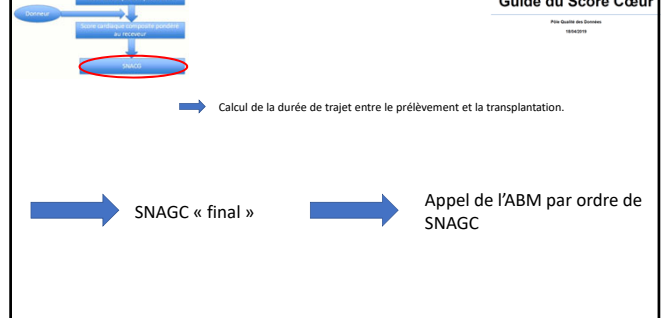
Score Cardiaque Composite Pondéré

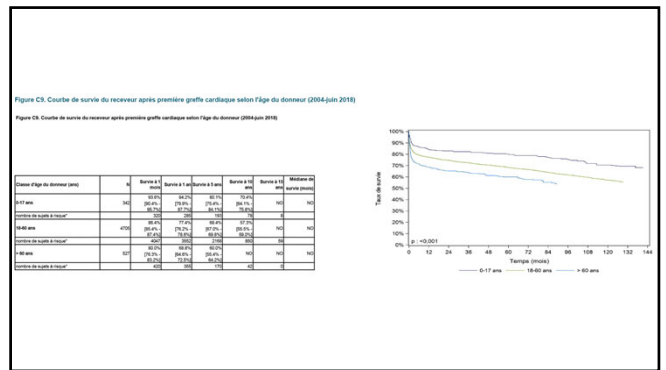
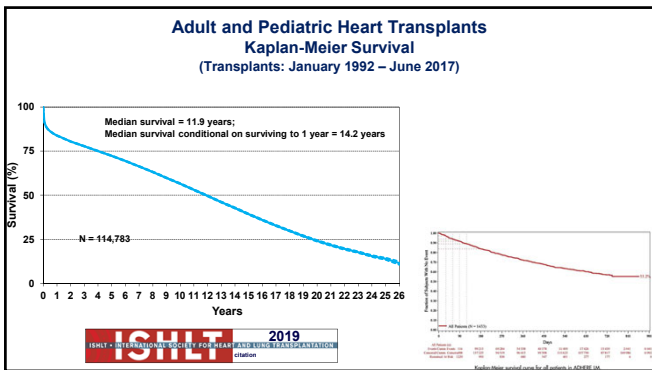
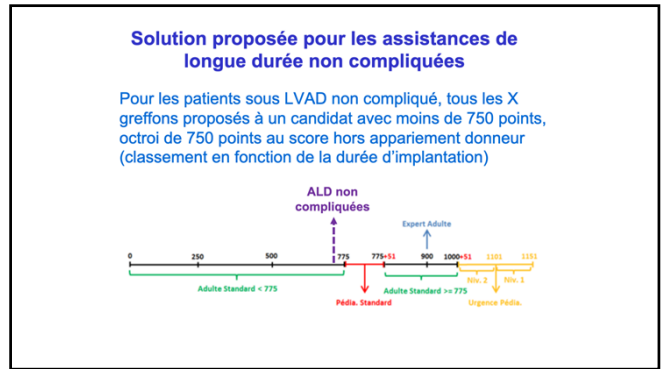
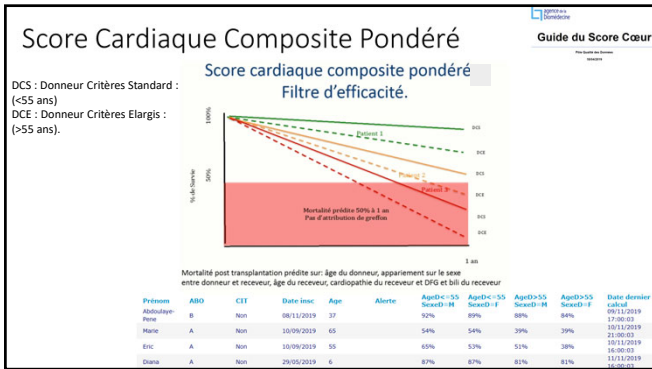


Score Cardiaque Composite Pondéré



Calcul du SNAGC

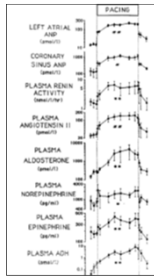




- ### Conclusion
- ICA = pronostic sombre.
 - Options thérapeutiques limitées, lourdes et projets complexes.
 - Problématique de la pénurie de greffons, de la sélection des patients
 - Caractère perfectible du score cœur (CM restrictives, LVAD non compliqués...)
 - Savoir parfois accompagner les patients dans un projet palliatif



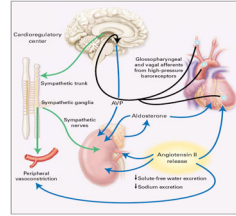
IC = maladie neuro-hormonale



Exemple d'IC expérimentale

Maladie neuro-hormonale

Pathophysiologie de l'IC: rôle des adaptations neurohormonales barorécepteurs-dépendantes



AP⁺-arginine vasoconstrictor; PRA=plasma renin activity
Schrier, Abraham. N Engl J Med 1999;341:577-85
Breitbart et al. Am J Med Sci 2003;326:15-24
Schneider. Am J Hypertens 2005;18:720-30

- Tôt dans l'IC, le SRAA est activé en tant que mécanisme compensateur
- La sévérité croissante de la maladie est associée à une augmentation de l'activité du SRAA
 - ↑ PRA, ↑ aldostérone, ↑ Ang II
- L'activation prolongée du SRAA a des effets délétères:
 - Vasoconstriction
 - ↑ pression sanguine
 - ↑ tonus sympathique
 - ↑ aldostérone
 - ↑ sodium
 - Fibrose
 - Hypertrophie myocardique

Beta-bloquants dans l'IC

Therapeutic modality	Mechanism(s) of action in HF	Effect on ANS function	Effects on HF phenotype	Clinical outcomes/indications in HF	Other Notes
Beta-blockers	Cardiac JAR antagonism; ANS neuronal JAR antagonism; Cardiac & adrenal GARC2/PNS outflow activity	↓ Outflow activity	Reversed adverse remodeling; ↑ early diastolic function; ↑ cardiac blood flow; protective against CA toxicity; ↑ cardiac oxygen, metabolic & energy demand/supply ratio	↓ all-cause & cardiac mortality; ↓ cardiovascular mortality; neuro-recovery HF, especially after MI	Contraindicated in acute HF. Certain polymorphisms in cardiac JAR & GARC2 genes affect response; beta-block agents not equal: carvedilol-metoprolol appear superior to HF

	Starting dose	Target dose
Beta-blockers		
Bisoprolol	1.25 mg o.d.	10 mg o.d.
Carvedilol	3.125 mg b.i.d.	25 mg b.i.d. ^a
Metoprolol succinate (CR/XL)	12.5–25 mg o.d.	200 mg o.d.
Nebivolol ^d	1.25 mg o.d.	10 mg o.d.

A beta-blocker is recommended for patients with HF to reduce the risk of HF hospitalization and death.^{114,115}

ESC 2012 August 30, 13700. doi:10.1093/eurheartj/ehs113.13700
The Adrenergic Nervous System in Heart Failure Pathophysiology and Therapy

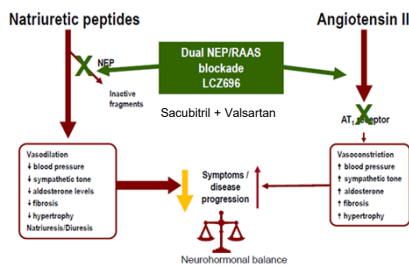
Bloqueurs du SRAA dans l'IC

	Starting dose	Target dose
ACE-I		
Captopril ^a	6.25 mg t.i.d.	50 mg t.i.d.
Enalapril	2.5 mg b.i.d.	10–20 mg b.i.d.
Lisinopril ^b	2.5–5 mg o.d.	20–35 mg o.d.
Ramipril	2.5 mg b.i.d.	5 mg b.i.d.
Trandolapril ^c	0.5 mg o.d.	4 mg o.d.
MRA		
Eplerenone	25 mg o.d.	50 mg o.d.
Spirolactone	25 mg o.d. ^f	50 mg o.d.

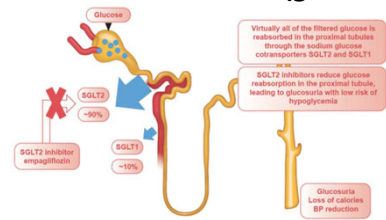
An ACE-I is recommended for patients with HF to reduce the risk of HF hospitalization and death.^{116,117}

An MRA is recommended for patients with HF to reduce the risk of HF hospitalization and death.^{118,119}

ARNi – sacubitril/valsartan



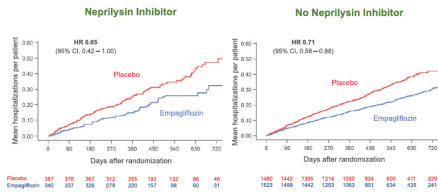
Inhibiteurs du SGLT-2 (gliflozines)



- Inhibit^r réabsorpt^r 30-50% du Gc filtré (-80 à 100g/j soit 300-400kcal/j)
- -0.6 à -0.9% HbA1C indpdm^t fct^r β sans hypoGc (perte d'action qd Gc filtré baisse)
- Perte 2 à 3kg
- Natriurèse et diurèse osmotique
- Baisse TAS - 4mmHg sans / FC

Butler, J. Eur. J. Heart Fail. 2017;19(11):1390-1400

Efficacité synergique avec ARNi



EMPEROR-Reduced

Packer M. Eur Heart J. 2021

Gliflozines et IC

- Bascule progressive du diabète vers IC et néphroprotection
- Véritable révolution en cours dans toutes les formes d'IC (et d'insuff. rénale)
- Utilité **qu'il y ait ou non diabète**
- Efficacité indépendante du DFG
- Effet synergique avec autres TTT de l'IC (ou de l'IRn)
- Mécanismes d'action encore incertains

IC avancée : traitements

- 1) les 4 classes
- + le fer
- 2) le ttt électrique
- 3) le structurel
- 4) la ré-adaptation

- Définition : guidelines ESC :
 - déf IC/Déf ICA
 - Déf étiologies/types de cardiopathies (avec diapos d'épidémiologie si possible).
- Epidémiologie.
- Pronostic de l'ICA.
- Sélection des patients:
 - I Need Help : algorithme pour adresser en centre tertiaire.
 - Sélection des patients pour le projet de transplantation, de LVAD:
 - Aigu : intermacs?
 - Chronique : critères ISHLT, guidelines ESC.
 - Un petit mot sur la VO2? Le KT droit?
- Traitements :
 - Algorithme des recos.
 - Puis détailler un peu chaque classe de ttt.
- Problématique du score cœur.