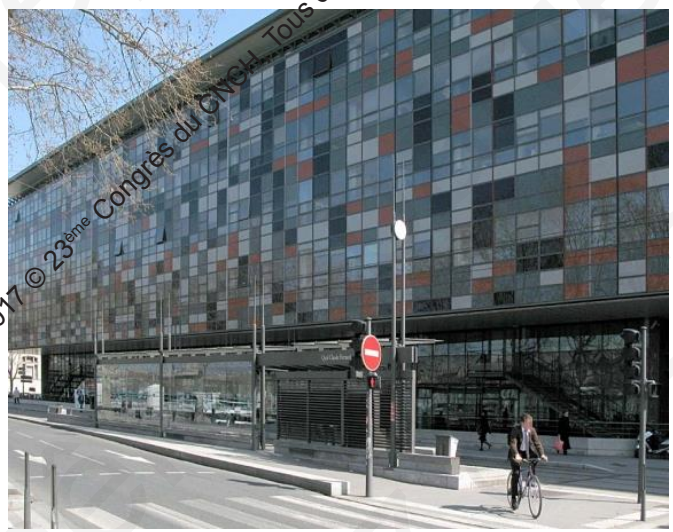
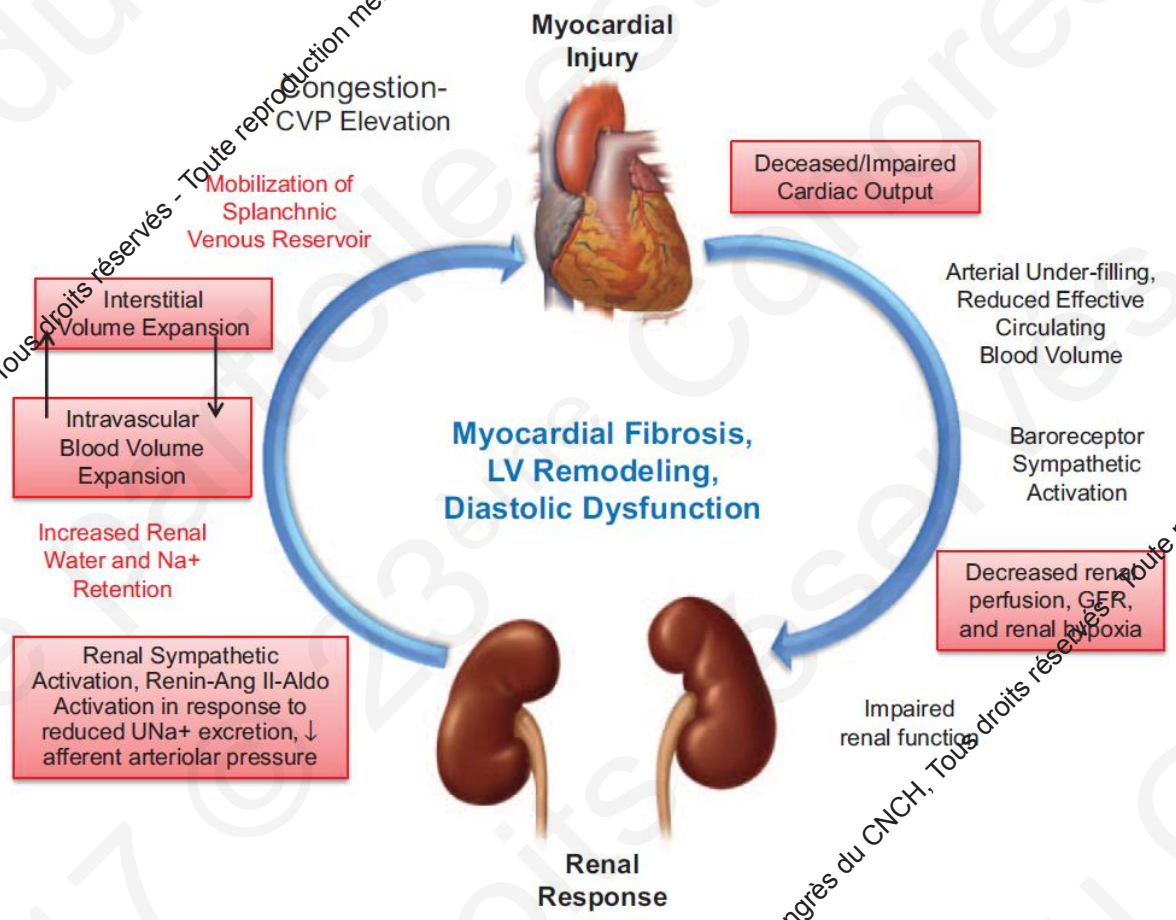
La congestion dans l'insuffisance cardiaque. Vide ou plein ? Quand la clinique ne suffit pas…



Dr JF AUPETIT
C H St Joseph . St Luc - Lyon

Dr J.C EICHER
CHU - Dijon

Physiopathologie de la congestion



Cardio-renal interactions in volume expansion and congestion in chronic heart failure.

Miller WL. *Circ Heart Fail* 2016;9:e002922

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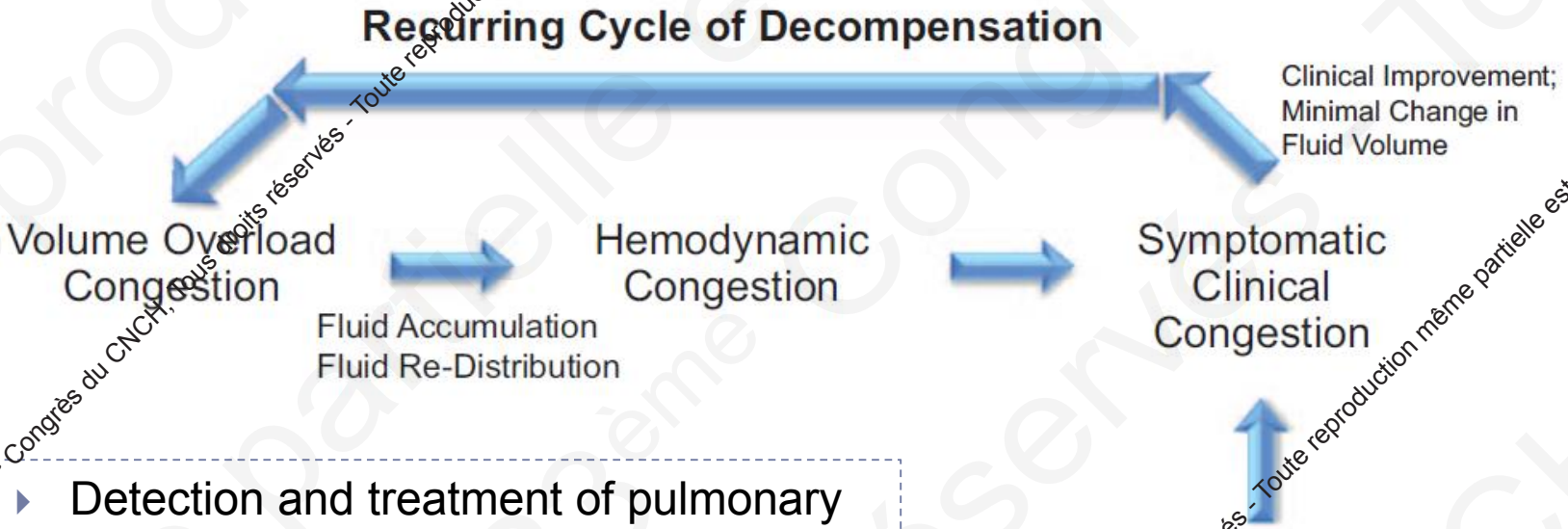
Le cercle vicieux de la congestion



- Detection and treatment of pulmonary congestion before it is clinically evident can prevent hospitalization and progression of heart failure.
- Post-discharge freedom from pulmonary congestion is associated with a better prognosis

Picano E. *Eur J Heart Fail* 2016

Miller WL. *Circ Heart Fail* 2016;9:e002922

European Journal of Heart Failure (2015) 17, 544–558
doi:10.1002/ejhf.289

REVIEW

Recommendations on pre-hospital & early hospital management of acute heart failure: a consensus paper from the Heart Failure Association of the European Society of Cardiology, the European Society of Emergency Medicine and the Society of Academic Emergency Medicine

Mebazaa A, *Eur J Heart Fail* 2015

Criteria for discharge from the hospital and follow-up in high-risk period

- Patients admitted with AHF are medically fit for discharge:
  - when hemodynamically stable, euvolemic, established on evidence-based oral medication and with stable renal function for at least 24 h before discharge
  - once provided with tailored education and advice about self-care

- Signes et symptômes de congestion = cause la plus fréquente d'hospitalisation pour IC
- Plus d'1/3 des patients présente encore des signes congestifs à la sortie de l'hôpital
- Congestion résiduelle = risque de réhospitalisation à court/moyen terme et risque de mortalité à long terme

Contrôle de la volémie

Réduction de la mortalité

Diurétiques

IEC

Beta-bloquant

Antagonistes des récepteurs minéralo-corticoïdes

ARA II

Ivabradine

LCZ 696

Réadaptation

Resynchronisation D A I

Traitement des symptômes résiduels

Digitaliques

Dérivés nitrés

Comment évaluer le statut hydrique dans l'insuffisance cardiaque ?

- Examen clinique
- Radiographie thoracique
- Échographie thoracique
- Échographie VCI
- Peptides natriurétiques et autres paramètres biologiques

- Mesure des pressions
- Mesure isotopique du volume sanguin
- Bio-impédance

Signes cliniques

- HF is a **clinical syndrome**
- characterized by typical **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)
- caused by a **structural and/or functional cardiac abnormality**
- resulting in a reduced cardiac output and/or **elevated intracardiac pressures** at rest or during stress

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

Symptoms	Signs
Typical	**More specific**
Breathlessness Orthopnoea Paroxysmal nocturnal dyspnoea Reduced exercise tolerance Fatigue, tiredness, increased time to recover after exercise Ankle swelling	Elevated jugular venous pressure Hepatojugular reflux Third heart sound (gallop rhythm) Laterally displaced apical impulse
Less typical	**Less specific**
• Provide individualized information to support self-management such as: ⇨ In the case of increasing dyspnoea or oedema or a sudden unexpected weight gain of >2 kg in 3 days, patients may increase their diuretic dose and/or alert their healthcare team.	
Confusion (especially in the elderly) Depression Palpitations Dizziness Syncope Bendopnoea	Peripheral oedema (ankle, sacral, scrotal) Pulmonary crepitations Reduced air entry and dullness to percussion at lung bases (pleural effusion) Tachycardia Irregular pulse Tachypnoea Cheyne Stokes respiration Hepatomegaly Ascites Cold extremities Oliguria Narrow pulse pressure

Signes cliniques

paramètre	limites
Dyspnée, orthopnée	
NYHA (4 grades)	subjectif
Échelle de Likert (5 grades)	
assis	
allongé	
Test de marche de 6 minutes	pas toujours réalisable
Râles crépitants	peu sensible, peu spécifique
Pression veineuse jugulaire	difficile chez l'obèse, variabilité inter-observateur
Œdèmes	ne reflètent pas forcément le volume intra-vasculaire
Poids	ne reflète pas forcément le volume intra-vasculaire

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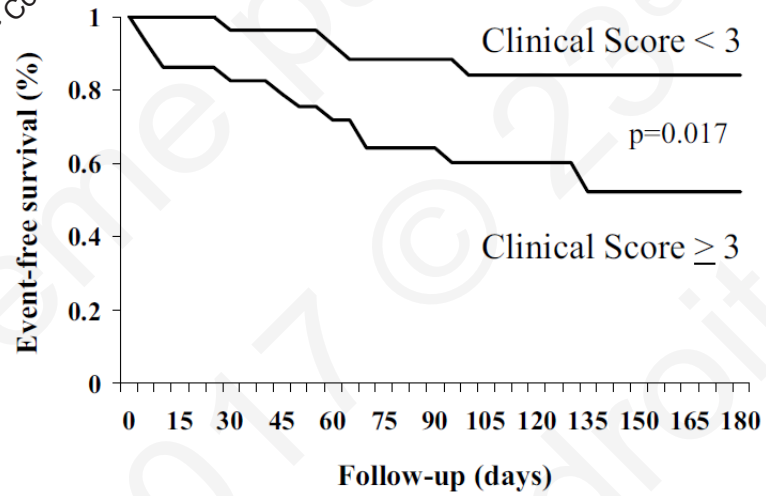
Scores de congestion

Reliability and prognostic value of traditional signs and symptoms in outpatients with congestive heart failure

- râles pulmonaires : 0-4
- pression veineuse : 0-4
- œdème périphérique : 0-4
- 3è bruit : 0-1
- orthopnée : 0-4



	Right atrial pressure ≥10 mmHg			
	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Jugular distension	58	71	53	76
Hepatojugular reflux	69	64	51	79
Peripheral edema	44	88	67	74
Rales	28	79	42	65
Third heart sound	25	89	56	69
Orthopnea	81	45	45	81
At least one of six clinical findings	94	26	41	89

	Left atrial pressure ≥20 mmHg			
	Sensitivity	Specificity	Positive predictive value	Negative predictive value
Jugular distension	50	66	40	74
Hepatojugular reflux	69	61	45	81
Peripheral edema	25	77	33	69
Rales	25	77	33	69
Third heart sound	25	90	57	70
Orthopnea	84	46	41	86
At least one of six clinical findings	97	25	37	95

Rohde LE. *Can J Cardiol* 2004

Scores de congestion

Relief and Recurrence of Congestion During and After Hospitalization for Acute Heart Failure

Insights From Diuretic Optimization Strategy Evaluation in Acute Decompensated Heart Failure (DOSE-AHF) and Cardiorenal Rescue Study in Acute Decompensated Heart Failure (CARESS-HF)

- Œdème
  - Trace/minime : 0
  - Modéré : 1
  - Sévère : 2
- Orthopnée (≥ 2 oreillers)
  - Absente: 0
  - Présente: 2

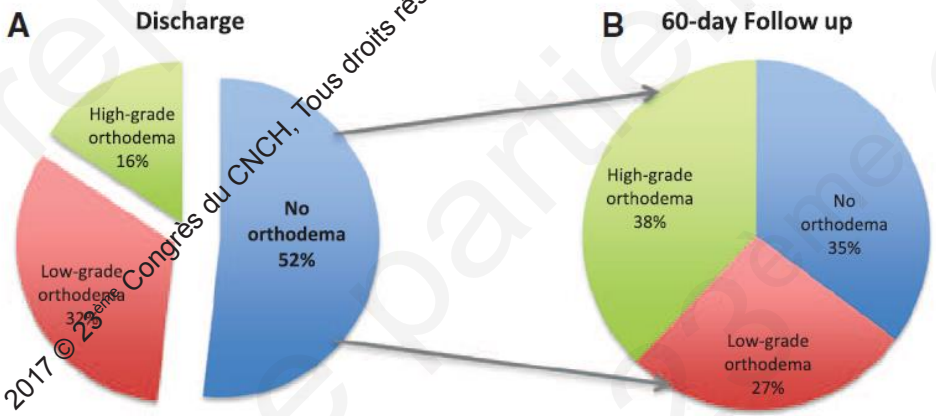
Table 2. Orthodema Scores

Mild edema, no orthopnea	0	No congestion
Moderate edema, no orthopnea	1	Low-grade orthodema/congestion
Severe edema OR orthopnea	2	
Moderate edema and orthopnea	3	High-grade orthodema/congestion
Severe edema and orthopnea	4	

Lalla A. *Circ Heart Fail* 2015

Relief and Recurrence of Congestion During and After Hospitalization for Acute Heart Failure

Insights From Diuretic Optimization Strategy Evaluation in Acute Decompensated Heart Failure (DOSE-AHF) and Cardiorenal Rescue Study in Acute Decompensated Heart Failure (CARESS-HF)



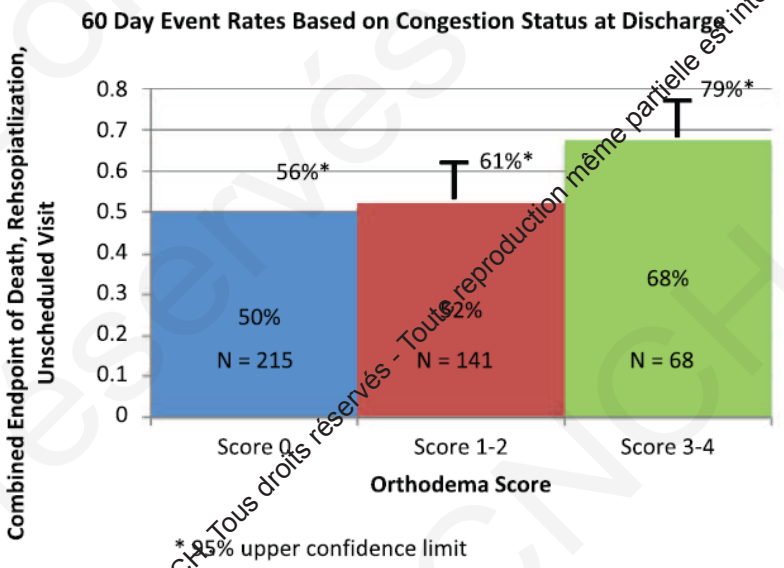


Figure 3. Sixty-day event rates based on discharge orthodema score to represent congestion (P=0.038).

Lalla A. *Circ Heart Fail* 2015

Tests dynamiques

- Test d'orthostatisme
  - Réponse normale (fonction VG et PRVG normales)
    - discrète baisse PAS 4 mmHg
    - augmentation FC
  - Insuffisance cardiaque et pressions élevées
    - réduction pré-charge et amélioration débit
    - augmentation paradoxale de la PAS
  - Insuffisance cardiaque et amélioration des pressions
    - absence d'augmentation paradoxale PAS
    - hypotension orthostatique = hypovolémie
    - non valable si FEVG préservée, RA, CMH

Radiographie pulmonaire

- Chest X-ray can be a useful test for the diagnosis of AHF. Pulmonary venous congestion, pleural effusion, interstitial or alveolar oedema and cardiomegaly are the most specific findings for AHF, although in up to 20% of patients with AHF, chest X-ray is nearly normal.[519] Supine chest radiographs are of limited value in AHF. Chest X-ray is also useful to identify alternative non-cardiac diseases that may cause or contribute to the patient's symptoms

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

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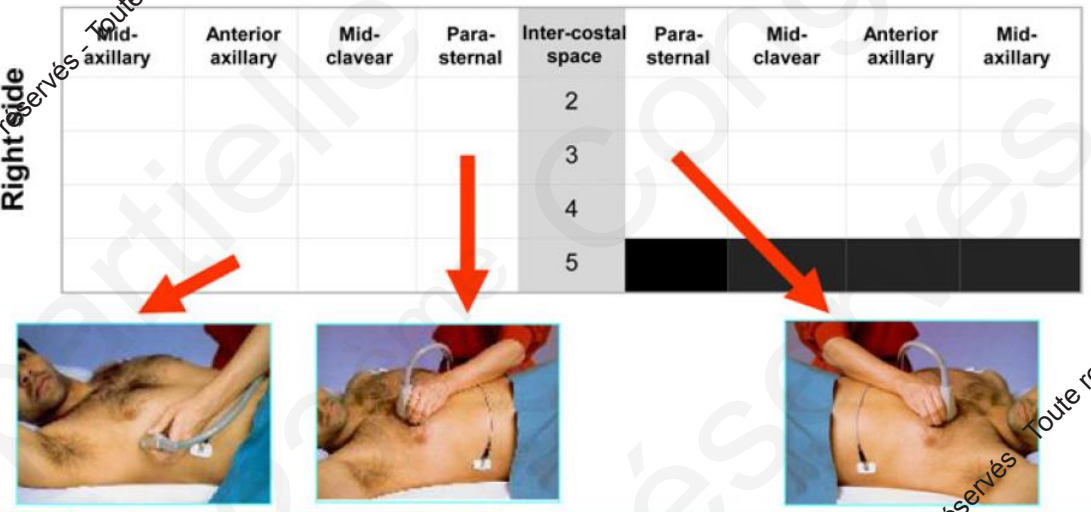
Ultrasound of extravascular lung water: a new standard for pulmonary congestion

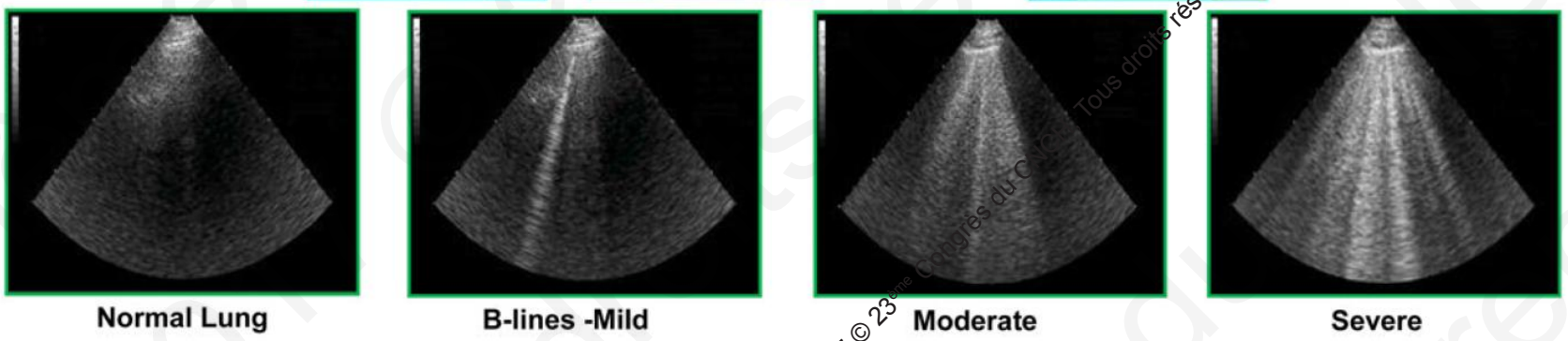
Eugenio Picano[1]* and Patricia A. Pellikka[2]

European Heart Journal (2016) **37**, 2097–2104

Table 2 Scoring of B-lines

Score	Number of B-lines	EVLW
0	≤5	Absent
1	6–15	Mild degree
2	16–30	Moderate degree
3	>30	Severe degree





Gargani et al. Cardiovascular Ultrasound (2015) 13:40
DOI 10.1186/s12947-015-0033-4

CARDIOVASCULAR ULTRASOUND

RESEARCH Open Access

Persistent pulmonary congestion before discharge predicts rehospitalization in heart failure: a lung ultrasound study

Luna Gargani[1*], P. S. Pang[2], F. Frassi[3], H. Miglioranza[4], F. L. Dini[5], P. Landi[1] and E. Picano[1]

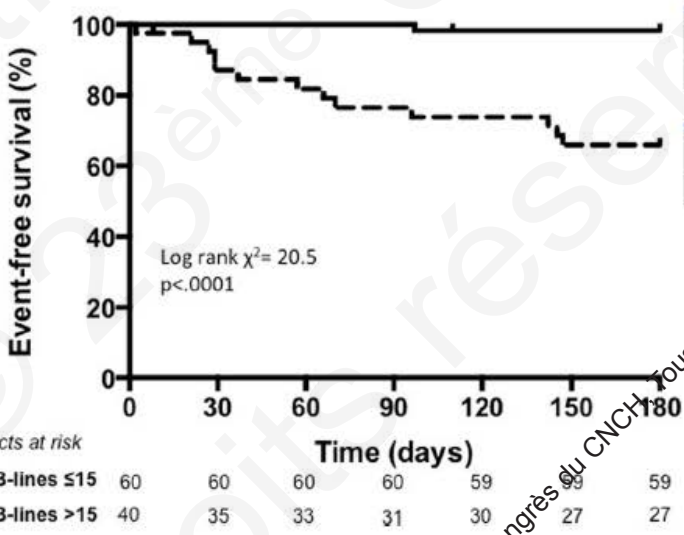
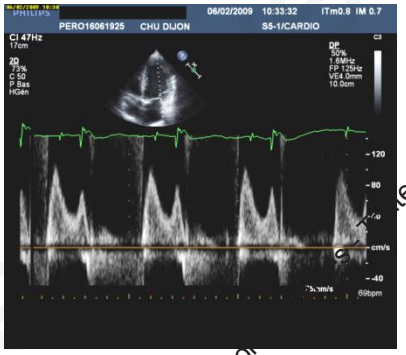


Fig 2 Kaplan-Meier survival curves in HF patients stratified according to the number of B-lines before discharge, at 6-months follow-up

Echocardiographie

- Pression OD et veine cave inférieure

- Pression OG et rapport E/e’



- Intérêt des échographes ultraportables

Peptides natriurétiques

- Laboratory tests:
  - Natriuretic peptides.
  - Upon presentation to the ED or CCU/ICU, a plasma NP level (BNP, NT-proBNP or MR-proANP) should be measured in all patients with acute dyspnoea and suspected AHF to help in the differentiation of AHF from non-cardiac causes of acute dyspnoea. NPs have high sensitivity, and normal levels in patients with suspected AHF makes the diagnosis unlikely (thresholds: BNP <100 pg/mL, NT-proBNP <300 pg/mL, MR-proANP <120 pg/mL).[57–61,77,78,521] However, elevated levels of NPs do not automatically confirm the diagnosis of AHF, as they may also be associated with a wide variety of cardiac and non-cardiac causes (Table 12.3). Unexpectedly low levels of NPs can be detected in some patients with decompensated end-stage HF, flash pulmonary oedema or right sided AHF.

Recommendations	Class [a]	Level [b]
Upon presentation a measurement of plasma natriuretic peptide level (BNP, NT-proBNP or MR-proANP) is recommended in all patients with acute dyspnoea and suspected AHF to help in the differentiation of AHF from non-cardiac causes of acute dyspnoea.	I	A

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

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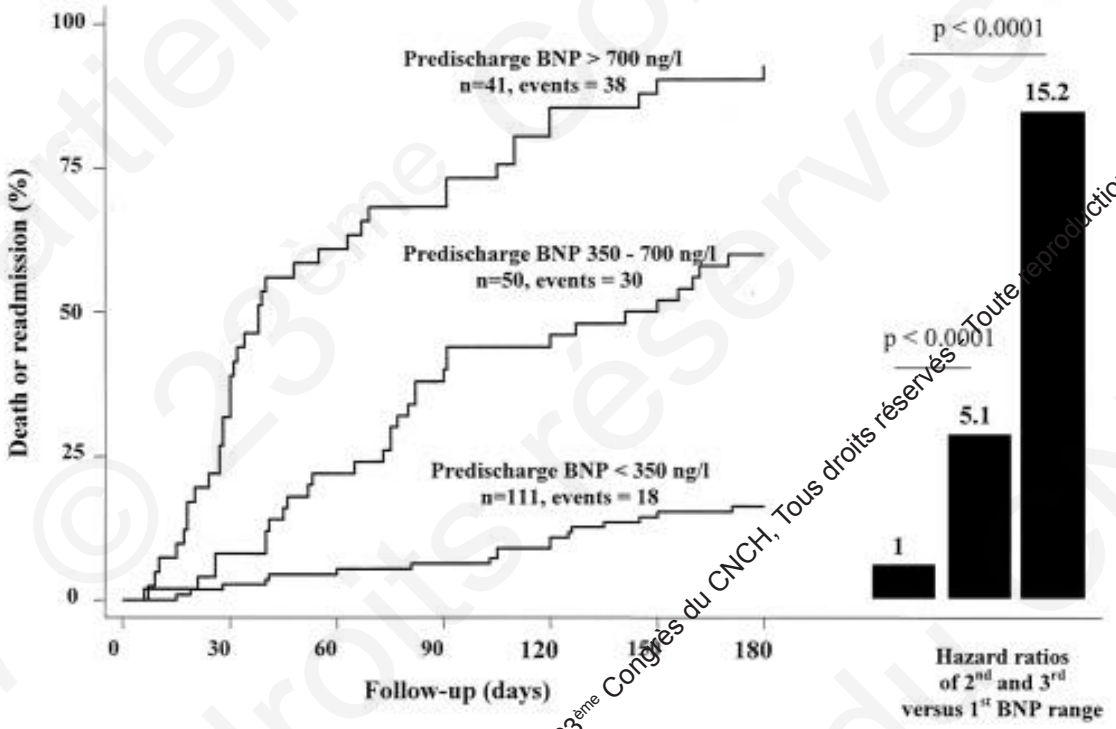
BNP et évolution hospitalière

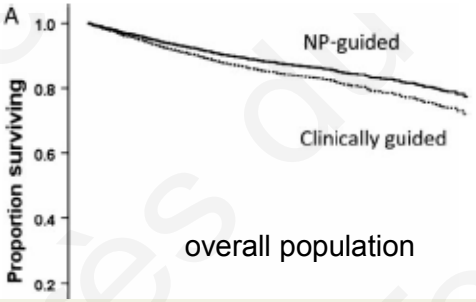
Predischarge B-Type Natriuretic Peptide Assay for Identifying Patients at High Risk of Re-Admission After Decompensated Heart Failure



Logeart D, *J Am Coll Cardiol* 2004

Effect of B-type natriuretic peptide-guided treatment of chronic heart failure on total mortality and hospitalization: an individual patient meta-analysis

Troughton RW. *Eur Heart J* 2014

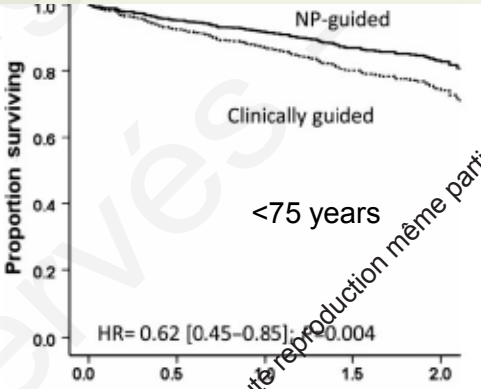


overall population

Conclusion Natriuretic peptide-guided treatment of heart failure reduces all-cause mortality in patients aged <75 years and overall reduces heart failure and cardiovascular hospitalization.

High circulating NPs predict unfavourable outcomes in patients with HF, and a decrease in NP levels during recovery from circulatory decompensation is associated with a better prognosis.

Although it is plausible to monitor clinical status and tailor treatment based on changes in circulating NPs in patients with HF, published studies have provided differing results. This does not enable us to recommend a broad application of such an approach

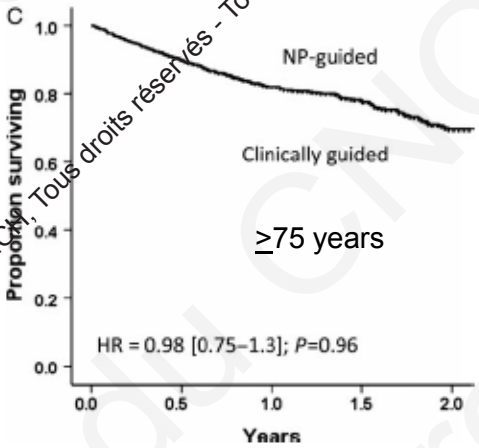


<75 years

2016 ESC Guidelines for the diagnosis and treatment of acute and chronic heart failure

Current Indications for Natriuretic Peptide Measurements in HF

Indication	ACC/AHA Recommendation Class-Level of Evidence
Diagnosis in patients with dyspnea (acute)	I-A
Diagnosis in patients with dyspnea (ambulatory)	I-A
Prognosis in patients with known HF (acute)	I-A
Prognosis in patients with known HF (ambulatory)	I-A
Achieving guideline-directed medical therapy (ambulatory)	IIa-B
Natriuretic peptide-guided therapy for chronic HF	IIb-B



≥75 years

2013 ACCF/AHA Guideline for the Management of Heart Failure

Autres paramètres biologiques

- Paramètres d'hémoconcentration
  - Protéines, albumine
  - Hémoglobine, hématocrite
  - Estimation du volume plasmatique

$$\%\ \text{change in plasma volume} = 100 \times \frac{\textit{hemoglobin (before)}}{\textit{hemoglobin (after)}} \times \frac{1 - \textit{hematocrit (after)}}{1 - \textit{hematocrit (before)}} - 100$$

Formule de Strauss

- Fonction hépatique

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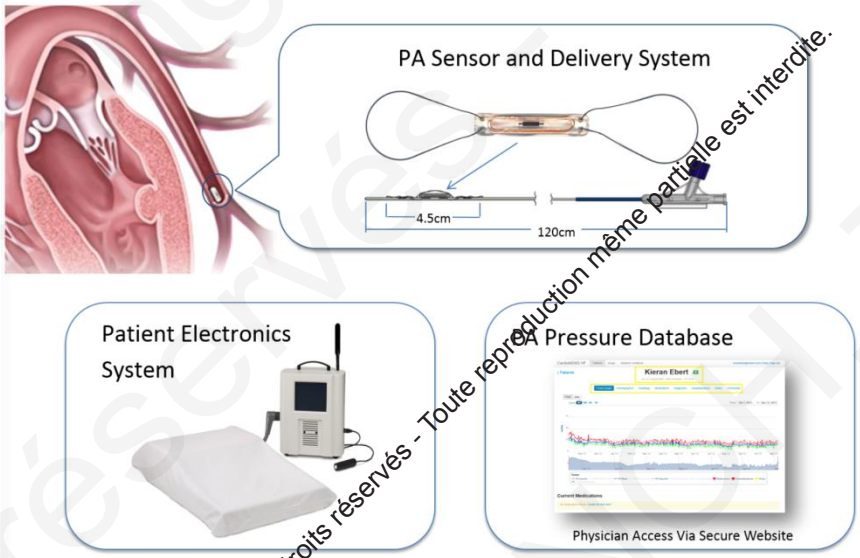
Monitoring des pressions pulmonaires

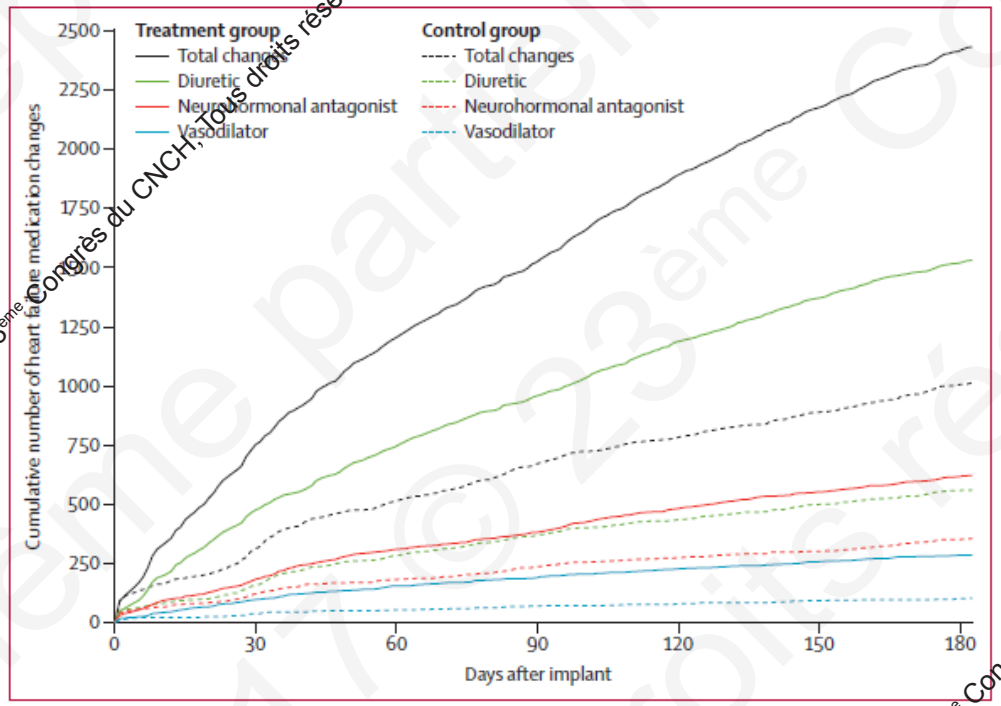
Monitoring of pulmonary artery pressures using a wireless implantable haemodynamic monitoring system (CardioMems) may be considered in symptomatic patients with HF with previous HF hospitalization in order to reduce the risk of recurrent HF hospitalization.	IIb	B

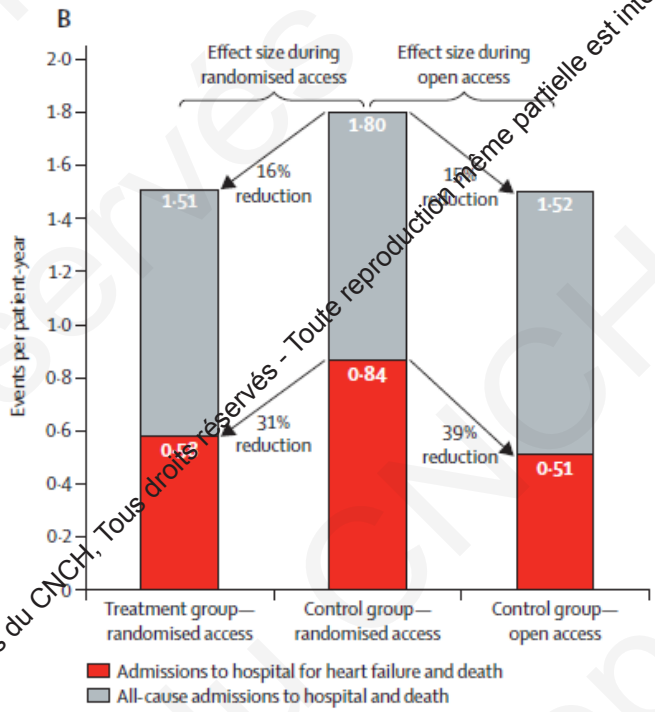


CardioMEMS HF System (SJM)

Sustained efficacy of pulmonary artery pressure to guide adjustment of chronic heart failure therapy: complete follow-up results from the CHAMPION randomised trial

William T Abraham, Lynne W Stevenson, Robert C Bourge, Jo Ann Lindenfeld, Jordan G Bauman, Philip B Adamson, for the CHAMPION Trial Study Group



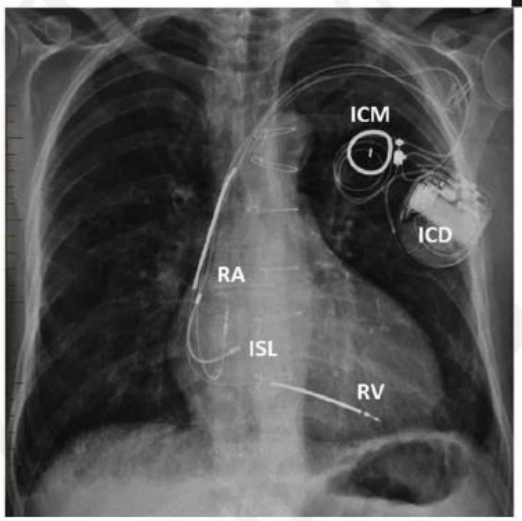


Abraham WT, *Lancet* 2016

Monitoring de la pression OG?

Left Atrial Pressure Monitoring in HF (LAPTOP-HF) ● Maurer et al

ISL : implantable sensor lead
ICM : implantable communication module



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Mesure du volume sanguin

- « Gold standard »

- Principe
  - Albumine marquée I^{131}
  - Détermination de l'hématocrite et de la radioactivité plasmatique
  - Principe de dilution d'un indicateur

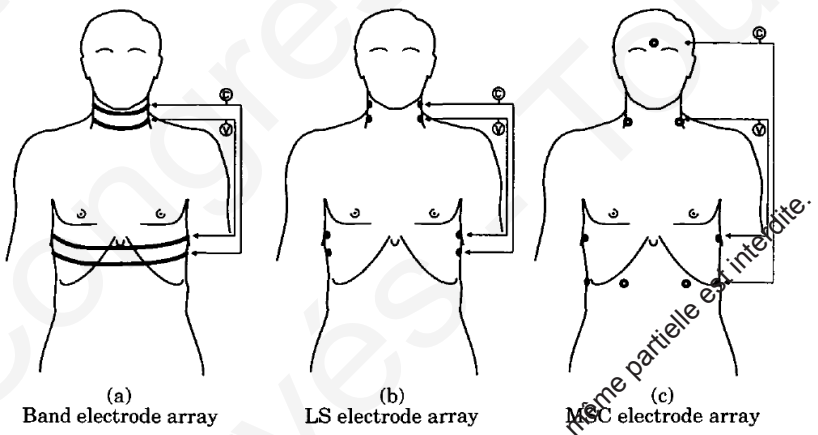
    $V = q/C$ q = quantité injectée

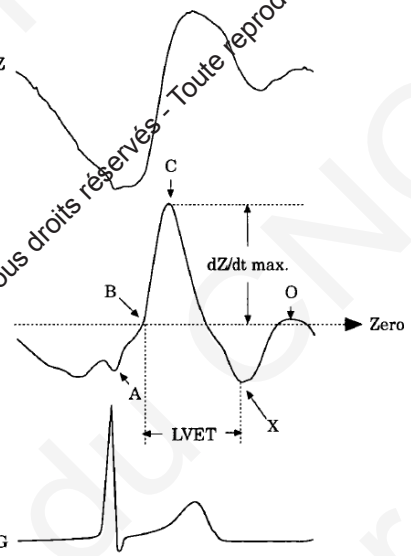
    c = concentration
  - Calcul volume globulaire / volume plasmatique / volume sanguin total

- Limites : faisabilité

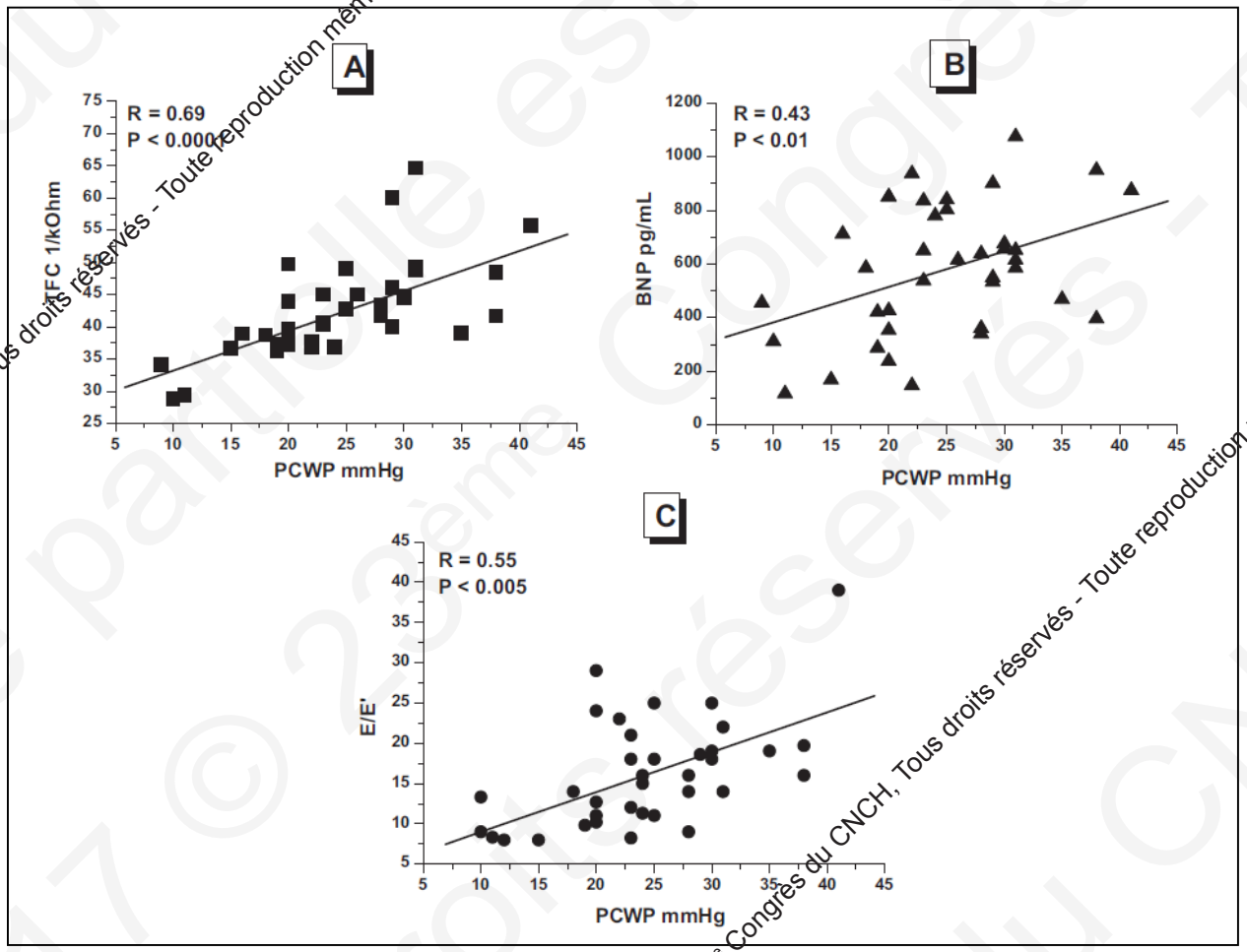
Bioimpédance

- Théorie
  - Thorax = conducteur électrique inhomogène
  - Courant électrique alternatif haute fréquence, basse intensité
  - Loi d'Ohm : Z = V/I
    - Z = impédance (ohms)
    - V = tension (volts)
    - I = intensité (ampères)
  - Impédance inversement proportionnelle à la quantité de sang ou d'eau intra-thoracique
  - Mesures possibles
    - Volume d'éjection systolique
    - Débit cardiaque
    - Contenu hydrique intra-thoracique





Transthoracic Impedance Accurately Estimates Pulmonary Wedge Pressure in Patients With Decompensated Chronic Heart Failure



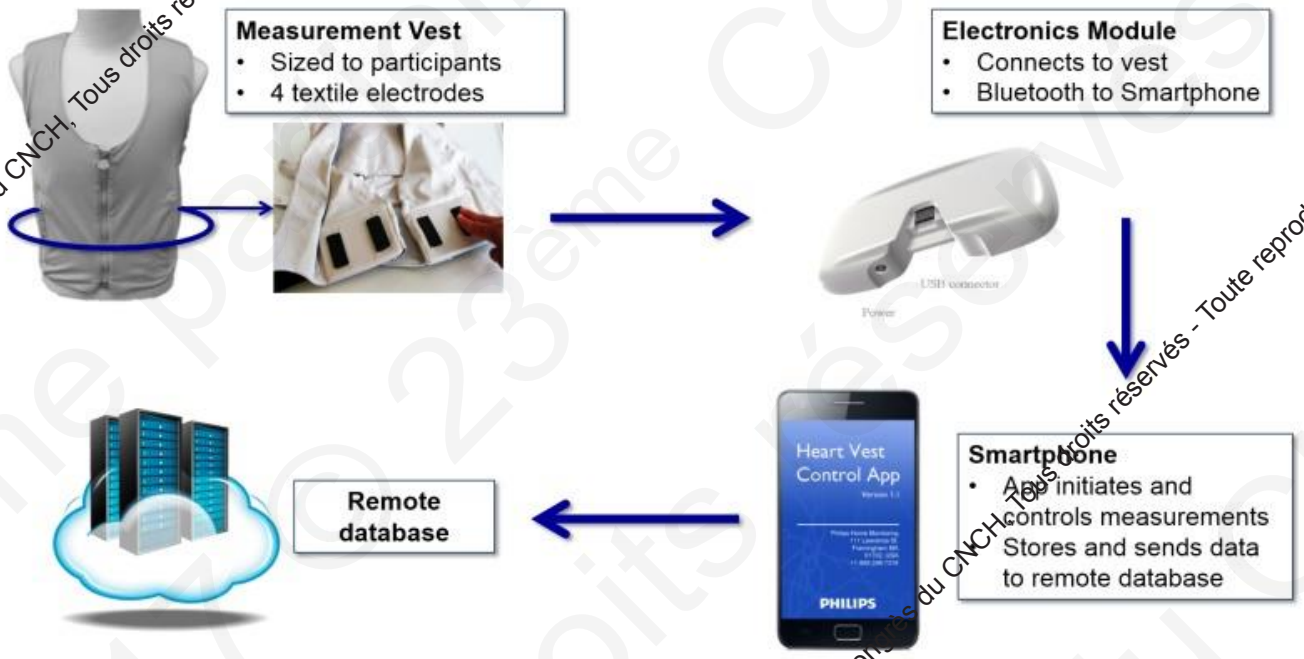
Malfatto G. *Congest Heart Fail 2012*

Bioimpédance

Wearable vest for pulmonary congestion tracking and prognosis in heart failure: A pilot study

Paloma Gastelurrutia [a,1], Illapha Cuba-Gyllensten [b,c,1], Josep Lupon [d,e], Elisabet Zamora [d,e], Cinta Llibre [d], Ángel Caballero [d], Jarno Riistama [c], Ronald Aarts [b,c], Antoni Bayes-Genis [a,d,e,*]

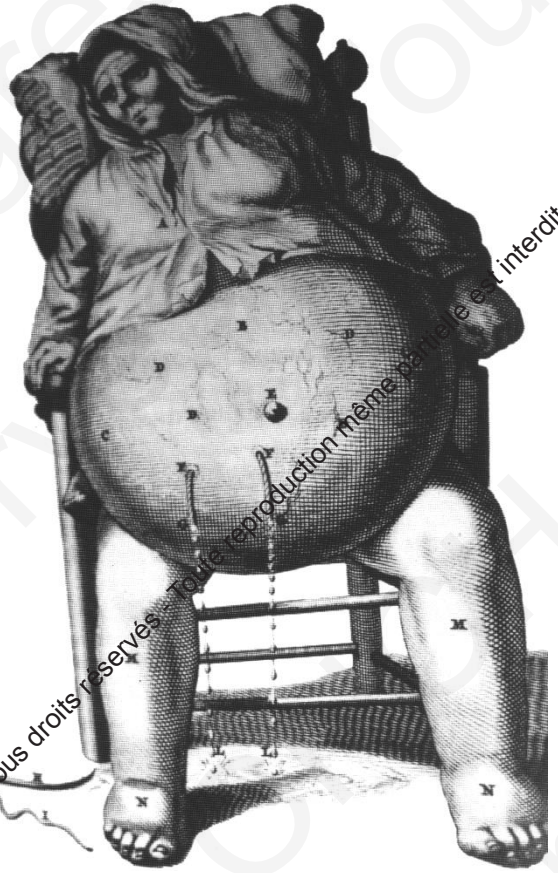
Int J Cardiol 2016



Dovancescu S. *JMIR Res Protoc*. 2015

En résumé… et en pratique

1. La clinique et la surveillance du poids
2. Les peptides natriurétiques et la biologie
3. L'échographie thoracique
4. Echographie de la veine cave inférieure



Le drainage au cordonnet d'un malade hydropique

Gravure de F. Dekkers (1695)

Centre d'Histoire de la Médecine de Paris VI

Regard physiopathologique

Poussée d'HTA

↑ pression oreillette gauche

Tachycardie FA

Infections bronchopulmonaires

Ischémie

Volémie globale peu augmentée

Vasodilatateurs +++
Diurétiques : hypovolémie rapide

Congestion pulmonaire sans hypervolémie globale

OAP brutal pour des pressions basses

Pas de ↓ de la perméabilité capillaire

Insuffisance rénale fonctionnelle, certes, mais le  d'abord !

- Évolution difficile de la volémie
- La fenêtre thérapeutique de la décongestion est étroite
- Mieux vaut l'hémoconcentration que la congestion +++

Ce qu'il faut surveiller, c'est surtout le K+