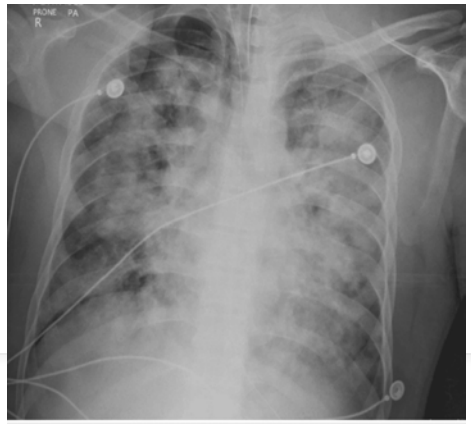
Choix du monitorage hémodynamique

NUNES Denis,
Service de Médecine Intensive Réanimation,
Hôpital Edouard Herriot

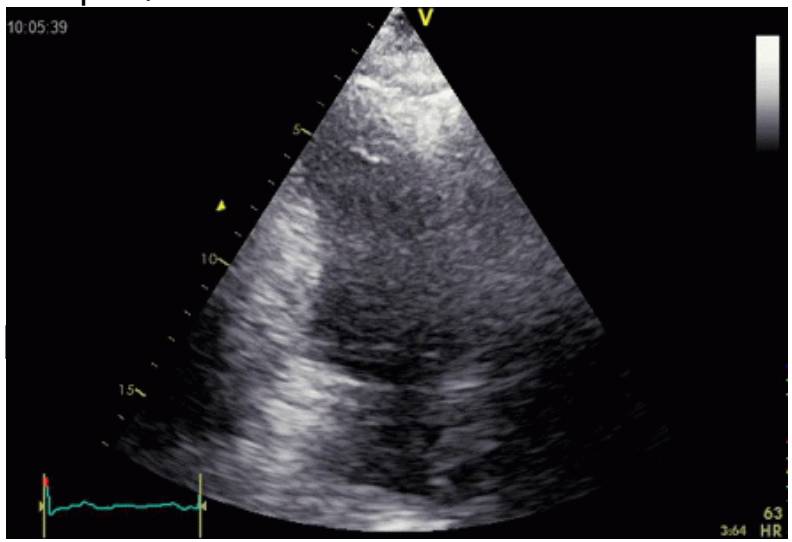
Cas clinique



Comment comprendre ce qu'il se passe et choisir le bon traitement ?

›hérique, mesure PA

c



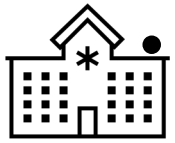
Lyon 1

HCL
HOSPICES CIVILS DE LYON

Le monitorage hémodynamique

Suivi en temps réel de paramètres permettant :

- De détecter une insuffisance circulatoire
- D'en comprendre le mécanisme
- D'évaluer la réponse aux traitements



Choc

Monitorage non invasif

→ Pression brassard !

The NEW ENGLAND JOURNAL of MEDICINE

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Deferring Arterial Catheterization in Critically Ill Patients with Shock

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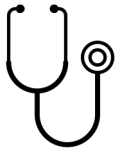
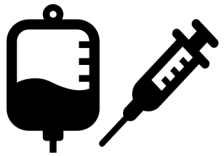
CONCLUSIONS

Among patients with shock, results for death from any cause at day 28 indicated that management without early arterial catheter insertion was noninferior to early catheter insertion. (Funded by the French Ministry of Health; ClinicalTrials.gov number, NCT03680963.)

[PSE] Norépinéphrine (Noradrénaline®): 16 mg/48 ml (333,3 µg/ml)

→ objectif de PAM (mmHg) : 65-75 mmHg (Jour 9)





Choc

Non Invasif

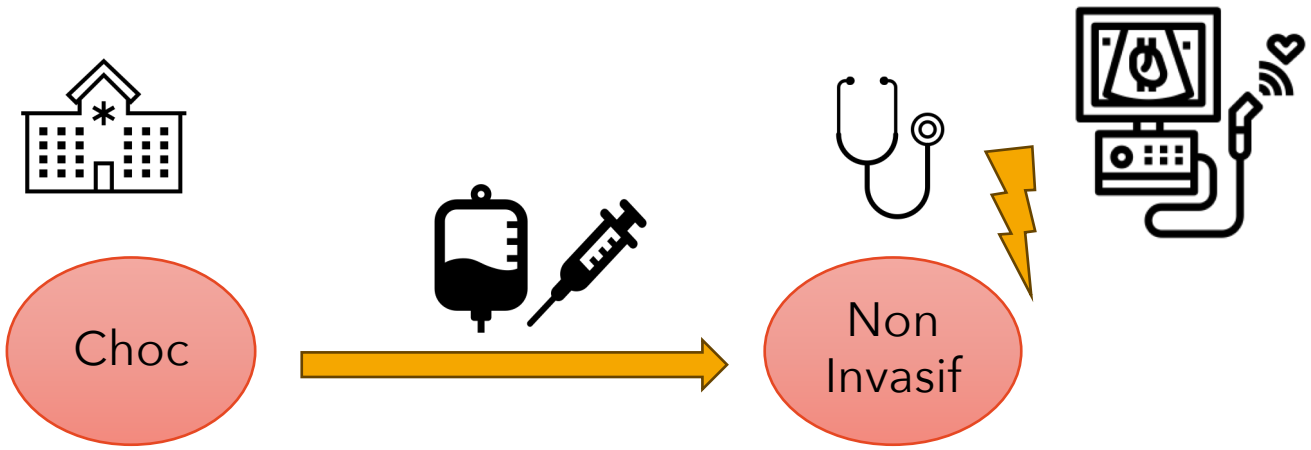
Lyon 1

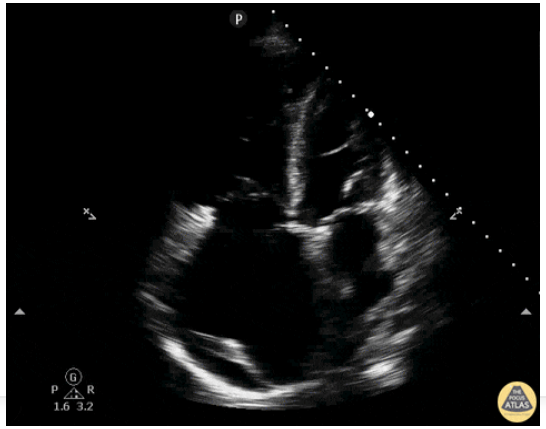
HCL HOSPICES CIVILS DE LYON

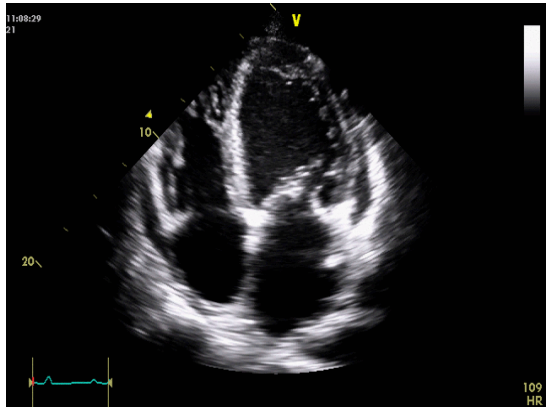
Et l'échographie ?

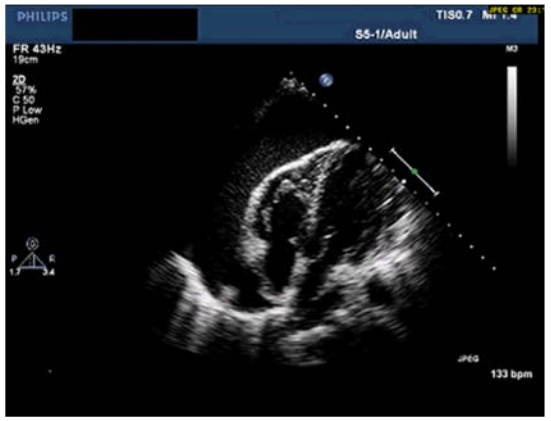
- Indispensable
- Bonne reproductibilité … mais non parfaite
- Chronophage

→ n'est pas un outil de monitorage

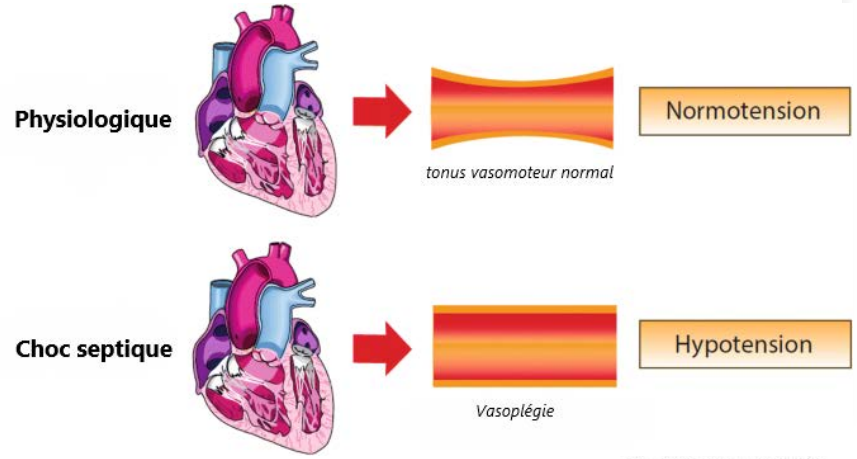




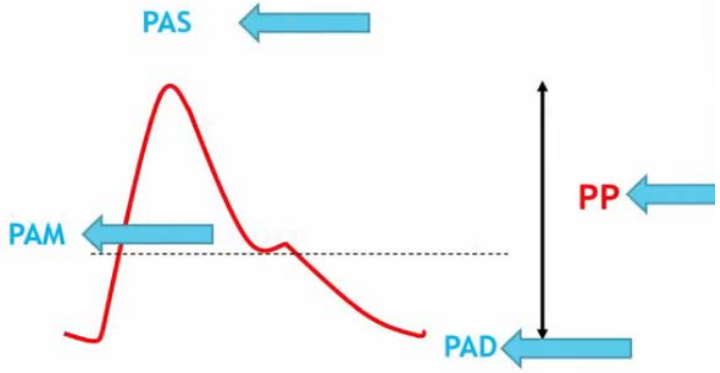


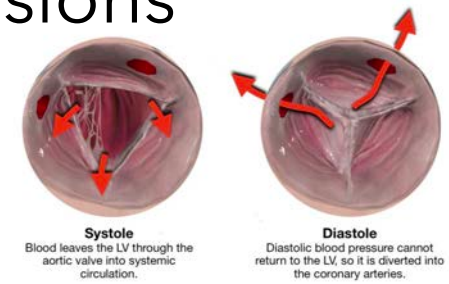


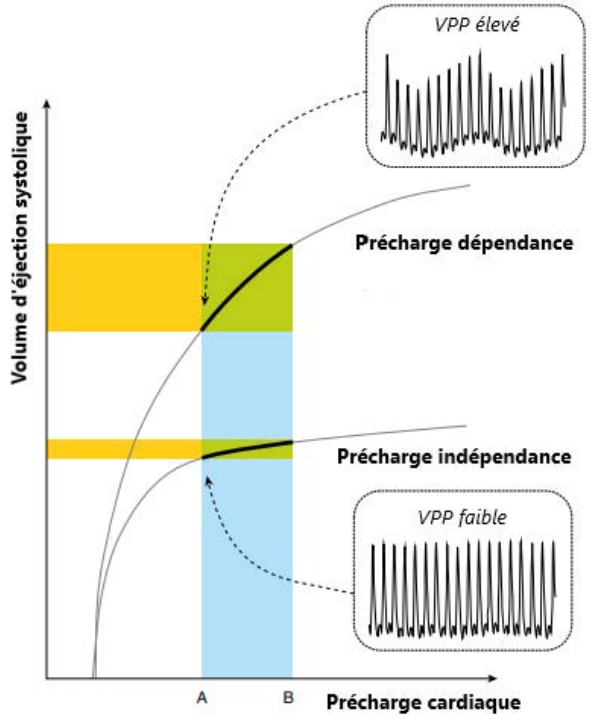
Monitorage "mini-invasif"

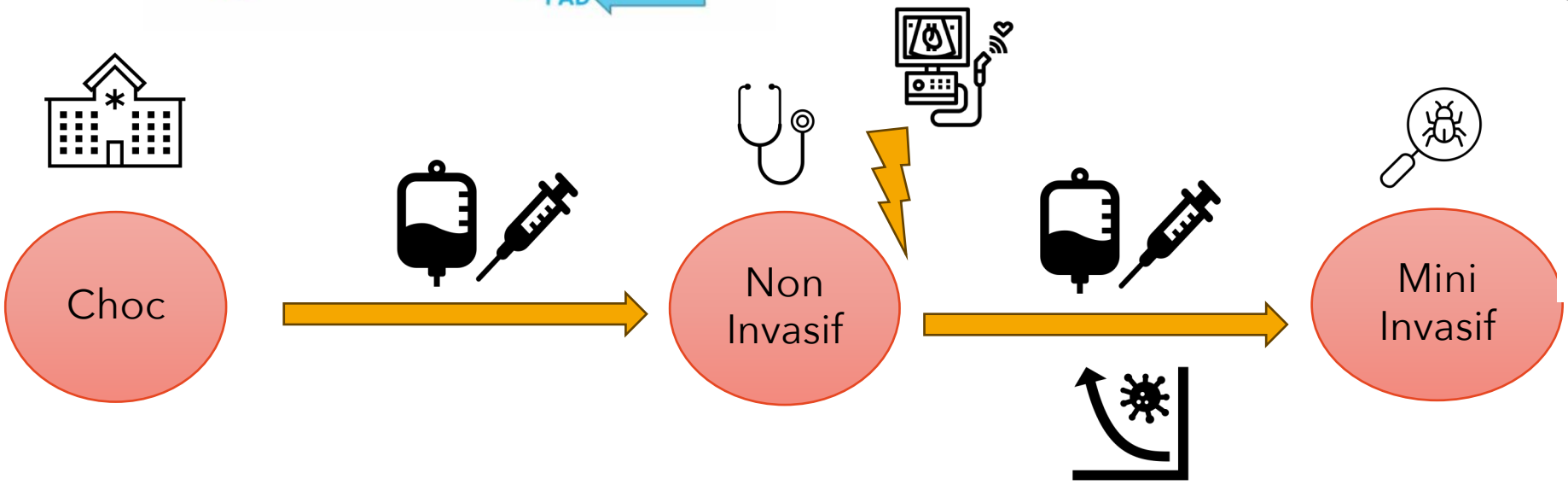


Cathéter artériel = donne 4 pressions









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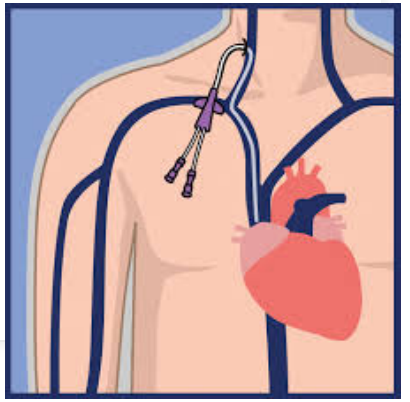
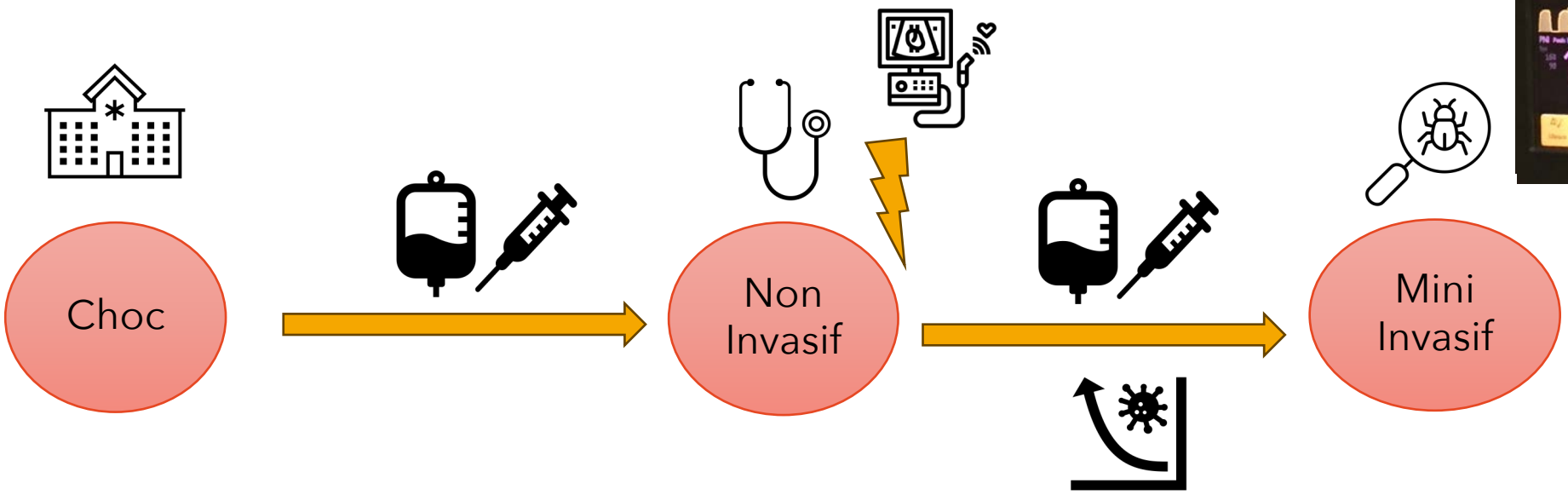


Cathéter veineux central = PVC

1) Type de choc
2) Alarme si valeurs extrêmes



Lyon 1

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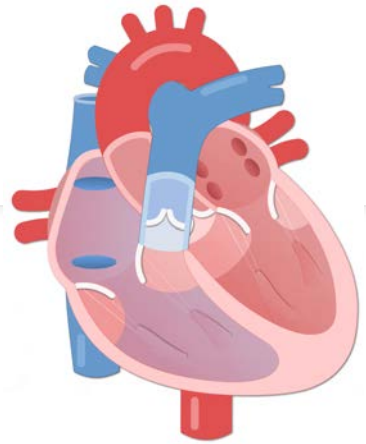
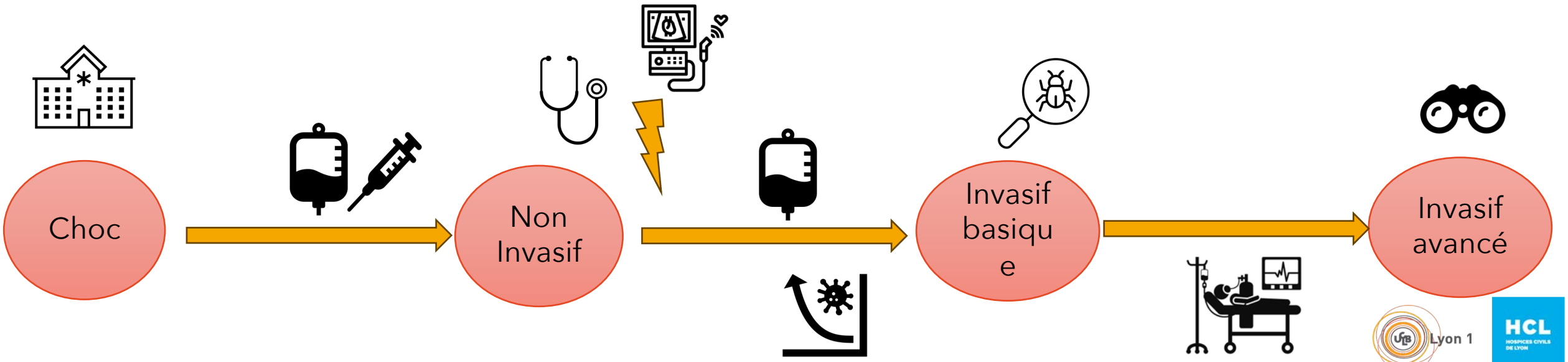
DE LYON

Le monitorage "invasif avancé"



= la mesure d'un débit cardiaque

= la mesure précise de l'apport d'O2 aux tissus



Mesurer le débit cardiaque

Systèmes avancés

Analyse calibré de l'onde de pouls

Systèmes « mini » invasifs

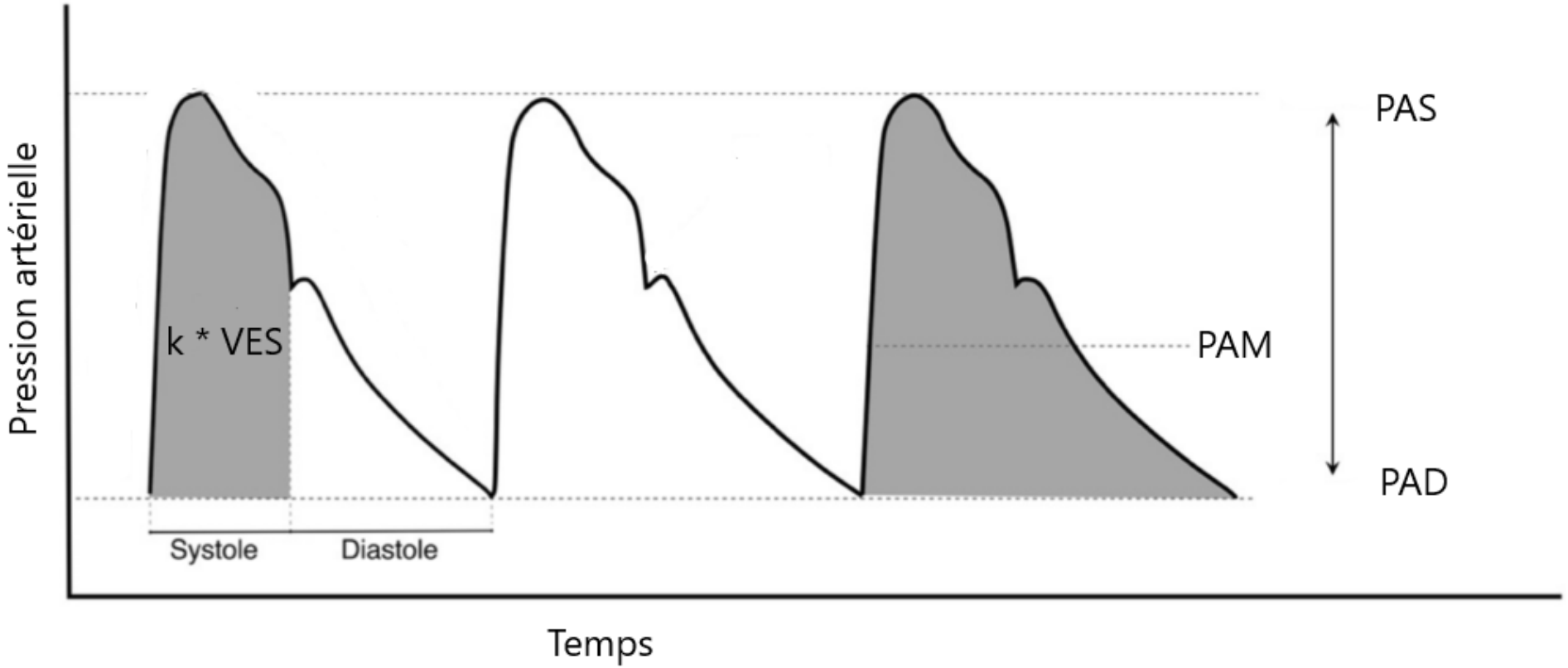
Analyse non calibré de l'onde de pouls

on invasifs

Analyse indirecte de l'onde de pouls

Mesurer le débit cardiaque

Contour de l'onde de pouls



Mesurer le débit cardiaque

Systèmes avancés

Analyse calibré de l'onde de pouls

Systèmes « mini » invasifs

Analyse non calibré de l'onde de pouls

Systèmes non invasifs

Analyse indirecte de l'onde de pouls

<u>3 défauts majeurs ici :</u>

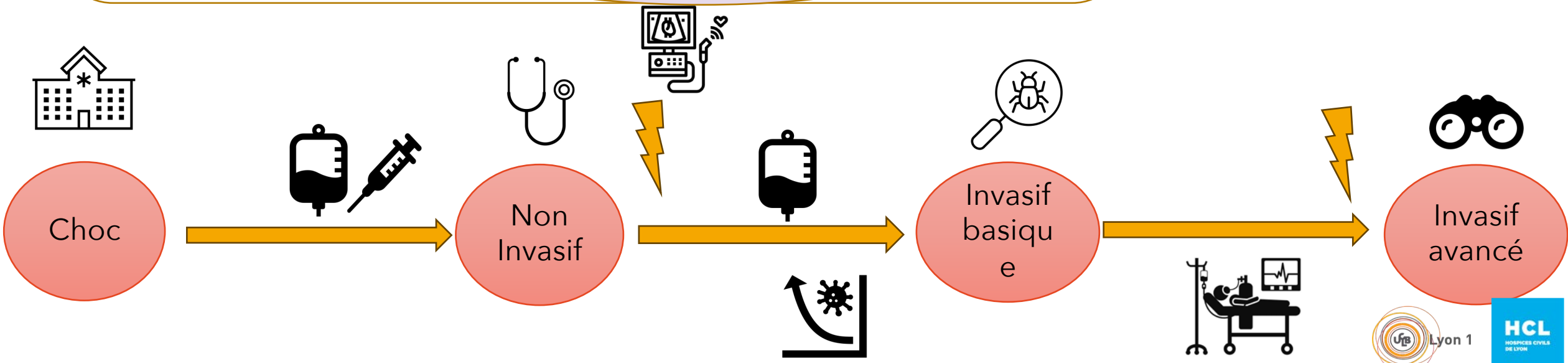
1) Méthodes imprécises et peu fiable en réanimation
2) Informations limitées = uniquement le débit
3) Patients graves qui auront une invasivité importante

Le monitorage invasif avancé

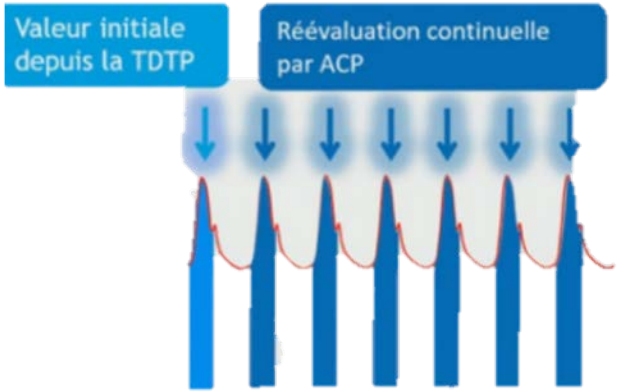
Systèmes avancés

Thermodilution

Analyse calibré de l'onde de pouls

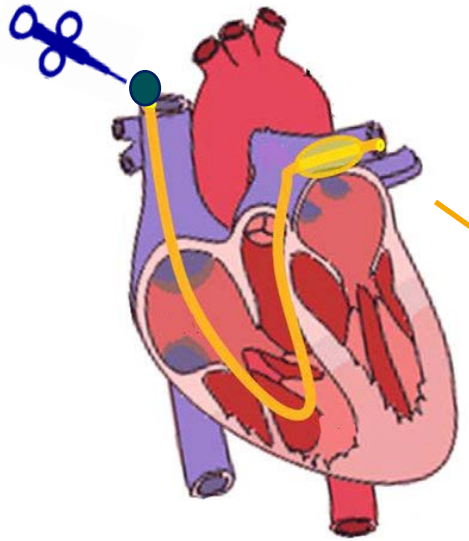


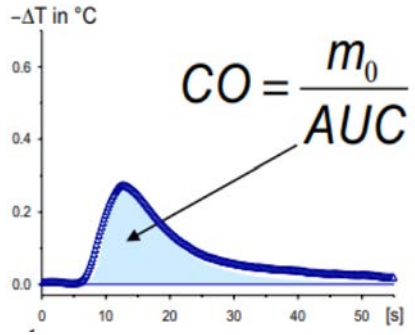
Mesurer le débit cardiaque



La thermodilution

- Transpulmonaire (= Picco)
- Pulmonaire (= Swan Ganz)



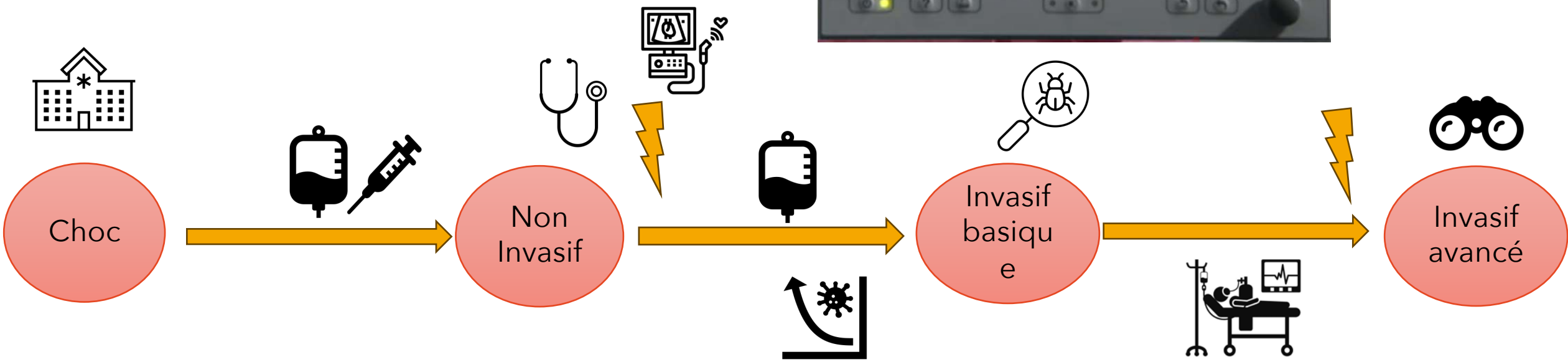


$$CO = \frac{m_0}{AUC}$$

D'après Teboul J-L et al. Intensive Care Med. 2016 & Monnet, X SRLF 2018

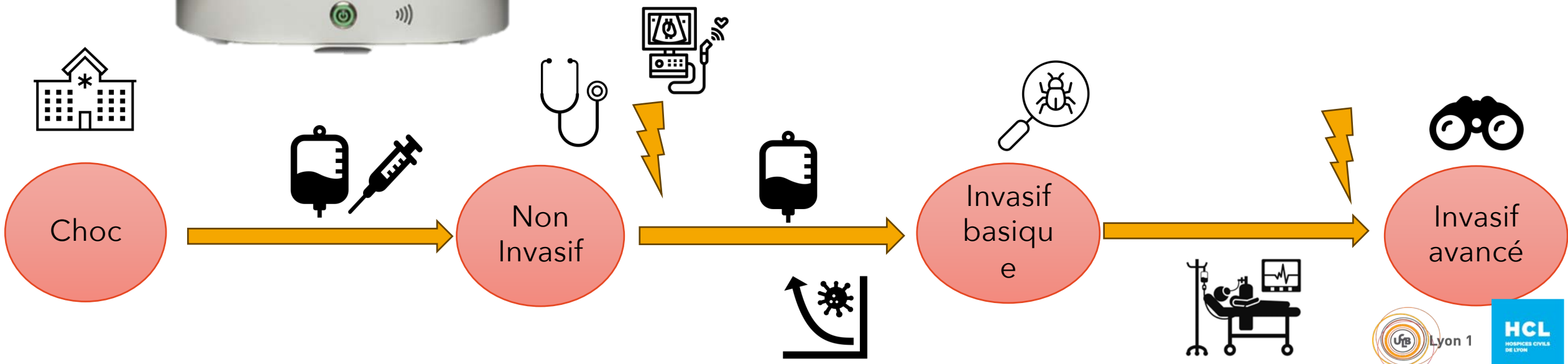
Le monitorage invasif avancé

PICCO / Ev100
Simple à mettre (attention à l'artère)
Analyse continue avec thermodilution fréquentes
Eléments de gravité pulmonaire → *Eau pulmonaire et Indice de perméabilité*
Test de précharges tous possibles
Calculs multiples paramètres



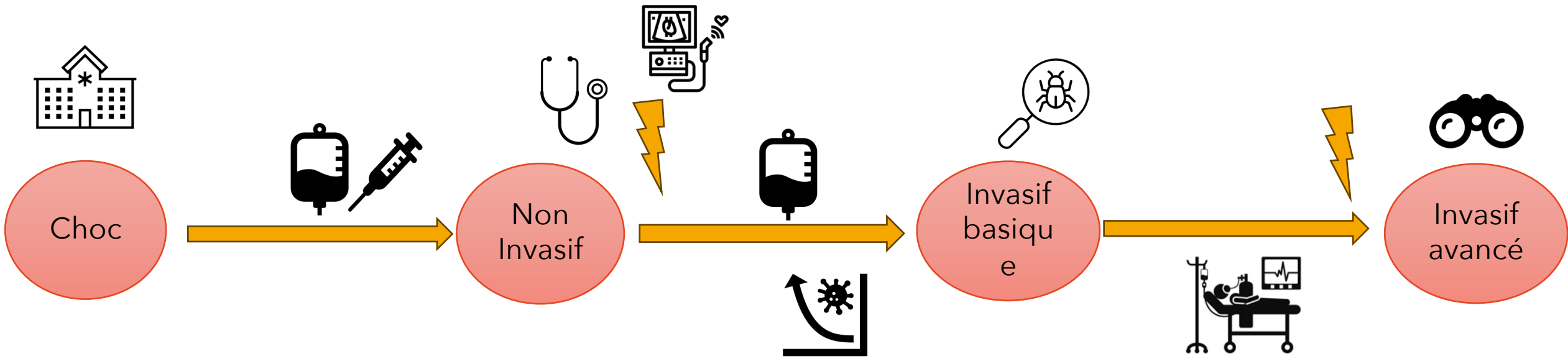
Le monitorage invasif avancé

Catheter pulmonaire (Swann-Ganz)
Pose & utilisation plus difficile
Analyse **semi-continue** avec thermodilution fréquentes
Donne la PAPO = pressions de remplissage gauche
Mesure SvO2
Estimation fine des pressions droites



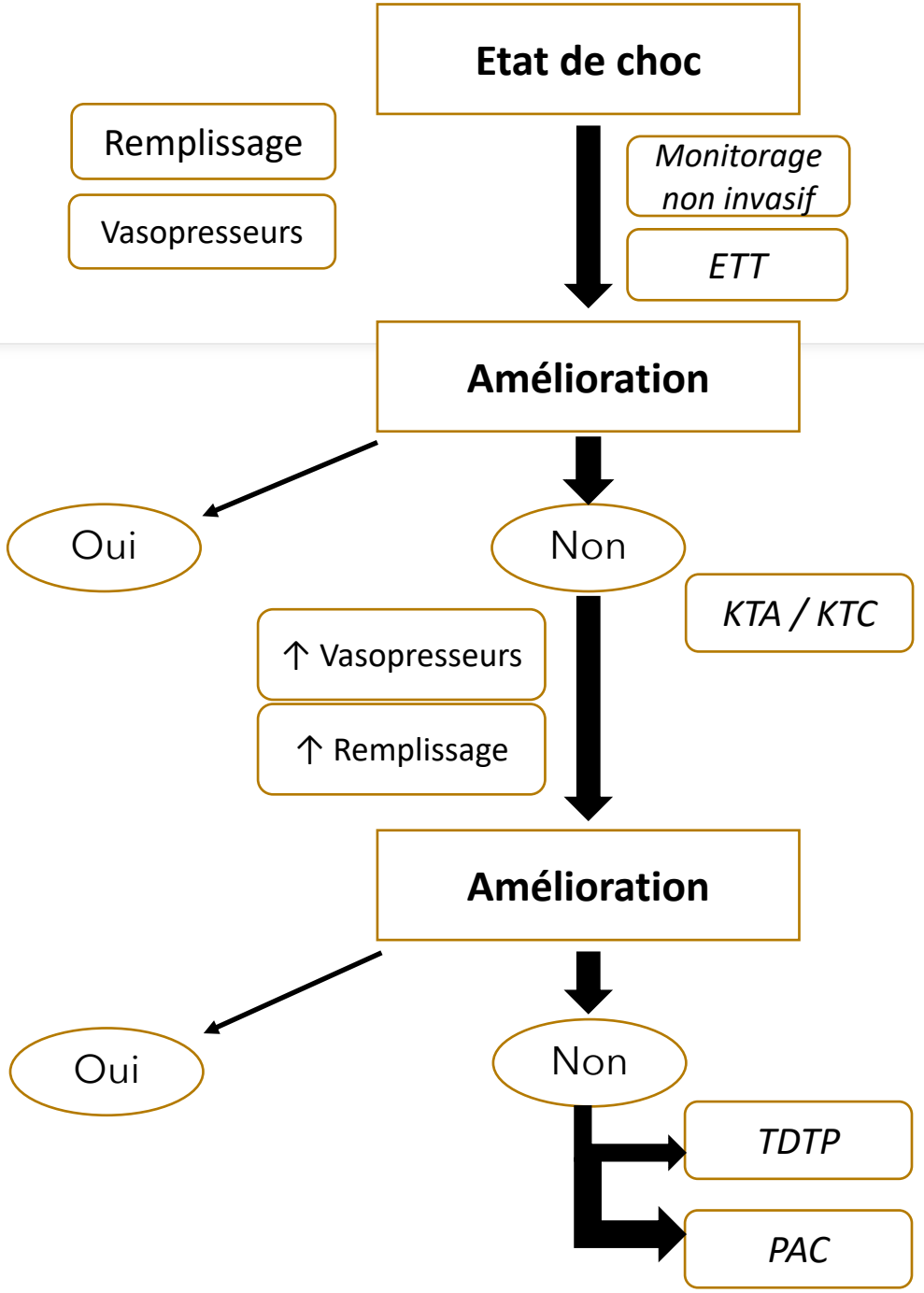
Le monitorage invasif avancé

PICCO / Ev100	Catheter pulmonaire (Swann-Ganz)
Simple à mettre (attention à l'artère)	Pose & utilisation plus difficile
Analyse continue avec thermodilution fréquentes	Analyse **semi-continue** avec thermodilution fréquentes
Eléments de gravité pulmonaire → *Eau pulmonaire et Indice de perméabilité*	Donne la PAPO = pressions de remplissage gauche
Test de précharges tous possibles	Mesure SvO2
Calculs multiples paramètres	Estimation fine des pressions droites



Conclusion


esicm
ESICM GUIDELINES ON CIRCULATORY SHOCK AND HEMODYNAMIC MONITORING 2025
ICM
QUESTION: Update of ESICM guidance on diagnosing shock and hemodynamic monitoring in adult ICU patients. Defines what to assess, when to intervene, and how to monitor, using PICO-framed questions and graded evidence to support practice.
CONCLUSION: Expert panel issued 50 statements to standardize assessment of shock. Guidance emphasizes serial tissue perfusion assessment, dynamic predictors of fluid responsiveness, targeted fluid use, arterial line and CO/SV monitoring in non-responders, and first-line echocardiography for type of shock.
1 RECOMMENDATION STRENGTH
STRONG RECOMMENDATION
WEAK RECOMMENDATION
UNGRADED DEFINITION
UNGRADED GOOD PRACTICE STATEMENT
2 CERTAINTY OF EVIDENCE
HIGH
MODERATE
LOW
VERY LOW
UNGRADED
3 AGREEMENT STRENGTH
WEAK
STRONG
SHOCK
The typical features are hypotension, tachycardia, and signs of hypoperfusion, such as abnormal skin perfusion, decreased urine output, and altered mental status. Although hypotension is commonly present, it is not required to define shock.
Monitoring skin perfusion should be performed using the assessment of CRT and this could be complemented with the assessment of skin temperature and mottling.
In patients with a central venous catheter and an arterial catheter, serial measurement of the veno-arterial difference in carbon dioxide partial pressure ($P_{v-a}CO_2$) should be performed.
When feasible, the assessment of microcirculation may be considered as an adjunct to comprehensive hemodynamic evaluation.
FLUID THERAPY
The potential benefit of fluid administration, predicted by the assessment of fluid responsiveness, should be weighed against the potential risk of fluid administration.
The risk of harm from fluid administration could be assessed using markers such as intravascular filling pressures, intra-abdominal pressure, extravascular lung water (EVLW), pulmonary vascular permeability index (PVPI), venous excess ultrasound (VExUS) grading, the ratio of the arterial oxygen partial pressure over the inspired oxygen fraction (PaO_2/FiO_2) ratio, or lung ultrasound score (LUS).
A fluid challenge is defined as a bolus of 200 to 500 mL given over 5-10 minutes while evaluating its effects.
The effectiveness of a fluid bolus in improving tissue perfusion should be evaluated by considering changes in variables such as CRT, skin mottling, $S_{cv}O_2$, carbon dioxide partial pressure (pCO_2)-derived variables, and lactate.
We recommend the passive leg raising (PLR) test to assess fluid responsiveness in mechanically ventilated patients in shock, with and without spontaneous breathing activity.
We recommend the end-expiratory occlusion test as an alternative to PLR test in mechanically ventilated patients in shock without spontaneous breathing activity.
HAEMODYNAMIC MONITORING
Cardiac output and/or stroke volume should be monitored in patients who do not respond to initial therapy to assess the type of shock, evaluate hemodynamic status, and determine therapeutic response.
When CO is monitored, its adequacy should be interpreted by evaluating organ function, tissue oxygenation, metabolism, and perfusion.
Transpulmonary thermodilution or pulmonary artery dilution with the pulmonary artery catheter (PAC) may be considered in patients for whom CO monitoring is required.
In patients with shock and moderate-to-severe ARDS, transpulmonary thermodilution or the PAC may be considered for guiding fluid therapy.
Serial echocardiographic evaluations should be performed to provide additional information on cardiac function, even when CO is monitored.
Arterial pressure should be monitored with an arterial catheter in shock that is not responsive to initial therapy and/or requiring vasopressor infusion.
The target blood pressure should be individualized during resuscitation of patients with shock.
A higher MAP target may be considered in patients with septic shock and a history of chronic arterial hypertension who show clinical improvement with higher blood pressure.
A higher MAP target may be considered in patients with septic shock with high CVP values who show clinical improvement with higher blood pressure.
Lower MAP targets may be considered in patients with traumatic hemorrhagic shock and uncontrolled bleeding in the absence of traumatic brain injury.
In the initial phase following trauma, a target systolic arterial pressure of 80–90 mmHg (MAP 50–60 mmHg) should be used until major bleeding has been stopped when there is no clinical evidence of traumatic brain injury and coma (Glasgow Coma Score ≤ 8). In traumatic brain injury (Glasgow Coma Score ≤ 8), we recommend targeting an initial mean arterial pressure ≥80 mmHg.
Targeting an initial MAP of ≥ 65 mmHg may be considered in patients with cardiogenic shock.
Serial monitoring of intra-abdominal pressure (IAP) may be considered in patients with shock and established risk factors for intra-abdominal hypertension.
Central venous pressure should be measured in patients with shock who have a central venous catheter.
A pre-specified CVP value should not be targeted during the resuscitation of patients with shock.
ECHOCARDIOGRAPHY
In patients with shock, echocardiographically defined phenotypes of left and RV systolic function may be of prognostic significance.
In patients with circulatory shock, echocardiography leads to changes in management and supports therapeutic impact.
Monnet, X., Messina, A., Greco, M. et al. ESICM guidelines on circulatory shock and hemodynamic monitoring 2025. Intensive Care Med (2025). [DOI] Funding: This project is sponsored and supported by the European Society of Intensive Care Medicine (ESICM). There was no external funding, which was conducted on internal resources only. Ethics: N/A. Registration: N/A


Etat de choc
Remplissage
Vasopresseurs
Monitorage non invasif
ETT
Amélioration
Oui
Non
KTA / KTC
↑ Vasopresseurs
↑ Remplissage
Amélioration
Oui
Non
TDTP
PAC

Conclusion

- Monitorer c'est prendre une loupe et comprendre l'intérieur de notre patient
- Tous les patients n'en "bénéficient" pas
- Mais chez les patients les plus sévères, cela permet de choisir le bon chemin à au lieu de jeter une pièce en l'air