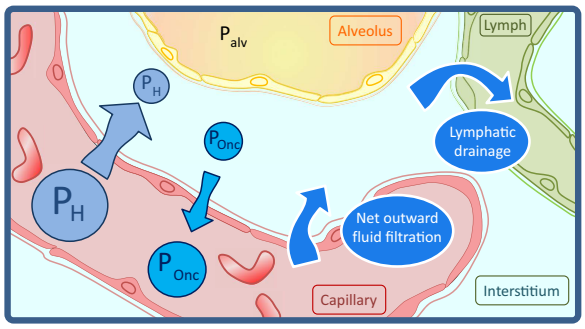
université de BORDEAUX

CHU Hôpitaux de Bordeaux

# OAP hydrostatique

B Séguy PH USIC-Hémodynamique
Lacanau 11 juin 2016






Flux sortant «net» =K($P_{h\ capillaire}$ - $P_{h\ intestitielle}$) -K($P_{onc\ capillaire}$ - $P_{onc\ interstitium}$ )

*Jozwiak & al ICM 2015*



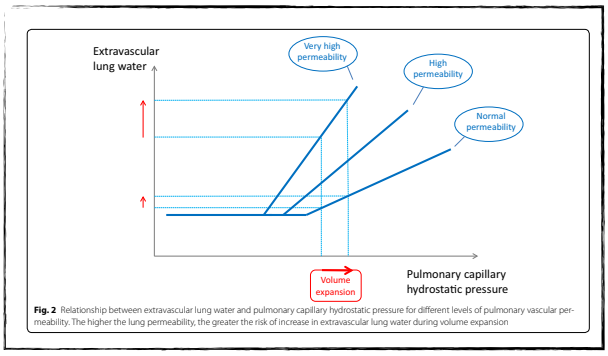



**Fig. 2** Relationship between extravascular lung water and pulmonary capillary hydrostatic pressure for different levels of pulmonary vascular permeability. The higher the lung permeability, the greater the risk of increase in extravascular lung water during volume expansion

Augmentation pression hydrostatique

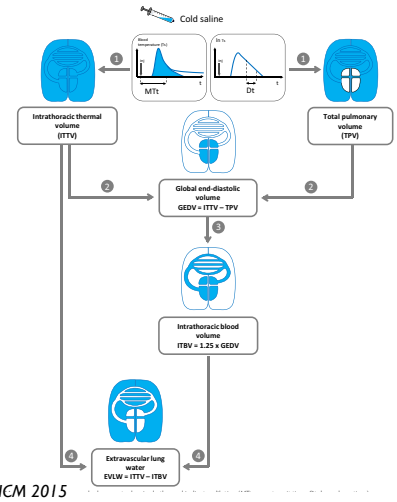
Diminution de la pression oncotique

Diminution de perméabilité capillaire

*Jozwiak & al ICM 2015*



Mesure de l'eau pulmonaire extra vasculaire en pratique clinique




*Jozwiak & al ICM 2015*



| | Study | Number of patients | Type of EVLW indexation | Prognostic value |
|---|---|---|---|---|
| *General critically ill patients* | Sakka et al. [4] | 373 | Actual body weight | Independent predictor of ICU mortality |
| *Severe sepsis or septic shock patients* | Martin et al. [3] | 29 | Actual body weight | Higher EVLWI in ICU non-survivors |
| | Chung et al. [75] | 33 | Actual body weight | Independent predictor of in-hospital survival |
| | Chung et al. [76] | 67 | Actual body weight | Independent factor for the development of MODS |
| | Chew et al. [73] | 51 | Actual and predicted body weight | Higher EVLWI in ICU non-survivors |
| | Mallat et al. [78] | 55 | Actual and predicted body weight | Independent predictor of ICU mortality |
| *ARDS patients* | Philips [85] | 59 | Actual and predicted body weight | Good predictor of ICU mortality |
| | Craig et al. [45] | 44 | Predicted body weight | Independent predictor of ICU mortality |
| | Brown et al. [37] | 59 | Predicted body weight | Independent predictor of ICU mortality |
| | Jozwiak et al. [36] | 200 | Predicted body weight | Independent predictor of Day 28 mortality |

*Jozwiak & al ICM 2015*



1° cause d'OAP «hydrostatique» = Insuffisance cardiaque aigue

- ↗ Ph Cap. = ↗ PTDVG
- 95% des patients avec ICA présentent des signes de surcharge pulmonaire

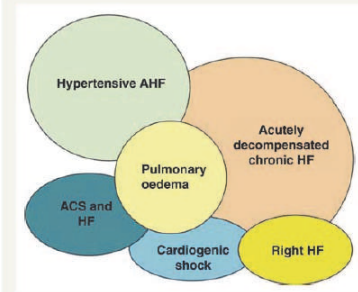
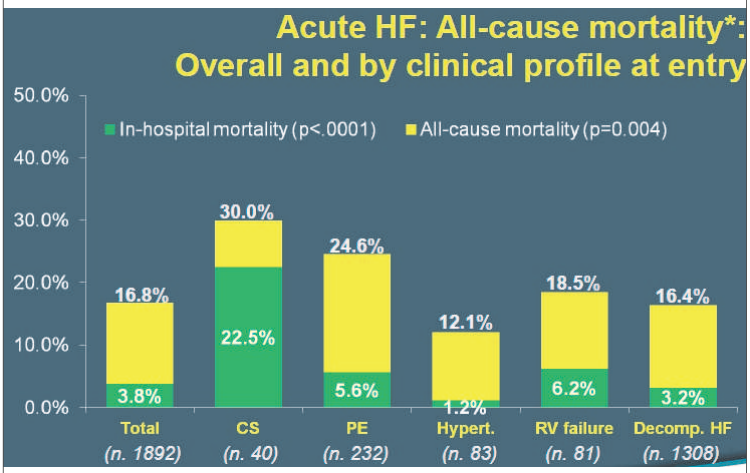
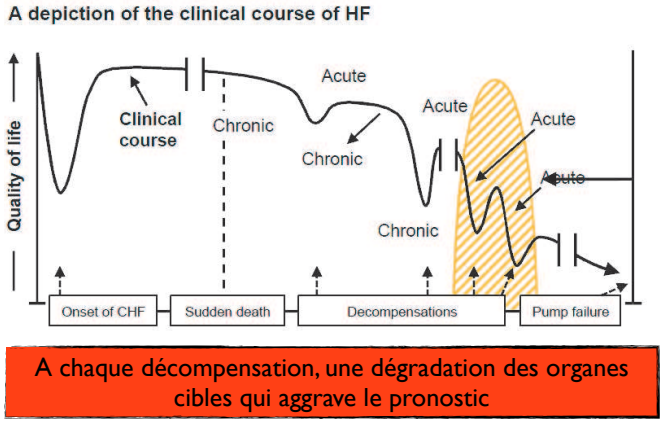



**Figure 1** Presenting clinical profiles. Reproduced with permission from Dickstein *et al.*, modified from Filippatos/Zannad *Heart Fail Rev* (2007) **12**:87–90[7]. AHF, acute heart failure, ACS, acute coronary syndrome, HF, heart failure.




European Journal of Heart Failure (2013) 15, 808–817

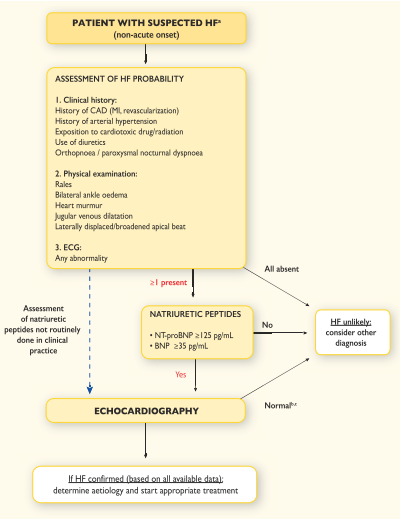





A chaque décompensation, une dégradation des organes cibles qui aggrave le pronostic

*Circulation.* 2012;125:1928-1952






*L'examen clinique est rarement normal*

*L'ECG est rarement normal*

*Les BNP ont une bonne VPN (> 90%) mais la VPP est médiocre (66%)*

*Ponikowki & al Eur Heart J 2016*

*Madamanchi & al Int J cardiol 2014*



## Causes non cardiaques d'augmentation des peptides natriurétiques

| | |
|---|---|
| **Cardiac** | Heart failure<br>Acute coronary syndromes<br>Pulmonary embolism<br>Myocarditis<br>Left ventricular hypertrophy<br>Hypertrophic or restrictive cardiomyopathy<br>Valvular heart disease<br>Congenital heart disease<br>Atrial and ventricular tachyarrhythmias<br>Heart contusion<br>Cardioversion, ICD shock<br>Surgical procedures involving the heart<br>Pulmonary hypertension |
| **Non-cardiac** | Advanced age<br>Ischaemic stroke<br>Subarachnoid haemorrhage<br>Renal dysfunction<br>Liver dysfunction (mainly liver cirrhosis with ascites)<br>Paraneoplastic syndrome<br>Chronic obstructive pulmonary disease<br>Severe infections (including pneumonia and sepsis)<br>Severe burns<br>Anaemia<br>Severe metabolic and hormone abnormalities (e.g. thyrotoxicosis, diabetic ketosis) |

*Faux négatif : obèse*

*Ponikowski & al Eur Heart J 2016*



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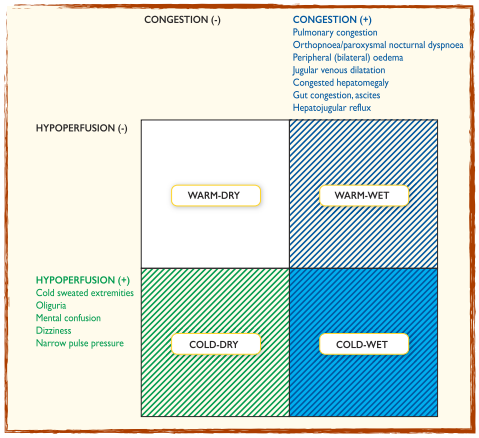
## Diagnostic clinique

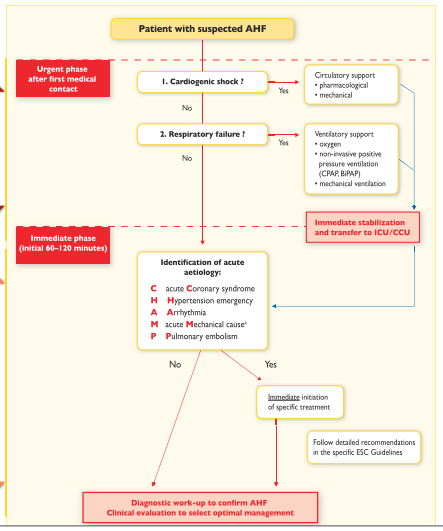


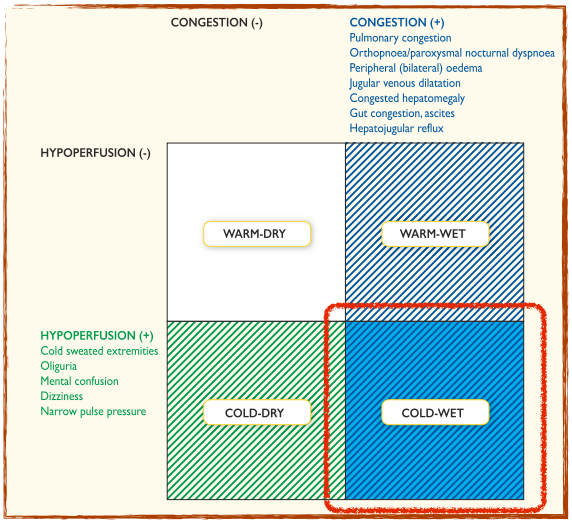

*Ponikowski & al Eur Heart J 2016*



*Phase urgente*

*Phase immédiate*








# Prise en charge respiratoire phase urgente

| | | |
|---|---|---|
| La VNI doit etre considérée chez tout les patients en détresse respiratoire aigue et commencé dès que possible | IIa | B |
| La ventilation mécanique est recommandée pour les patients en échec de traitement non invasif | I | C |
| $O_2$ > 90% et $Po_2$ > 8 kPa | I | C |

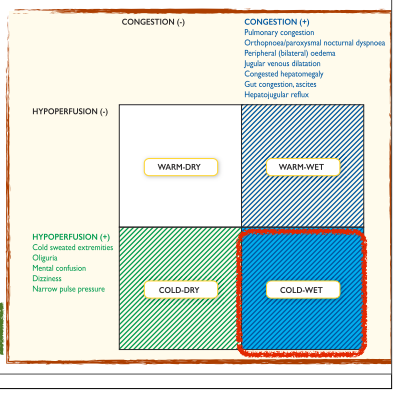


# Identification des patients instable hémodynamiquement

OAP + hypoTA/ hypoperfusion

Pronostic péjoratif

PEC en centre spécialisée





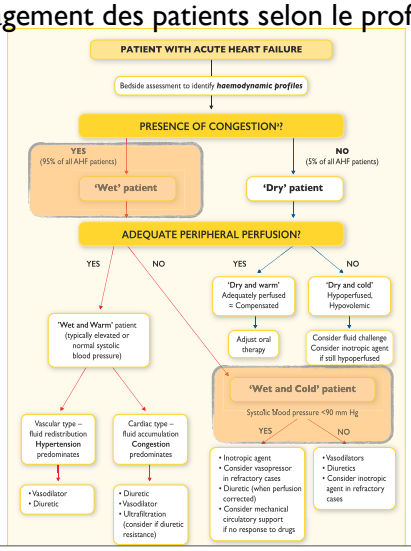

# Phase immédiate

- Identification des facteurs déclenchant nécéssitant une PEC urgente (< 120mn)
  - Sy coronarien aigue (Angio<2h)
  - Complication mécanique aigue (IM rupture de cordage, Endocardite...)
  - Urgence hypertensive
  - Urgence rythmique

| | |
|---|---|
| Role de l'ETT à la phase aigue surtout si instable hémodynamiquement | I |



## Management des patients selon le profil clinique






# Prise en charge médicamenteuse

| | | |
|---|---|---|
| **Diuretics** | | |
| Intravenous loop diuretics are recommended for all patients with AHF admitted with signs/symptoms of fluid overload to improve symptoms. It is recommended to regularly monitor symptoms, urine output, renal function and electrolytes during use of diuretics. | I | C |
| In patients with new-onset AHF or those with chronic, decompensated HF not receiving oral diuretics the initial recommended dose should be 20–40 mg i.v. furosemide (or equivalent); for those on chronic diuretic therapy, initial i.v. dose should be at least equivalent to oral dose. | I | B |
| It is recommended to give diuretics either as intermittent boluses or as a continuous infusion, and the dose and duration should be adjusted according to patients' symptoms and clinical status. | I | B |
| Combination of loop diuretic with either thiazide-type diuretic or spironolactone may be considered in patients with resistant oedema or insufficient symptomatic response. | IIb | C |
| **Vasodilators** | | |
| i.v. vasodilators should be considered for symptomatic relief in AHF with SBP >90 mmHg (and without symptomatic hypotension).<br>Symptoms and blood pressure should be monitored frequently during administration of i.v. vasodilators. | IIa | B |
| In patients with hypertensive AHF, i.v. vasodilators should be considered as initial therapy to improve symptoms and reduce congestion. | IIa | B |
| **Inotropic agents – dobutamine, dopamine, levosimendan, phosphodiesterase III (PDE III) inhibitors** | | |
| Inotropic agents are not recommended unless the patient is symptomatically hypotensive or hypoperfused because of safety concern. | III | A |
| **Other drugs** | | |
| For acute control of the ventricular rate In patients with atrial fibrillation:<br>a. digoxin and/or beta-blockers should be considered as the first-line therapy.[d]<br>b. amiodarone may be considered. | IIa<br>IIb | C<br>B |

# Peu de nouveauté !

**Table 4** Short- and long-term novel therapies for acute heart failure syndromes

| Short term | Long term | Both |
|---|---|---|
| Cinaciguat | Direct renin inhibitors | Adenosine antagonists |
| CD-NP | Macronutrients | Vasopressin antagonists |
| Relaxin | Micronutrients | Digoxin |
| Adenosine regulating agents | CRT/AICD | |
| Stresscopin | | |
| Istaroxime | | |
| Cardiac myosin activators | | |

European Heart Journal (2010) **31**, 784–793

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# Et l'EER /UF ?

| Recommendations | Class [a] | Level [b] | Ref [c] |
|---|---|---|---|
| Ultrafiltration may be considered for patients with refractory congestion, who failed to respond to diuretic-based strategies. | IIb | B | 578–580 |
| Renal replacement therapy should be considered in patients with refractory volume overload and acute kidney injury. | IIa | C | |

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# Medical History

- **43 year-old male with no past medical history**
- **Posterior STEMI**
- **Primary PCI at H12 in local hospital ( no on site surgery )**
- **Proximal Cx TIMI 0 and Mild LAD stenosis**
- **Succesful Cx desobstruction ( Thrombo-aspiration and BMS implantation )**
- **At d5 acute pulmonary oedema mechanical ventilation**
- **Ventilator acquired pneumoniae -Septic shock**
- **Weaning failure from ventilator the next 3 wks**
- **A TEE done during one failed weaning test demonstrated massive MR and EF% 35**
- **Tranferred for urgent mitral valve surgery**
- **At arrival , patient was sedated,ventilated with low tidal volume - 100% O² ( P/F ratio 90 ) and under 1 mg/h epinephrine**

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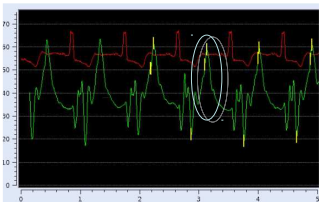
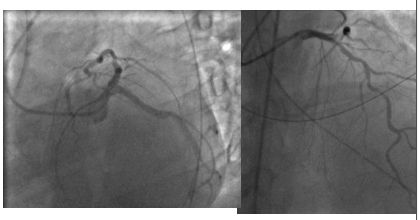
# Hemodynamic and TEE evaluation on arrival





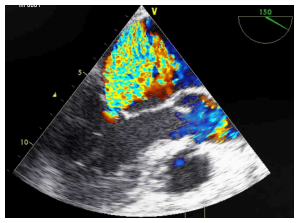
MeanPulmonary wedge pressure 38 mmHg

Mean pulmonary artery pressure 55 mmHg

Cardiac Index 2.3 l:mn:m²

Aortic pressure 85/50 mmHg

Left ventricular pressure 90/35 mmHg



Grade IV acute mitral regurgitation and EF % 35

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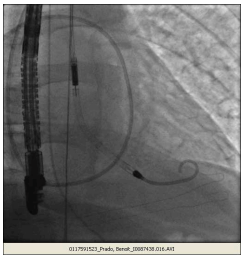
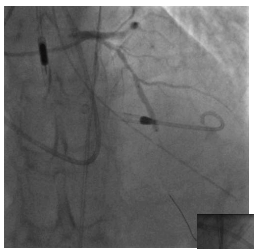
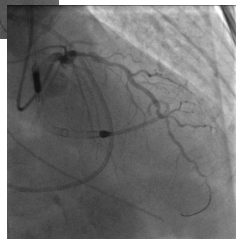
# Impella LP 2.5 implantation and LAD PCI







Succesful implantation of Impella 2.5 by right femoral artery

Signifcant mild LAD stenosis treated with BMS implantation

Pemeability of the Prox Circumflex stent

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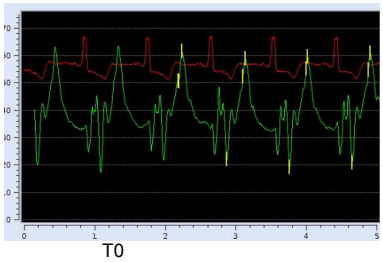
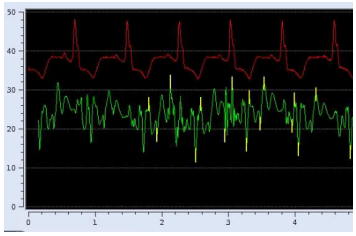
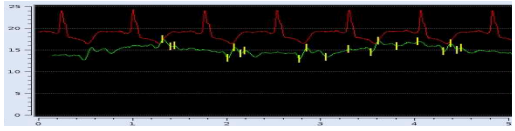
Pulmonary wedge pressure evolution under Impella implantation



T0



T 15 mn



T30mn

Mean Pulmonary wedge pressure 15 mmHg at 30 mn

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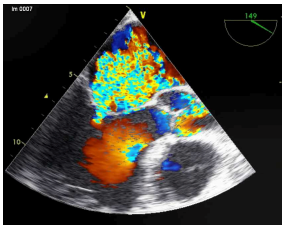
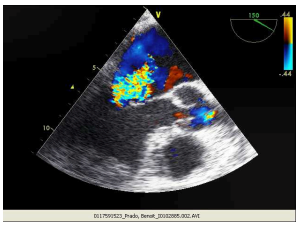
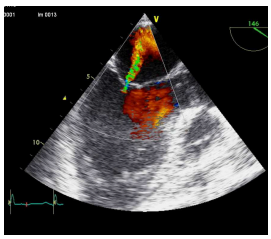
## Confirmed by TEE ..



Before impella …





After …



# Conclusion

- OAP hydrostatique associé à une surmortalité
- La première cause est l'insuffisance cardiaque aigue
- La prise en charge est
  - «urgente» : PEC Ins Resp Aigue et identifier les chocs cardiogéniques
  - «immédiate» (<120mn): SCA , complications mécaniques
- Apport diagnostic et pronostic de l'ETT