

# Assistance Ventriculaire Gauche Définitive

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# Insuffisance Cardiaque et AVG définitive

## Insuffisance Cardiaque

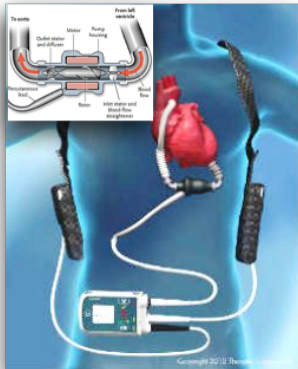
Pathologie fréquente  
Mortalité élevée  
Capacités fonctionnelles ↓  
Qualité de vie ↓

## AVG

Progrès constants  
Amélioration survie  
Capacités fonctionnelles ↑  
Qualité de vie ↑

### IC et AVG en France:

Taux d'implantation 6 x inférieur qu'aux USA  
AVG définitive implantée en urgence

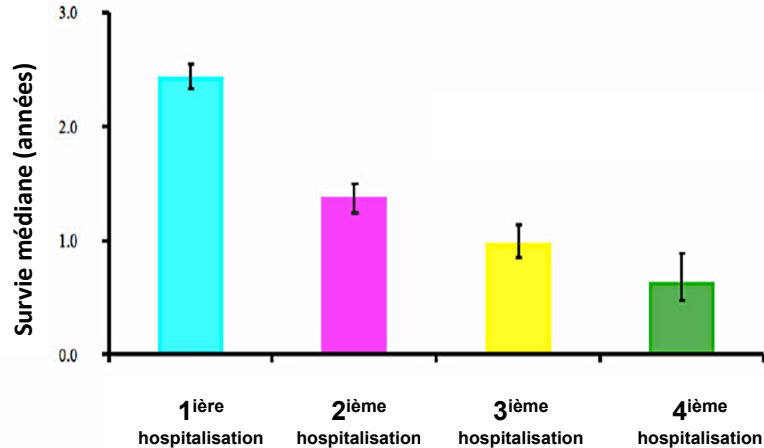


# Insuffisance Cardiaque

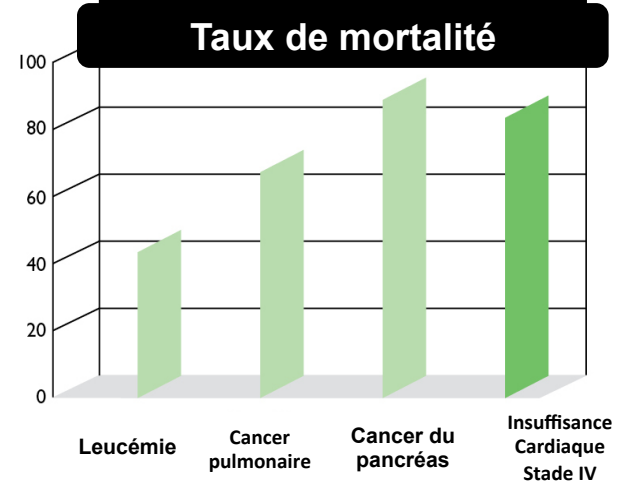
## Mortalité

La survie médiane diminue après chaque hospitalisation pour insuffisance cardiaque

Patients en Classe IV NYHA sous traitement médical optimal = Taux de mortalité similaire aux cancers les plus péjoratifs



Miller L. J Am Coll Cardiol 2013



Pleasanton, Calif: Thoratec Corp.

# Insuffisance Cardiaque

## Clinique

### Enquête fonctionnelle:

- **Plus de la moitié des patients en IC se sont déclarés en « mauvaise » ou « très mauvaise santé » (versus 9% pour les patients sans IC).**
- **50% des patients s'estiment fortement limités « dans les activités de la vie quotidienne » (versus 10% pour les patients sans IC)**

# Etude REMATCH

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Journal of Medicine

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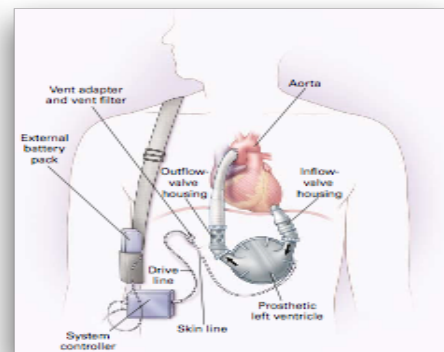
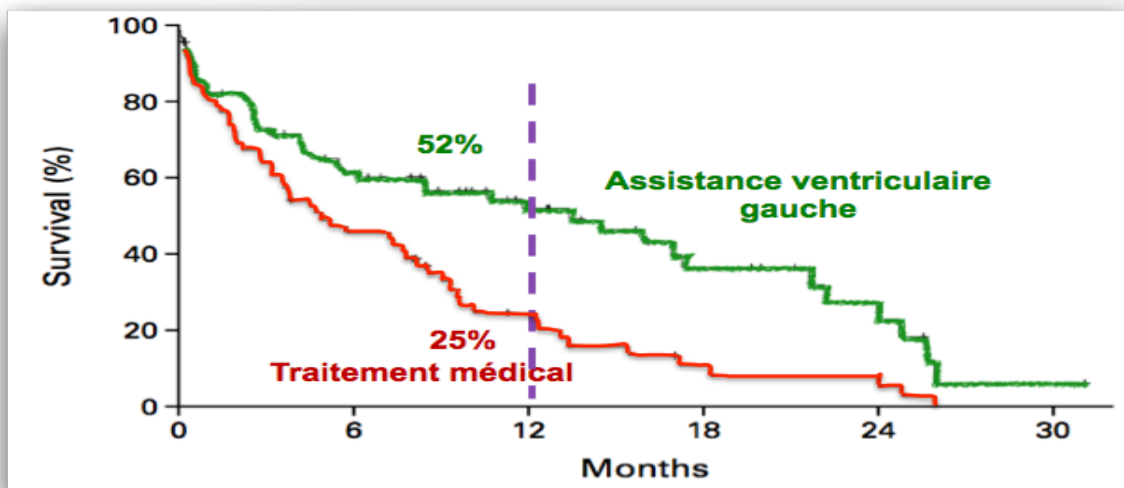


LONG-TERM USE OF A LEFT VENTRICULAR ASSIST DEVICE  
FOR END-STAGE HEART FAILURE

ERIC A. ROSE, M.D., ANNETTE C. GELING, Ph.D., ALAN J. MOSKOWITZ, M.D., DANIEL F. HEITJAN, Ph.D.,  
LYNNE W. STEVENSON, M.D., WALTER DEMBITSKY, M.D., JAMES W. LONG, M.D., Ph.D., DEBORAH D. ASCHIM, M.D.,  
ANITA R. TERNEY, M.P.H., RONALD G. LEVITAN, M.Sc., JOHN T. WATSON, Ph.D., AND PAUL MEDR, Ph.D.,  
FOR THE RANDOMIZED EVALUATION OF MECHANICAL ASSISTANCE FOR THE TREATMENT OF CONGESTIVE HEART FAILURE  
(REMATCH) STUDY GROUP\*

- Etude prospective randomisée
- Patients Classe IV NYHA sous traitement médical optimal
- 2 groupes: AVG définitive (68 pts) / traitement médical optimal (61 pts)
- AVG 1ère génération (Heartmate I)

**Amélioration de la survie sous AVG à  
1 an et 2 ans**



Indications

# Etude REMATCH

**TABLE 3. QUALITY OF LIFE AND FUNCTIONAL STATUS OF PATIENTS AT ONE YEAR.\***

SCALE†	ONE YEAR		P VALUE
	NO. ASSESSED/ TOTAL NO. (%)	SCORE	
SF-36			
Physical function			0.01
LVAD group	23/24 (96)	46±19	
Medical-therapy group	6/11 (55)	21±21	
Emotional role			0.03
LVAD group	23/24 (96)	64±45	
Medical-therapy group	6/11 (55)	17±28	
Minnesota Living with Heart Failure			0.11
LVAD group	23/24 (96)	41±22	
Medical-therapy group	6/11 (55)	58±21	
Beck Depression Inventory			0.04
LVAD group	22/24 (92)	8±7	
Medical-therapy group	5/11 (45)	18±7	
Median NYHA class			<0.001
LVAD group	24/24 (100)	II	
Medical-therapy group	7/11 (64)	IV	

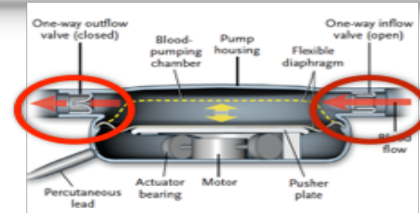
**Amélioration de la qualité de vie et du statut fonctionnel à 1 an sous AVG**

**TABLE 5. INCIDENCE OF SERIOUS ADVERSE EVENTS.\***

EVENT	MEDICAL-THERAPY GROUP (N=60)	LVAD GROUP (N=67)	RATE RATIO (95% CI)
	rate/patient-yr		
All	2.75	6.45	2.35 (1.86–2.95)
Nonneurologic bleeding	0.06	0.56	9.47 (2.30–38.90)
Neurologic dysfunction†	0.09	0.39	4.35 (1.31–14.50)
Supraventricular arrhythmia	0.03	0.12	3.92 (0.47–32.40)
Peripheral embolic event	0.06	0.14	2.29 (0.48–10.80)
Sepsis	0.30	0.60	2.03 (0.99–4.13)
Local infection	0.24	0.39	1.63 (0.72–3.70)
Renal failure	0.18	0.25	1.42 (0.54–3.71)
Miscellaneous adverse events	0.98	1.37	1.41 (0.93–2.12)
Syncope	0.03	0.04	1.31 (0.12–14.40)
Serious psychiatric disease	0.03	0.04	1.31 (0.12–14.30)
Cardiac arrest	0.18	0.12	0.65 (0.21–2.00)
Nonperioperative myocardial infarction	0.03	0.02	0.65 (0.04–10.30)
Ventricular arrhythmia	0.56	0.25	0.45 (0.22–0.90)
Hepatic failure	0.00	0.02	—
Event related to the LVAD			
Suspected malfunction of LVAD	—	0.75	—
Perioperative bleeding	—	0.46	—
Infection of drive-line tract or pocket	—	0.41	—
Infection of pump interior, inflow tract, or outflow tract	—	0.23	—
Right heart failure	—	0.17	—
Failure of LVAD system	—	0.08	—
Thrombosis in LVAD	—	0.06	—
Perioperative myocardial infarction	—	0.00	—

**Sous AVG la fréquence des EIG était augmentée de 2,35 fois par rapport au groupe traitement médical**

- défaillance de l'AVG
- thromboembolique
- infection locale



# Etude Heartmate

ORIGINAL ARTICLE

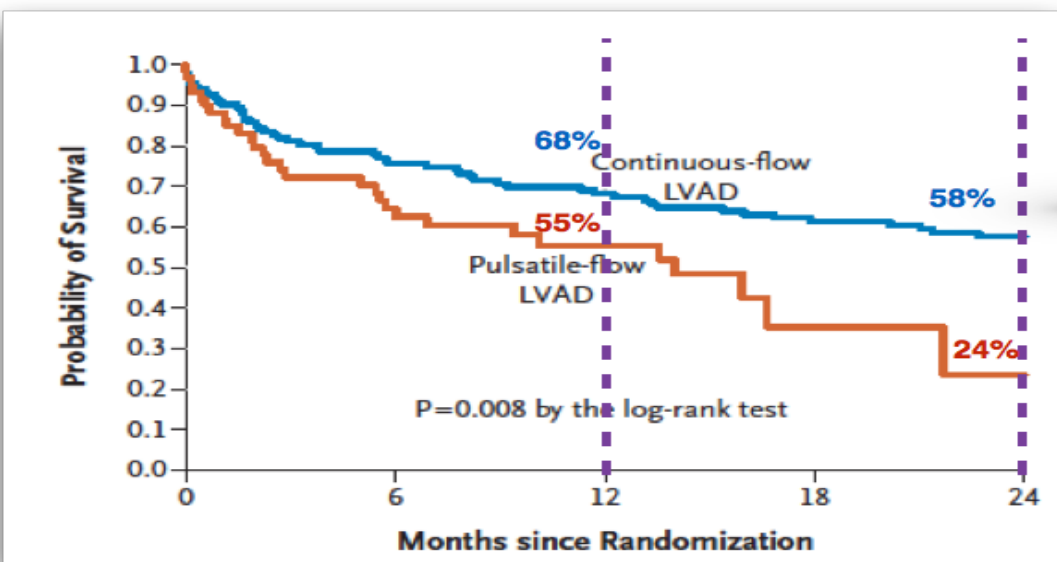
## Advanced Heart Failure Treated with Continuous-Flow Left Ventricular Assist Device

Mark S. Slaughter, M.D., Joseph G. Rogers, M.D., Carmelo A. Milano, M.D., Stuart D. Russell, M.D., John V. Conte, M.D., David Feldman, M.D., Ph.D., Benjamin Sun, M.D., Antone J. Tatroles, M.D., Reynolds M. Delgado, III, M.D., James W. Long, M.D., Ph.D., Thomas C. Wozniak, M.D., Waqas Ghumman, M.D., David J. Farrar, Ph.D., and O. Howard Frazier, M.D., for the HeartMate II Investigators\*

N Engl J Med 2009;361:2241-51.

- Etude prospective randomisée
- Indication **AVG définitive**
- **NYHA Classe III ou IV**
- **80% sous support inotropique**
- **2 groupes: AVG flux pulsatile (Heartmate I - 66 pts) / AVG flux continu (Heartmate II - 134 pts)**

Indications



**Amélioration de la survie sous AVG à flux continu à 1 an et 2 ans**



# Etude Heartmate

## Réduction de l'ensemble des EIG sous AVG à flux continu

Indications

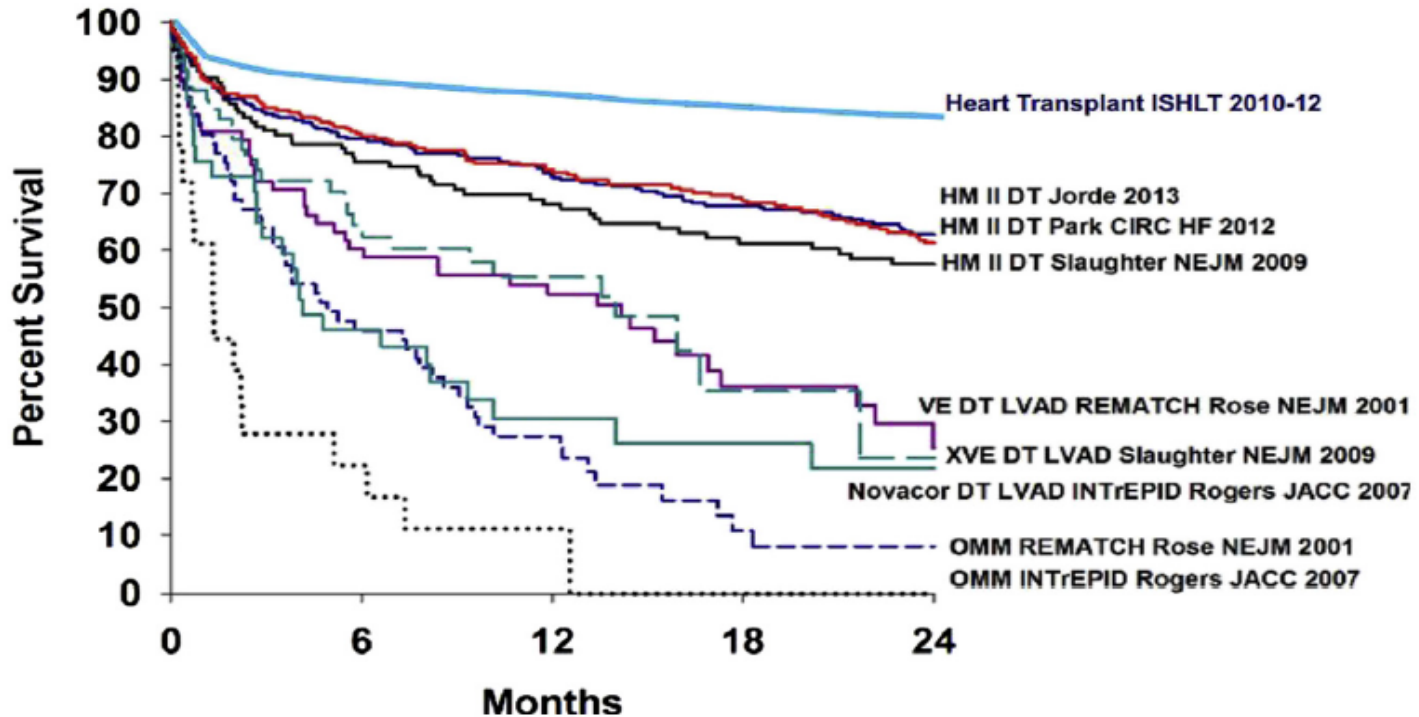
Subgroup	Continuous-Flow LVAD (N=133) (211 patient-yr)		Pulsatile-Flow LVAD (N=59) (41 patient-yr)		Relative Risk (95% CI)	P Value for Interaction
	no. (%)	no. of Events/ Patient-Yr	no. (%)	no. of Events/ Patient-Yr		
Pump replacement	<b>-88,2%</b> 12 (9)	0.06	20 (34)	0.51		<0.001
Stroke	24 (18)	0.13	8 (14)	0.22		0.21
Ischemic	11 (8)	0.06	4 (7)	0.10		0.38
Hemorrhagic	15 (11)	0.07	5 (8)	0.12		0.33
LVAD-related infection	<b>-41,6%</b> 47 (35)	0.48	21 (36)	0.90		0.01
Local non-LVAD infection	65 (49)	0.76	27 (46)	1.33		0.02
Sepsis	<b>-64,8%</b> 48 (36)	0.39	26 (44)	1.11		<0.001
Bleeding						
Bleeding requiring PRBC	108 (81)	1.66	45 (76)	2.45		0.06
Bleeding requiring surgery	40 (30)	0.23	9 (15)	0.29		0.57
Other neurologic event	29 (22)	0.17	10 (17)	0.29		0.14
Right heart failure						
Managed with extended use of inotropes	<b>-69,5%</b> 27 (20)	0.14	16 (27)	0.46		<0.001
Managed with RVAD	5 (4)	0.02	3 (5)	0.07		0.12
Cardiac arrhythmia	<b>-47,3%</b> 75 (56)	0.69	35 (59)	1.31		0.006
Respiratory failure	<b>-61,2%</b> 50 (38)	0.31	24 (41)	0.80		<0.001
Renal failure	<b>-29,4%</b> 21 (16)	0.10	14 (24)	0.34		<0.001
Hepatic dysfunction	3 (2)	0.01	0	0.00		
LVAD thrombosis	5 (4)	0.02	0	0.00		
Rehospitalization	<b>-37,8%</b> 107 (94)	2.64	42 (96)	4.25		0.02

0.0 0.5 1.0 1.5  
 ← Continuous-Flow Better      Pulsatile-Flow Better →



# Amélioration de la survie des patients sous AVG

Indications



**ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure 2012**

The Task Force for the Diagnosis and Treatment of Acute and Chronic Heart Failure 2012 of the European Society of Cardiology. Developed in collaboration with the Heart Failure Association (HFA) of the ESC

**Recommendations for surgical implantation of LVADs in patients with systolic heart failure**

Recommendations	Class <sup>a</sup>	Level <sup>b</sup>	Ref <sup>c</sup>
An LVAD or BiVAD is recommended in selected patients <sup>d</sup> with end-stage HF despite optimal pharmacological and device treatment and who are otherwise suitable for heart transplantation, to improve symptoms and reduce the risk of HF hospitalization for worsening HF and to reduce the risk of premature death while awaiting transplantation.	I	B	254, 255, 258
An LVAD should be considered in highly selected patients <sup>d</sup> who have end-stage HF despite optimal pharmacological and device therapy and who are not suitable for heart transplantation, but are expected to survive >1 year with good functional status, to improve symptoms, and reduce the risk of HF hospitalization and of premature death.	IIa	B	254

**Patient ≥65 ans ou CI greffe  
FEVG < 25%  
IC < 2,2 l/min/m<sup>2</sup>  
VO<sub>2</sub> max < 14 ml/kg/min**

**Traitement médical optimal**

**NYHA III-IV  
Absence de CI à AVG**

**AVG définitive**

Lund LH Eur Journal of Heart Failure 2010  
Lee S Cardiology 2013  
McMurray JV Eur Heart J 2012

## Critères d'exclusion

### AVG définitive

- **Comorbidités associées avec espérance de vie < 2 ans**
- **Insuffisance cardiaque non systolique**
- **Infection évolutive**
- **Insuffisance rénale sévère (Cl créat < 30 ml/min/1,73 m<sup>2</sup>) - dialyse**
- **Saignement actif**
- **Bilirubine > 85 µmol/l et INR > 2,5**
- **Plaquettes < 50 000x10<sup>9</sup>/L**
- **Défaillance multi-viscérale**
- **Dysfonction VD sévère**
- **Artérite sévère**
- **Insuffisance respiratoire sévère**

# Optimiser la sélection des patients

## Critères de sélection

### 3 facteurs majeurs

1

Statut clinique et hémodynamique (Profils INTERMACS)

2

Ventricule droit

3

Fonction rénale

# Optimiser la sélection des patients

## Statut clinique et hémodynamique (Profils INTERMACS)

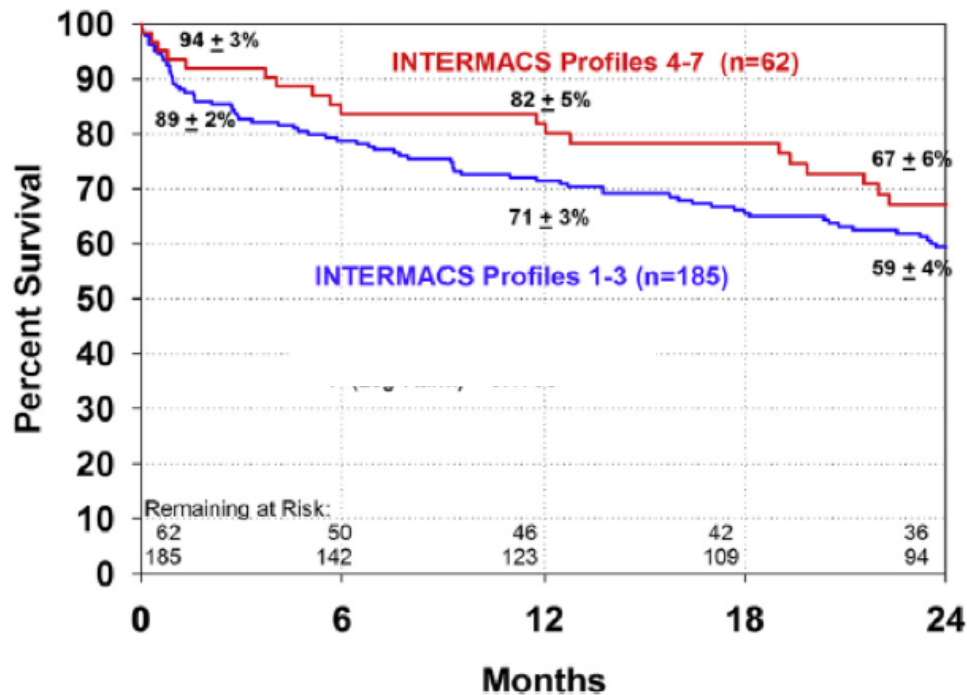
Profiles	Definition	Description
INTERMACS 1	<i>"Crash and burn"</i>	Hemodynamic instability in spite of increasing doses of catecholamines and/or mechanical circulatory support with critical hypoperfusion of target organs (severe cardiogenic shock)
INTERMACS 2	<i>"Sliding on inotropes"</i>	Intravenous inotropic support with acceptable blood pressure but rapid deterioration of kidney function, nutritional state, or signs of congestion
INTERMACS 3	<i>"Dependent stability"</i>	Hemodynamic stability with low or intermediate, but necessary due to hypotension, doses of inotropics, worsening of symptoms, or progressive kidney failure
INTERMACS 4	<i>"Frequent flyer"</i>	Temporary cessation of inotropic treatment is possible, but the patient presents frequent symptom recurrences and typically with fluid overload
INTERMACS 5	<i>"Housebound"</i>	Complete cessation of physical activity, stable at rest, but frequently with moderate water retention and some level of kidney dysfunction
INTERMACS 6	<i>"Walking wounded"</i>	Minor limitation on physical activity and absence of congestion while at rest. Easily fatigued by light activity
INTERMACS 7	<i>"Placeholder"</i>	Patient in NYHA functional class II or III with no current or recent unstable water balance



Mortalité

# Optimiser la sélection des patients

## Statut clinique et hémodynamique (Profils INTERMACS)



# Optimiser la sélection des patients

## Ventricule droit

10% - 30% défaillance VD après AVG

Défaillance du VD après AVG est associée à:

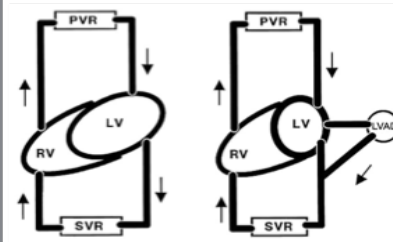
- ↑ mortalité hospitalière
- ↑ mortalité à long terme
- ↓ capacités fonctionnelles à long terme



Implantation AVD temporaire ou définitive

Conditions prédisposantes:

1. Cardiopathie causale
2. Facteurs péri-opératoires (transfusion, arythmie)
3. AVG:
  - ↓ post-charge VD
  - ↑ pré-charge VD
  - déplacement du septum vers le VG:
    - ↑ compliance du VD
    - ↓ inotropisme



# Optimiser la sélection des patients

Critères de sélection

## Fonction rénale

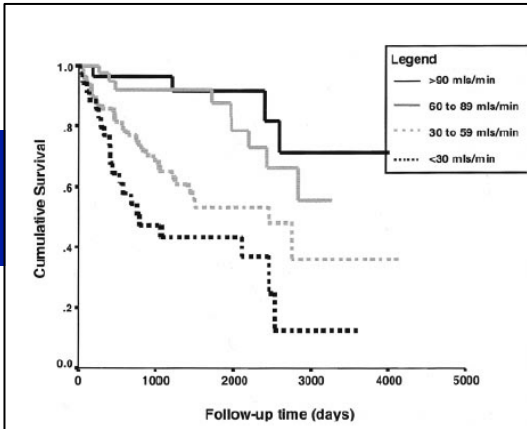
IR fréquemment associée à l'IC

**Table 3.** Prevalence of Renal Impairment Assessed at Baseline Outpatient Assessment or Baseline Hospital Admission for HF Patients (Based on a Total of 11 Studies)

Population	Renal Impairment				
	%	Any*		Moderate to Severe†	
		n/N	%	n/N	%
All patients	63	49,163/77,793	29	18,724/65,324	
Non-randomized	69	38,218/55,475	32	17,703/55,475	
Outpatients	51	11,621/23,007	10	1,049/10,538	
Hospitalized	69	37,542/54,786	32	17,675/54,786	

\*Creatinine >1.0 mg/dl, creatinine clearance or estimated glomerular filtration rate <90 ml/min, or cystatin-C >1.03 mg/dl. †Creatinine ≥1.5 mg/dl, creatinine clearance or estimated glomerular filtration rate <53 ml/min, or cystatin-C ≥1.56 mg/dl.

Survie actuarielle fortement dépendante du DFG



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ISSN 0735-1015/\$18.00  
doi:10.1016/j.jacc.2003.11.084

**Heart Failure**

Renal Impairment and Outcomes in Heart Failure  
Systematic Review and Meta-Analysis

Grace L. Smith, MD, MPH,\* Judith H. Lichtman, PhD, MPH,† Michael B. Bracken, PhD, MPH,‡  
Michael G. Shlipak, MD, MPH,§ Christopher O. Phillips, MD, MPH,¶ Paul DiCapua, BS,\*  
Harlan M. Krumholz, MD, SM, FACC\*†‡§¶

*New Haven, Connecticut; San Francisco, California; and Cleveland, Ohio*

**Renal Insufficiency and Heart Failure**  
Prognostic and Therapeutic Implications From a Prospective Cohort Study

Finlay A. McAlister, MD, MSc, FRCP, Justin Ezekowitz, MB, BCh,  
Marcello Tonelli, MD, MSc, FRCP, Paul W. Armstrong, MD, FRCP

**(Circulation. 2004;109:1004-1009.)**

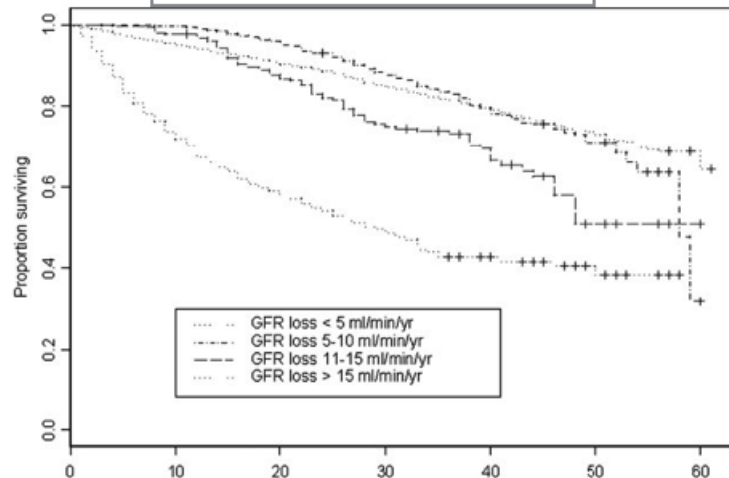


# Optimiser la sélection des patients

## Fonction rénale

Mortalité fortement liée à la  
sévérité  
de la dégradation de la  
fonction rénale

Survie actuarielle patients  
avec  $DFG \geq 60$  ml/min/1,73m<sup>2</sup>

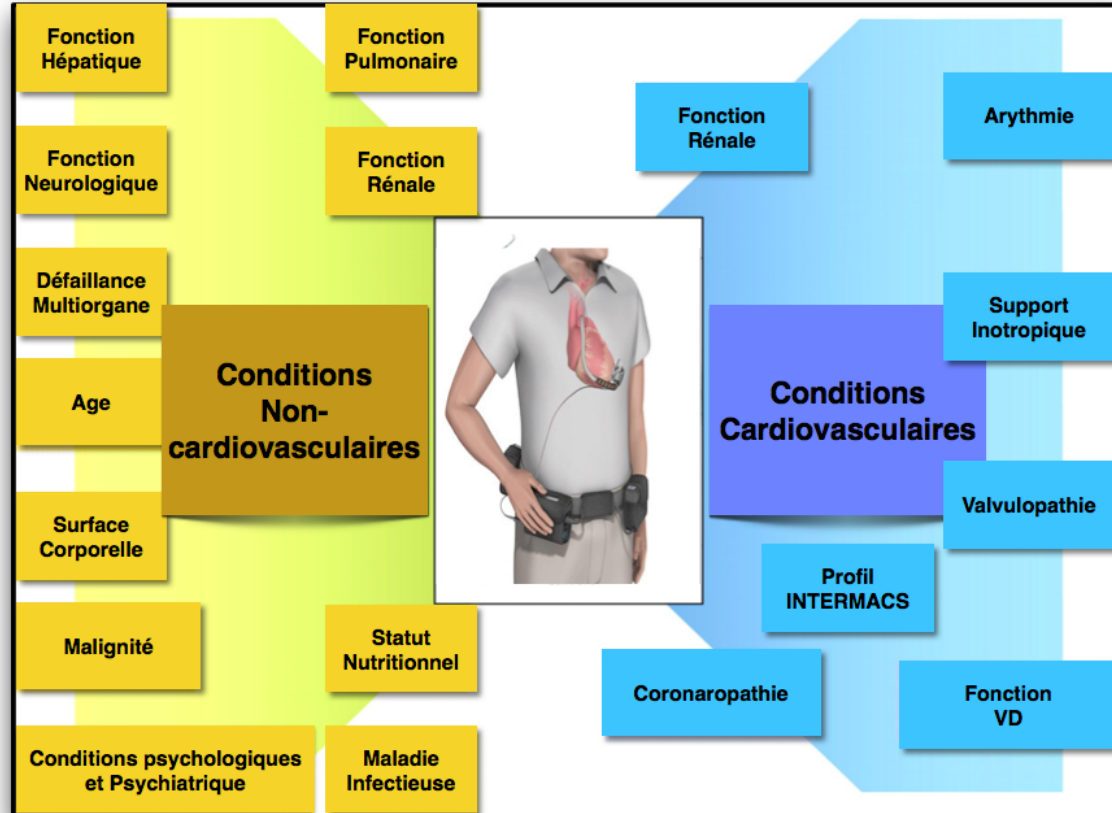


### Kidney Function and Mortality among Patients with Left Ventricular Systolic Dysfunction

Nadia A. Khan,<sup>\*</sup> Irene Ma,<sup>\*</sup> Christopher R. Thompson,<sup>\*</sup> Karin Humphries,<sup>\*</sup> Deeb N. Salem,<sup>†</sup> Mark J. Sarnak,<sup>‡</sup> and Adeera Levin<sup>†</sup>  
Divisions of <sup>\*</sup>Internal Medicine, <sup>†</sup>Cardiology, and <sup>‡</sup>Nephrology, University of British Columbia, Vancouver, British Columbia, Canada; and Divisions of <sup>†</sup>Cardiology and <sup>‡</sup>Nephrology, Tufts-New England Medical Center, Boston, Massachusetts

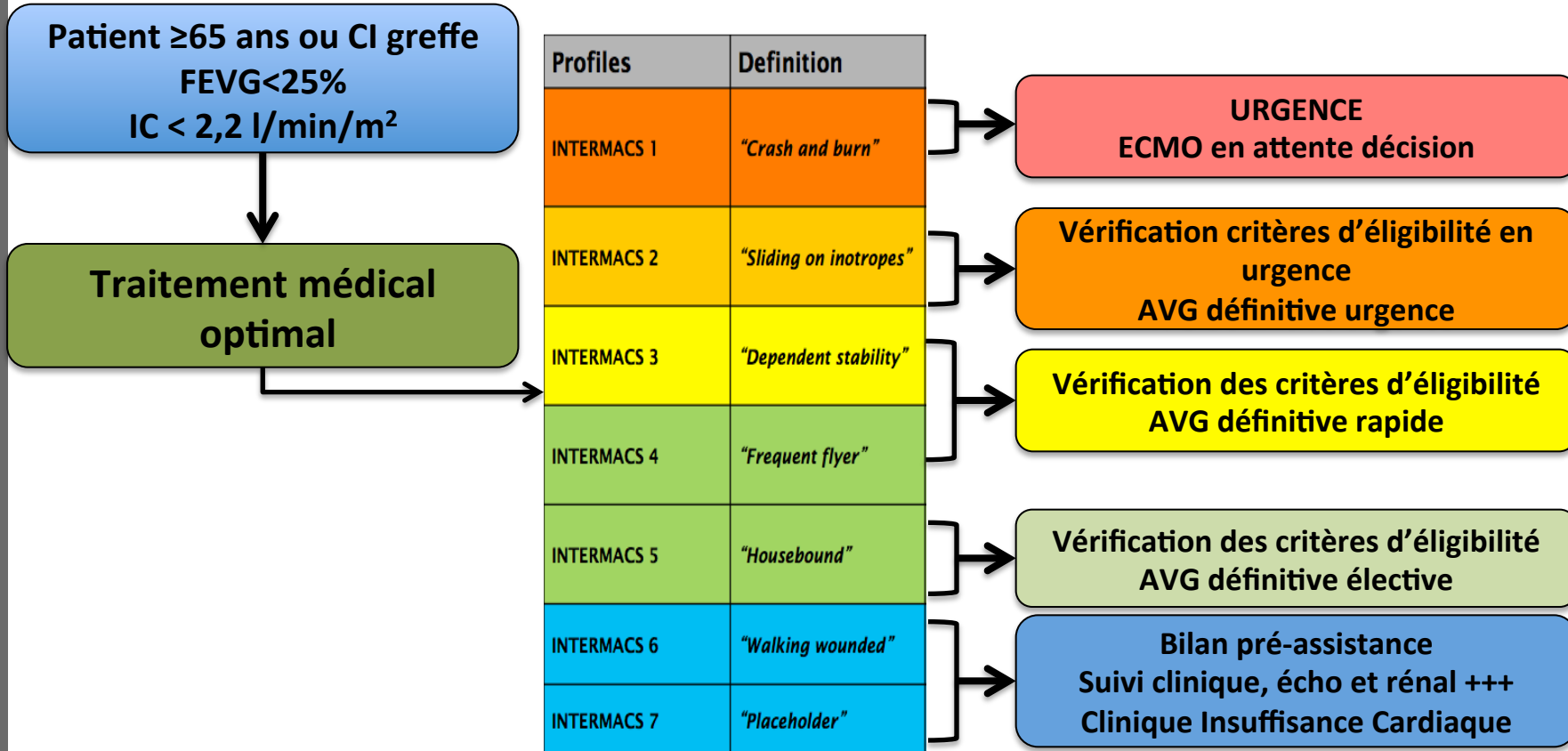
# AVG définitive

## Prise en charge multidisciplinaire de l'IC



# AVG définitive

Conclusion



## AVG définitive

- **AVG doit faire partie intégrante du traitement de l'IC.**
- **AVG améliore la survie, le statut fonctionnel et la qualité de vie des patients en IC terminale, symptomatique, sous traitement médical optimal.**
- **Référer rapidement les patients symptomatiques sous traitement médical optimal.**

*Le bon patient, au bon moment, avant qu'il ne soit trop tard*

# AVG définitive

Conclusion

Le futur



HeartWar

