XI Reunión. Estado del Arte en
INSUFICIENCIA CARDIACA
PRÁCTICA CLÍNICA Y MODELOS ORGANIZATIVOS
Sede: Hotel Meliá MaríaPita, A Coruña
A CORUÑA 27-28 SEPTIEMBRE 2024

XI Meeting. State of the Art in
HEART FAILURE
CLINICAL PRACTICE AND ORGANIZATIONAL MODELS
Venue: Hotel Meliá MaríaPita, A Coruña
ACoruñaHF2024
A CORUÑA 27-28 SEPTEMBER 2024

CARDIOGENIC SHOCK CODE IN GALICIA
CÓDIGO SHOCK CARDIOGÉNICO EN GALICIA
Identification and initial management
Identificación y manejo inicial

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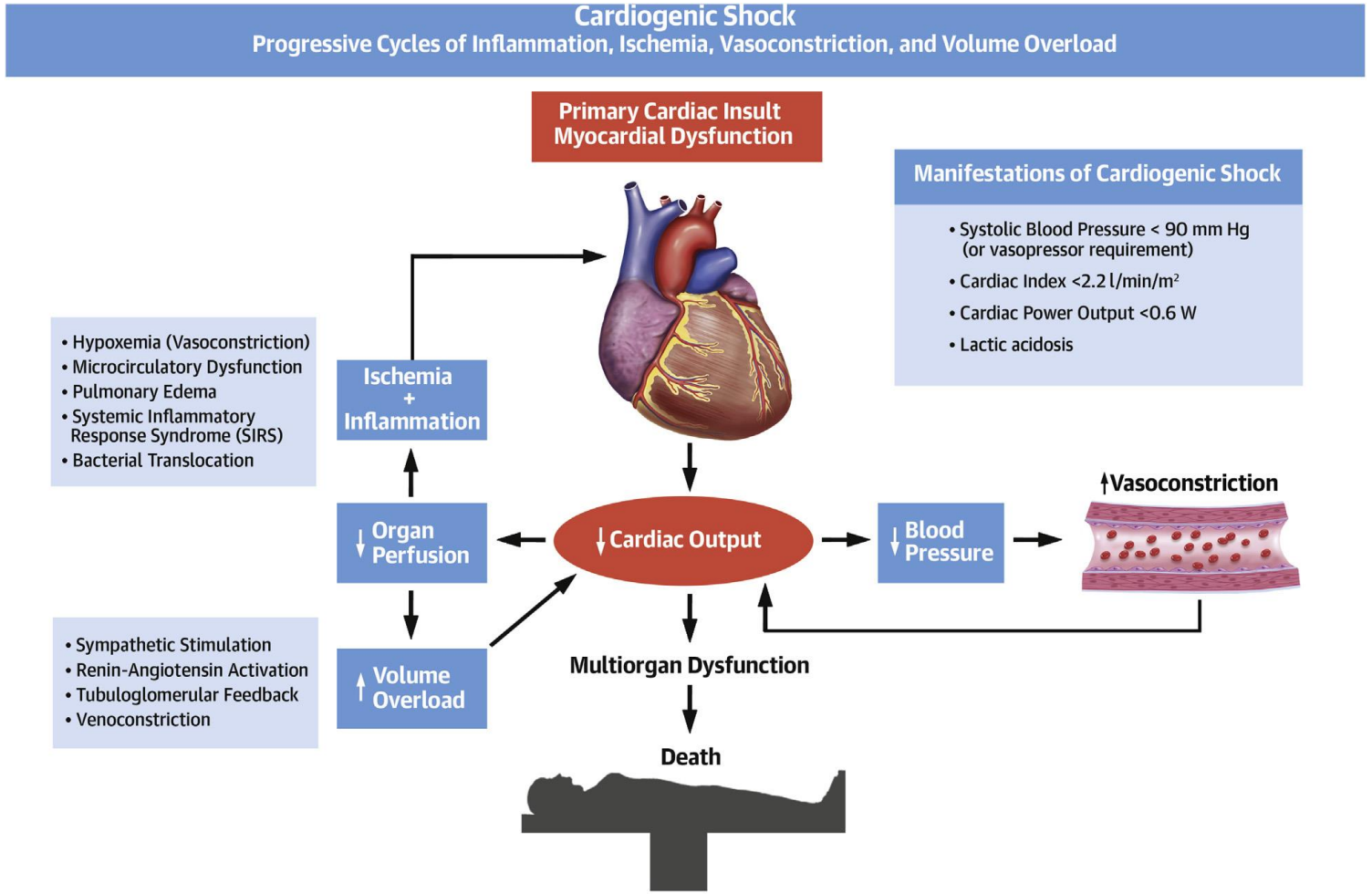
1. Introduction
2. Definition of cardiogenic shock and severity stratification
3. Identification of patients in cardiogenic shock
4. Diagnosis
5. Initial Management

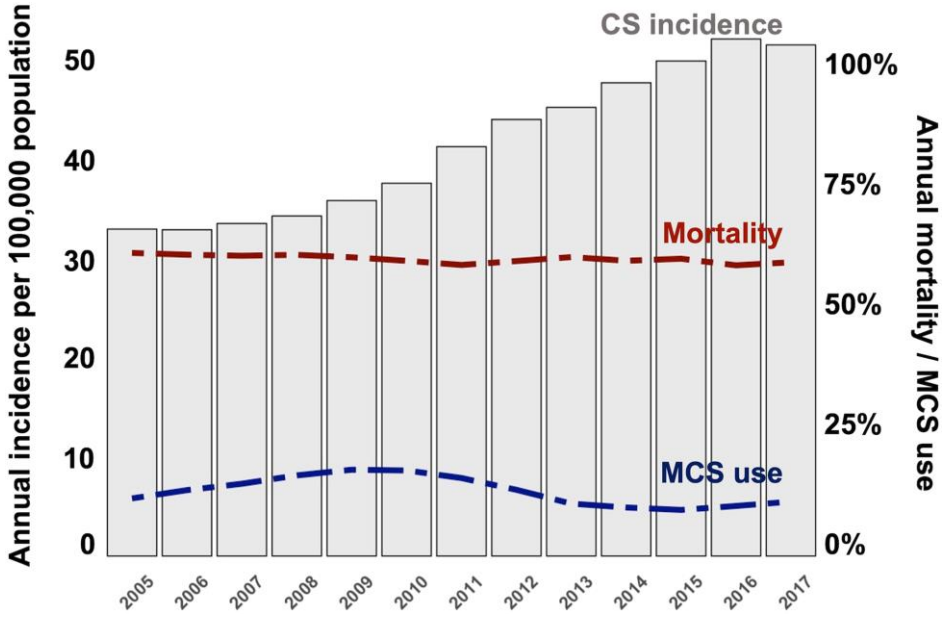
INTRODUCTION

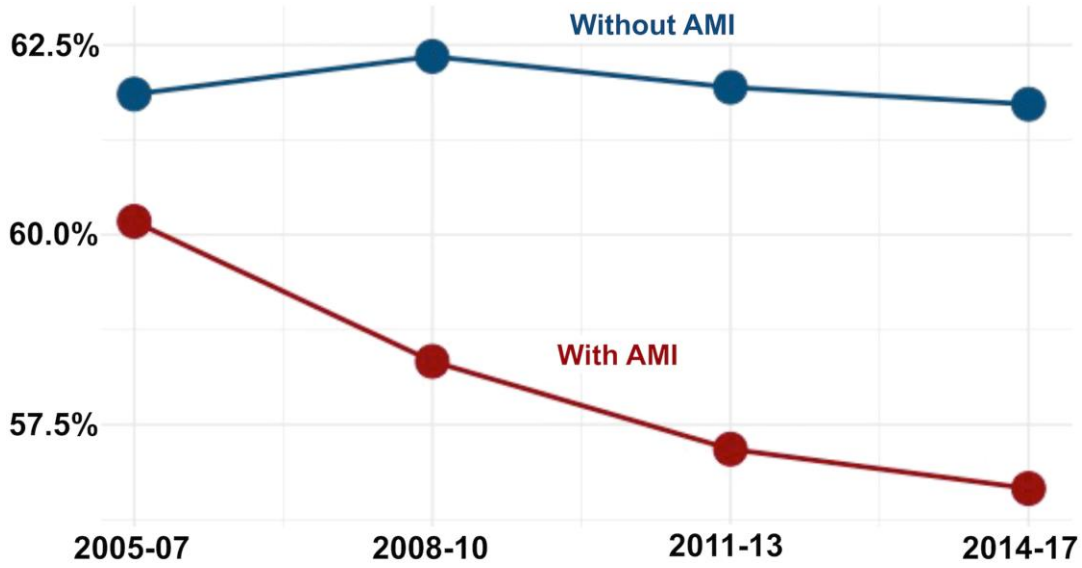


Tehrani et al. J Am Coll Cardiol HF 2020;8:879–91

INTRODUCTION

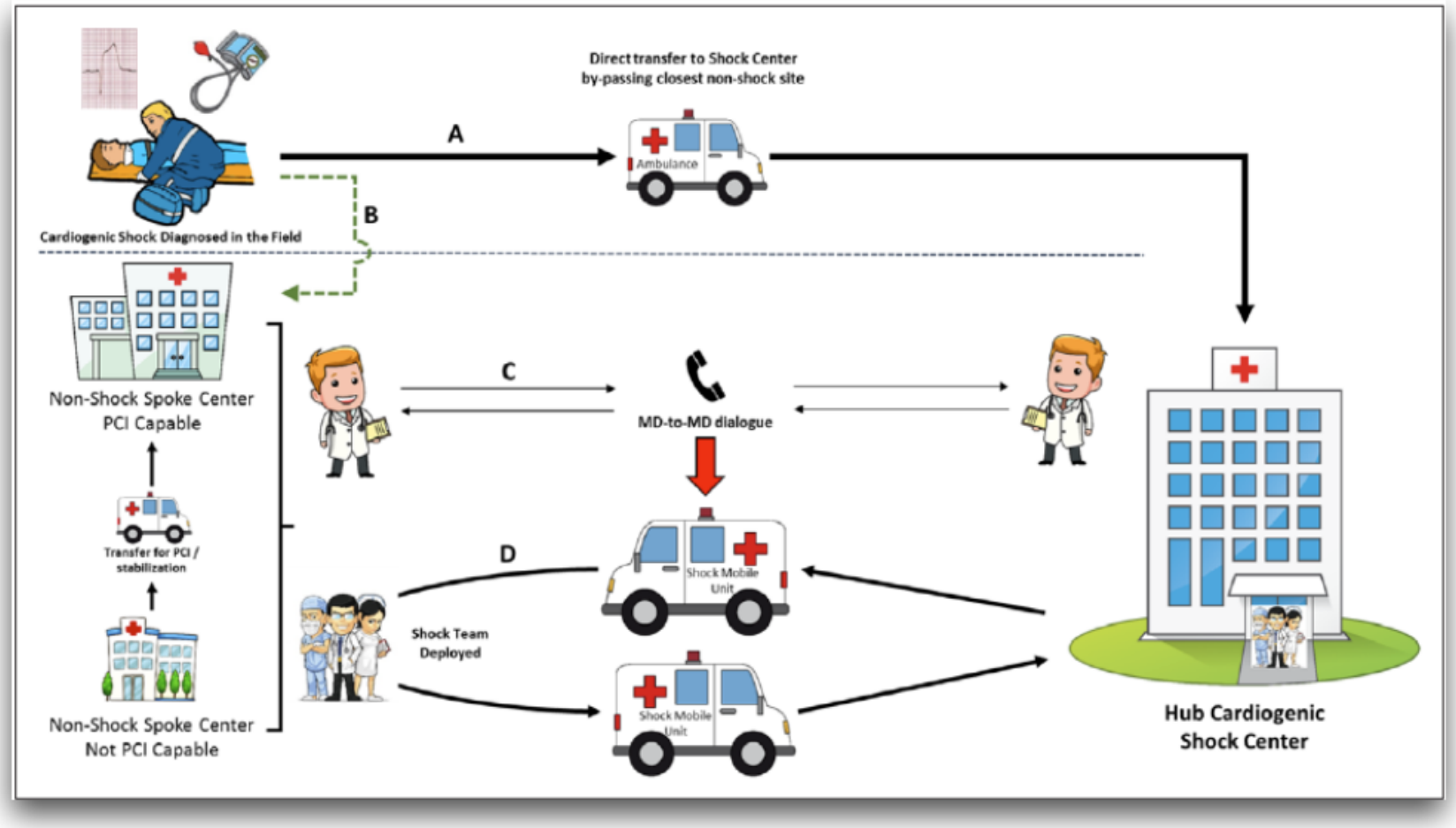
Increased incidence of cardiogenic shock
2-5% as a form of presentation of acute heart failure (AHF).
Prevalence of 15% in cardiac intensive care units (CICU) (≃ 30% in high-complexity units)
Increase in non-acute coronary syndrome (ACS) cardiogenic shock: less standardized management.





B. Schrage et al. ESC Heart Failure 2021; 8: 1295–1303

INTRODUCTION



van Diepen et al. Circulation 2017;136:232-268

1. Introduction
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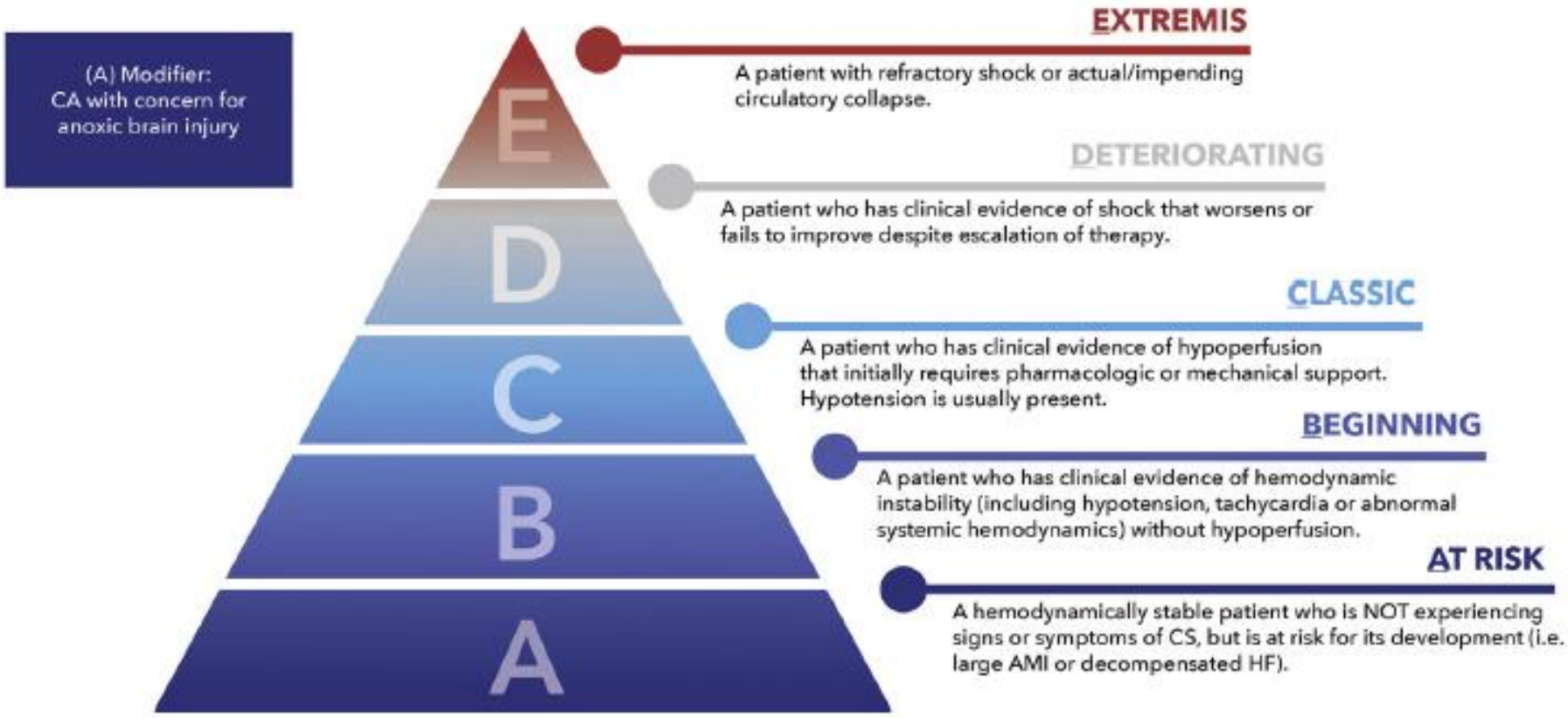
DEFINITION

Hypotension >30 min (a)	Evidence (clinical symptoms and/or signs) of:		Cause of shock is cardiogenic (d)
	Tissue hypo-perfusion with at least one of the following criteria (b):	Elevated left ventricular filling pressures (c)	
Systolic blood pressure <90 mm Hg for >30 min or need of vasopressors to maintain pressure >90 mm Hg during systole	1. Altered mental status 2. Cold, clammy skin and extremities 3. Oliguria with urine output <30 ml/h 4. Arterial lactate >2.0 mmol/l	Pulmonary congestion confirmed by: Clinical examination (new orthopnoea) or chest radiography Pulmonary capillary wedge pressure derived from: • Pulmonary artery catheterization or • By Doppler echocardiography (mitral E wave deceleration time ≤130 ms) Left ventricular end diastolic pressure (LVEDP) at catheterization >20 mm Hg	Left ventricular pump failure with a left ventricular ejection fraction <40% measured by: • Left ventriculography or • Echocardiography Shock secondary to mechanical causes: • Acute severe mitral regurgitation and/or mitral apparatus rupture. • Severe underlying valvular heart disease (e.g. aortic stenosis, mitral stenosis, or aortic insufficiency) • Rupture of the ventricular septum or free wall. Shock secondary to predominant right ventricular (RV) failure or severe RV dysfunction of any cause Shock due to brady-arrhythmia or tachy-arrhythmia

European Heart Journal: Acute Cardiovascular Care 2020, Vol. 9(2) 183–197

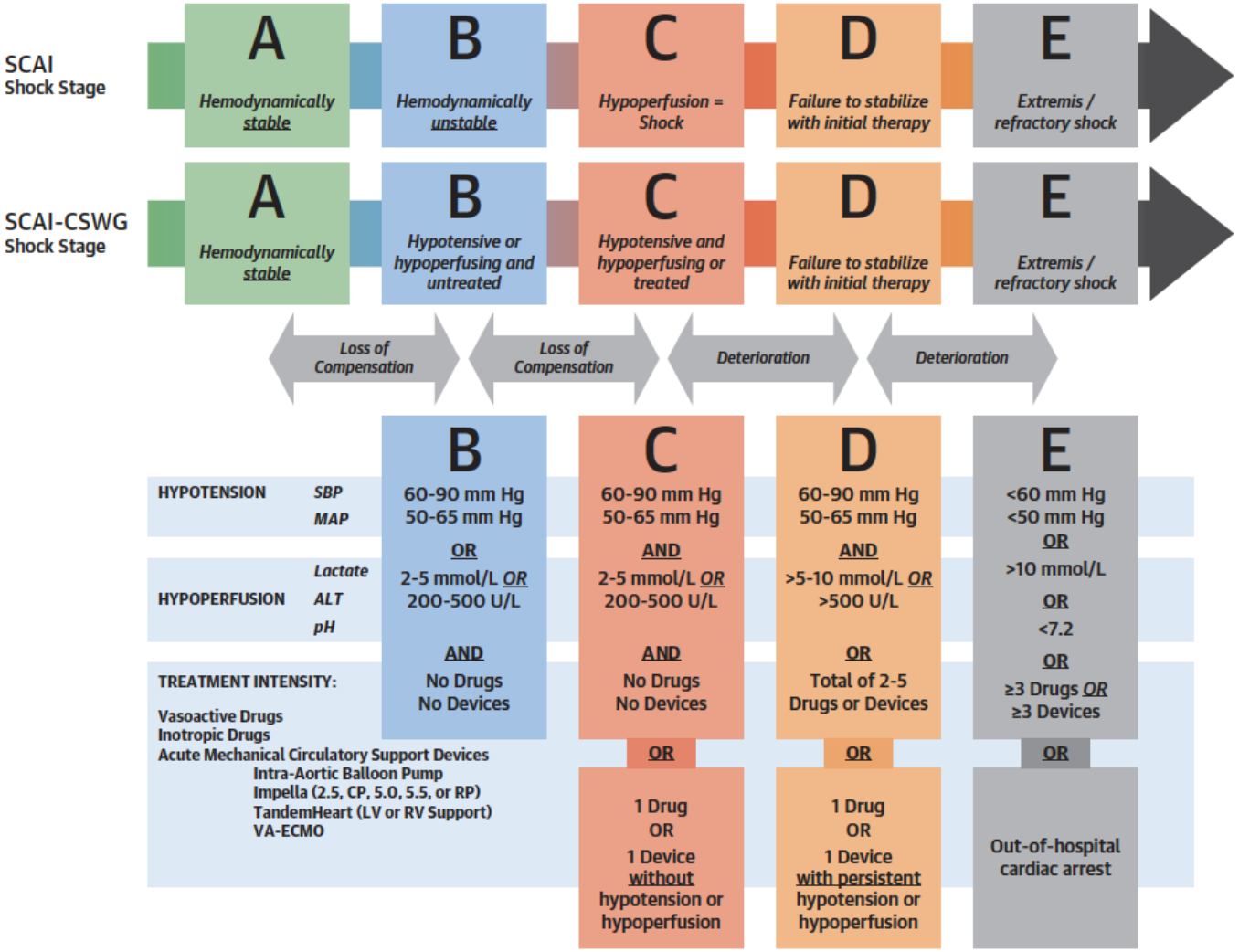
CLASSIFICATION



J Am Coll Cardiol 2022 Jan 28;S0735-1097(22)00180-2.

CLASSIFICATION

CÓDIGO SHOCK CARDIOGÉNICO
Atención al paciente en Shock Cardiogénico en el Servicio Gallego de Salud



JACC. 2022 Jul, 80 (3) 185–198.

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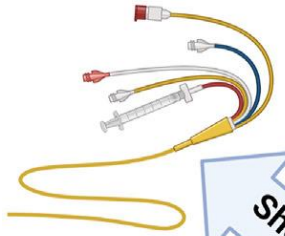


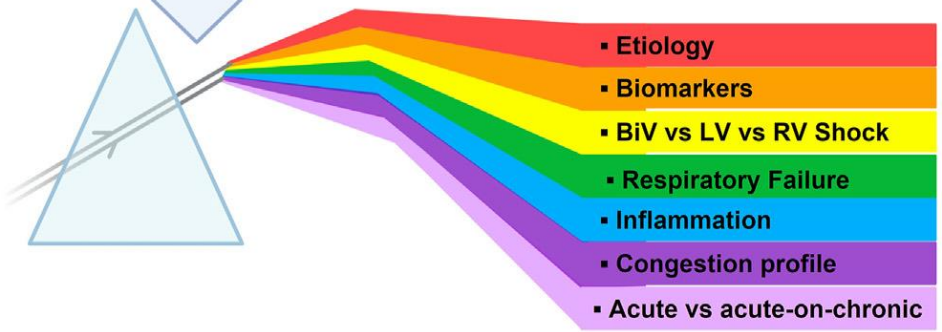
Shock Severity

- SCAI Stage
- Fluid responsiveness
- Hemodynamic profile
- Vasoactive doses
- Vasoactive Toxicity
- Shock trajectory
- Metabolic derangement (hemometabolic shock)

Risk Modifiers

- Age
- Frailty
- Comorbidities
- Cardiac arrest +/- anoxic brain injury
- Presence/Reversibility of non-cardiac organ failure
- Transplant/VAD candidacy
- System factors (e.g., hub vs spoke location, stability for transfer)

Phenotype



Crit Care Clin 40 (2024): 37–56

IDENTIFICATION

Inclusion Criteria and Activation of the “Cardiogenic Shock Code” in Galicia

For all patients with Cardiogenic Shock (CS) at SCAI stage B or higher, who do not meet exclusion criteria

CÓDIGO SHOCK CARDIOGÉNICO

Atención al paciente en Shock Cardiogénico en el Servicio Gallego de Salud

Referral to "Shock Center":

Patients presenting with high severity (SCAI D/E), VIS>20, clinical deterioration, lack of improvement during hospitalization, and/or high-risk profile should be assessed by the hospital's "Shock Team.”

IDENTIFICATION

EXCLUSION CRITERIA FOR CARDIOGENIC SHOCK CODE

Absolute Exclusion Criteria:

1. Patient's Negative
2. Severe concomitant illness:
    - Metastatic malignant neoplasm.
    - Severe neurological disease or brain damage, including cognitive impairment.
    - Severe neuromuscular disease, including dependency situations.
    - Extreme frailty with no possibility of reversibility.
    - Advanced heart failure with no possibility of transplantation or Durable Mechanical Assistance (DAVI).
    - Clinical Life Expectancy < 1 Year

IDENTIFICATION

Relative Exclusion Criteria:

- Age > 80 years.
- End-stage renal failure with no option for kidney transplant (CrCl < 15 ml/min or dialysis).
- Severe chronic liver disease with no option for liver transplant (MELD > 17).
- Advanced pulmonary disease with no option for lung transplant.

Deactivation Criteria:

•Non-Cardiac Diagnosis: Specific treatment applied based on initial assessment.
•Severe Comorbidity or Irreversible Multi-Organ Failurev

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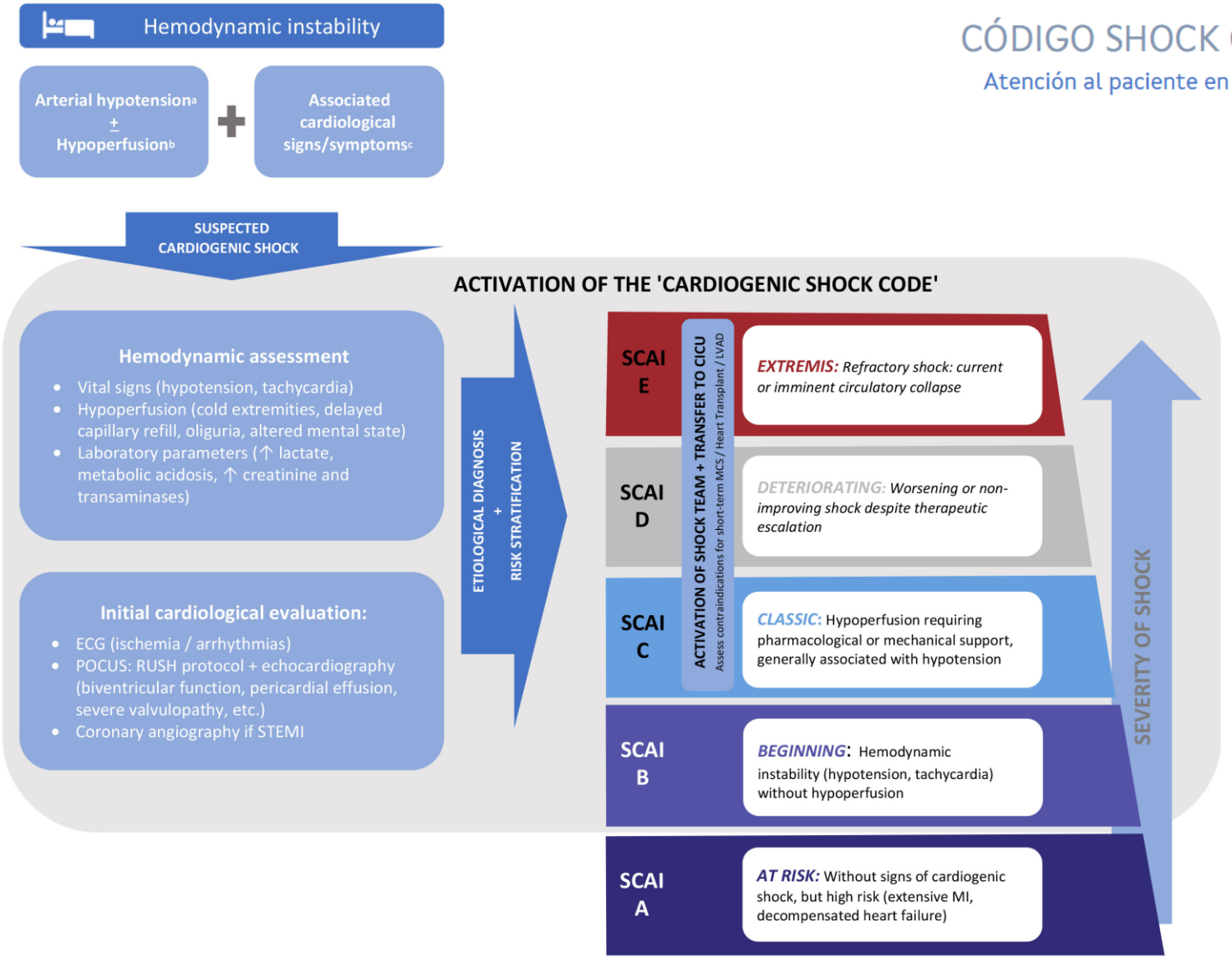
Atención al paciente en Shock Cardiogénico en el Servicio Gallego de Salud



a) Arterial hypotension: SBP < 90 mmHg, MAP < 60 mmHg, or the need for inotropes or vasopressors to maintain SBP > 90 mmHg. b) Hypoperfusion: Clinical (lethargy, cold extremities, oliguria, sweating, dizziness) or biochemical (lactate > 2 mmol/L, metabolic acidosis, elevated creatinine). c) Clinical suspicion of cardiac origin: History of heart failure, cardiac surgery, vascular disease, or cardiovascular risk factors; or clinical signs of chest pain, cardiac arrest, or arrhythmias.

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DIAGNOSIS

1. MONITORIZATION

•Prehospital Monitoring:

- Position the patient with the head of the bed elevated 45º

Monitor continuously:

- Blood Pressure (BP)
- Heart Rate (HR)
- Respiratory Rate (RR)
- Electrocardiogram (ECG)
- Oxygen Saturation (SaO2)
- End-Tidal CO2 (EtCO2)

DIAGNOSIS

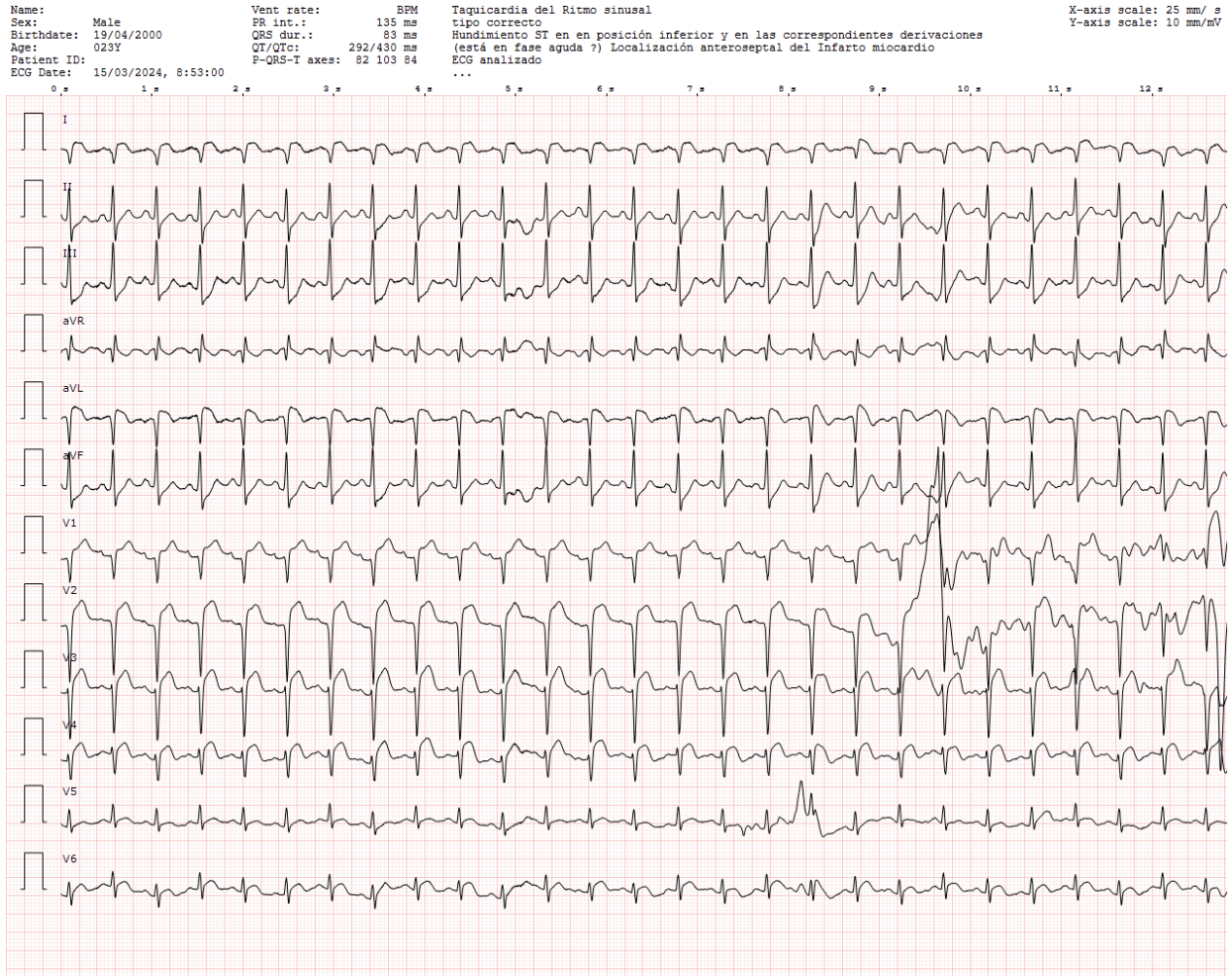
2. PHYSICAL EXAMINATION

Warning Signs and Symptoms

1. Clinical symptoms of hypoperfusion: cold and clammy extremities, mental confusion, dizziness, oliguria (<0.5 mL/kg/h).
2. Pulmonary congestion: Killip class > 2
3. Hypotension (SBP < 90 mmHg (or a decrease of 30 mmHg)) or decreased pulse pressure (< 45 mmHg)
4. Heart Rate < 40 or > 120 bpm (> 90 bpm21) or severe arrhythmias (VT/VF, advanced AV block)
5. Increased respiratory effort: Respiratory rate > 25 breaths/min with use of accessory muscles for breathing, or respiratory rate < 8 breaths/min despite dyspnea
6. Hypoxemia: SaO2 < 90% or PaO2 < 80 mmHg (Type I hypoxemic respiratory failure if PaO2 < 60 mmHg)
7. Hypercapnia: PaCO2 > 45 mmHg (Type II hypercapnic respiratory failure if PaCO2 > 50 mmHg)
8. Metabolic acidosis (pH < 7.35 with HCO3 < 18 mMol/L) with elevated lactate (> 2 mMol/L)
9. Hyperglycemia > 160 – 180 mg/dL

DIAGNOSIS

3. ECG



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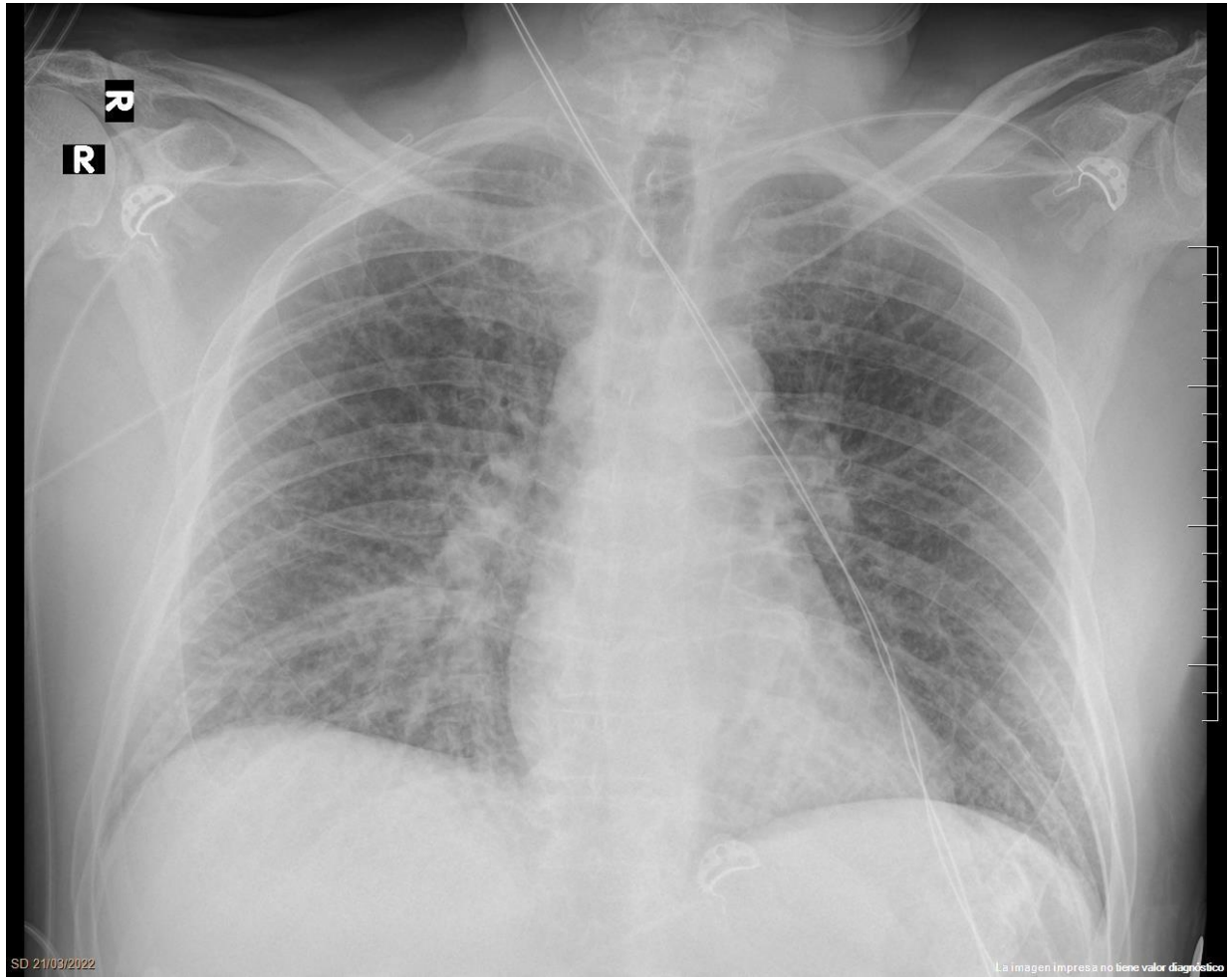
DIAGNOSIS

4. CHEST X RAY



DIAGNOSIS

5. Arterial Blood Gas Analysis and Lactate Measurement

- **Lactate Measurement:**
  - Recommended upon admission as an indicator of hypoperfusion and tissue hypoxia.
  - SCAI SHOCK group suggests a cutoff level of 2 mmol/L to support the diagnosis of CS.
  - **Ideal timing: Within the first 10 minutes of availability.**

- **Arterial Blood Gas Analysis in Established Shock:**
  - Metabolic acidosis with hyperlactatemia and increased base deficit.
  - pH and base deficit are used as markers of shock severity in various risk/severity models.
  - Also assesses for respiratory acidosis or insufficiency.

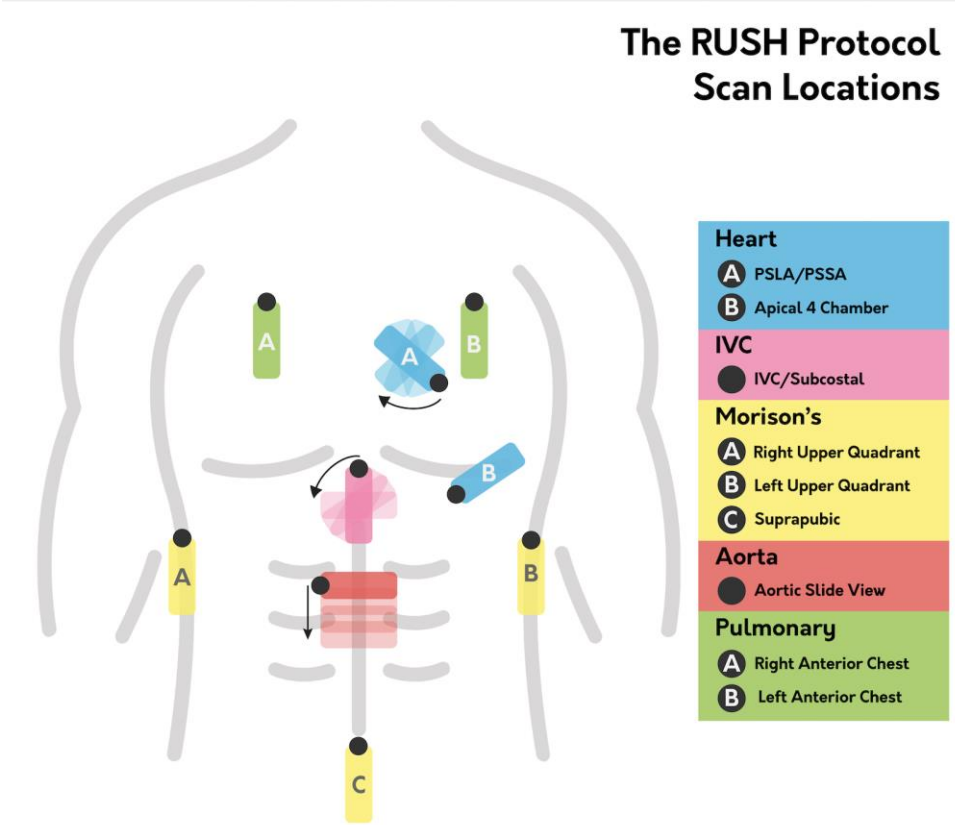
DIAGNOSIS

6. LABORATORY TESTS

Laboratory investigations		
Complete blood counts	Every 12–24 h	Consider more frequently in patients with or at high risk for bleeding.
Serum electrolytes	Every 6–12 h	Frequency should be tailored to risks or presence of renal failure and electrolyte disorders
Serum creatinine	Every 12–24 h	Urine output along with serum creatinine monitoring are markers of renal perfusion and acute kidney injury
Liver function tests	Daily	Monitoring for congestive hepatopathy and/or hypoperfusion
Lactate	Every 1–4 h	Lactate clearance is a marker of resolving end organ hypoperfusion and lack of clearance is associated with a higher risk of mortality.
Coagulation laboratories	Every 4–6 h for those on anti-coagulants until therapeutically stable, every 24 h if not on anti-coagulants	Altered drug elimination, high frequency use of antithrombotics, and use of mechanical support devices often necessitates antithrombotic monitoring

DIAGNOSIS

7. POCUS



*Probe orientation is based on a single dot location set to the left-upper screen. For this reason, for cardiac imaging probe orientation is based on emergency medicine preference.

Table 1
Rapid Ultrasound in SHock (RUSH) protocol: ultrasonographic findings seen with classic shock states

RUSH Evaluation	Hypovolemic Shock	Cardiogenic Shock	Obstructive Shock	Distributive Shock
Pump	Hypercontractile heart Small chamber size	Hypocontractile heart Dilated heart	Hypercontractile heart Pericardial effusion Cardiac tamponade RV Strain Cardiac thrombus	Hypercontractile heart (early sepsis) Hypocontractile heart (late sepsis)
Tank	Flat IVC Flat jugular veins Peritoneal fluid (fluid loss) Pleural fluid (fluid loss)	Distended IVC Distended jugular veins Lung rockets (pulmonary edema) Pleural fluid (effusions) Peritoneal fluid (ascites)	Distended IVC Distended jugular veins Absent lung sliding (pneumothorax)	Normal or small IVC (early sepsis) Peritoneal fluid (peritonitis) Pleural fluid (empyema)
Pipes	Abdominal aneurysm Aortic dissection	Normal	DVT	Normal

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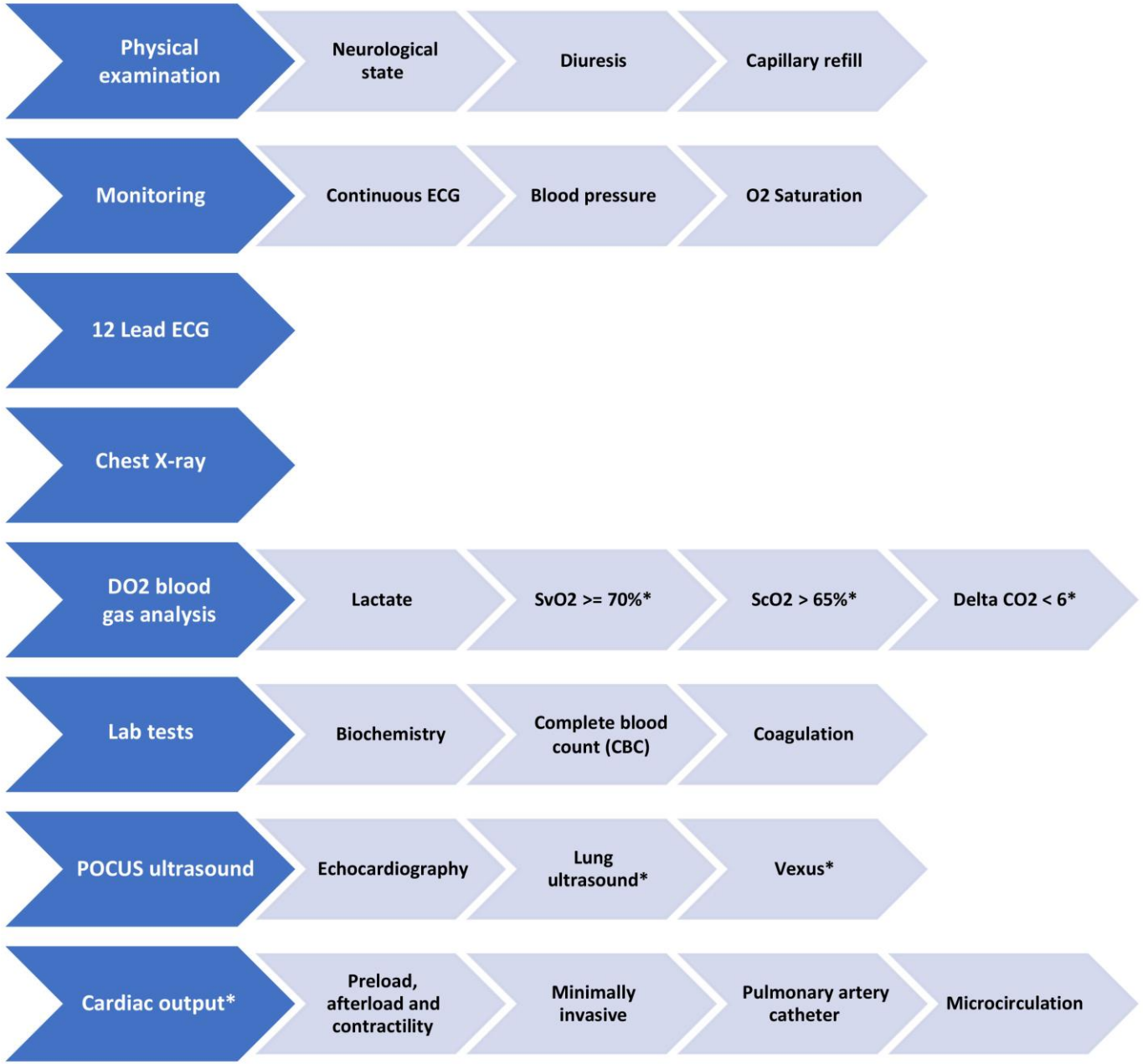

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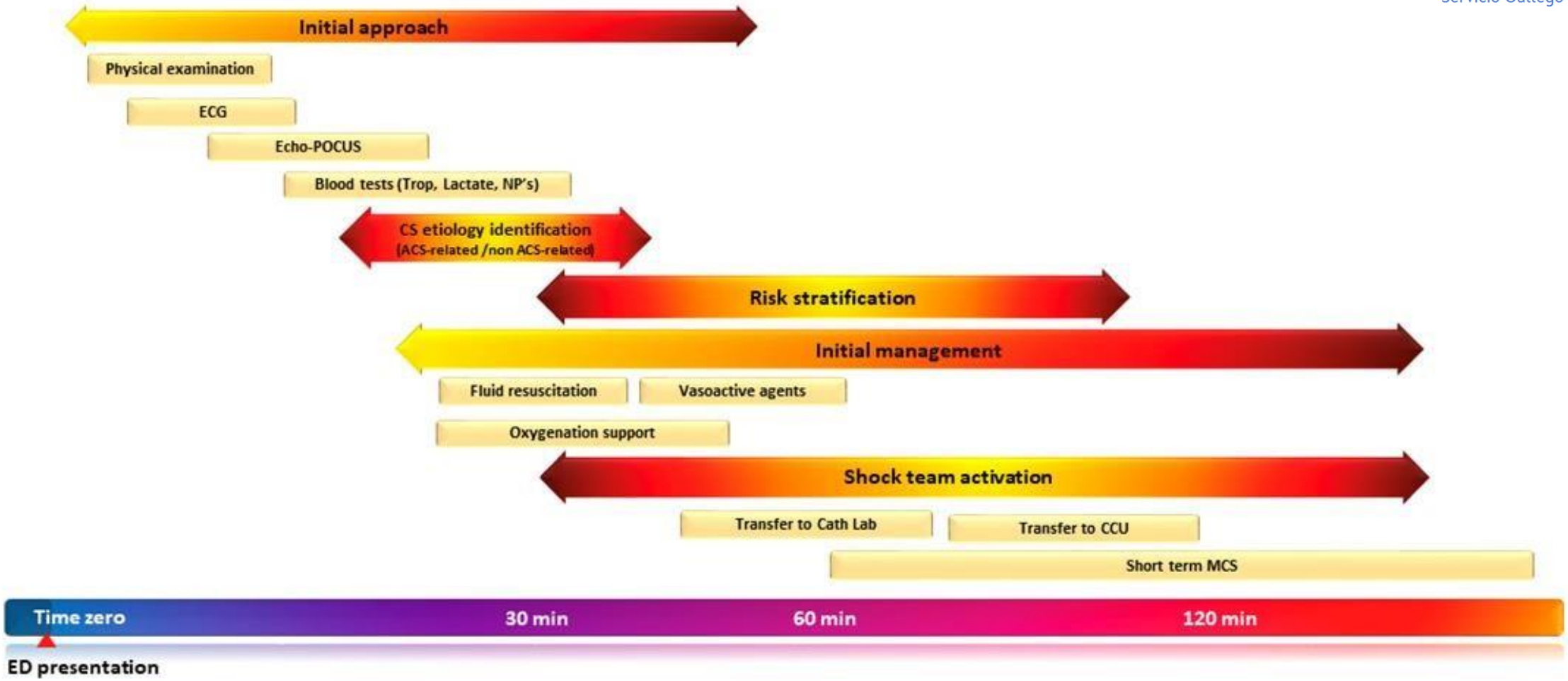
MANAGEMENT


Initial approach
Physical examination
ECG
Echo-POCUS
Blood tests (Trop, Lactate, NP's)
CS etiology identification
(ACS-related /non ACS-related)
Risk stratification
Initial management
Fluid resuscitation
Vasoactive agents
Oxygenation support
Shock team activation
Transfer to Cath Lab
Transfer to CCU
Short term MCS
Time zero
30 min
60 min
120 min
ED presentation

CÓDIGO SHOCK CARDIOGÉNICO

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Restoring Blood Pressure

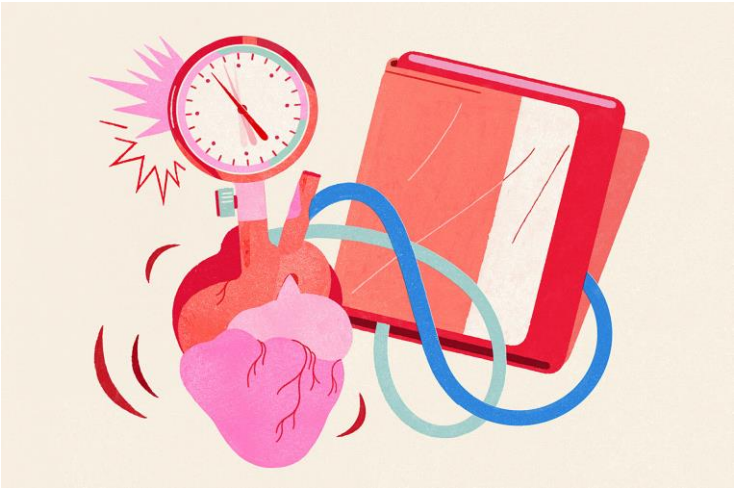
Target Mean Arterial Pressure (MAP):

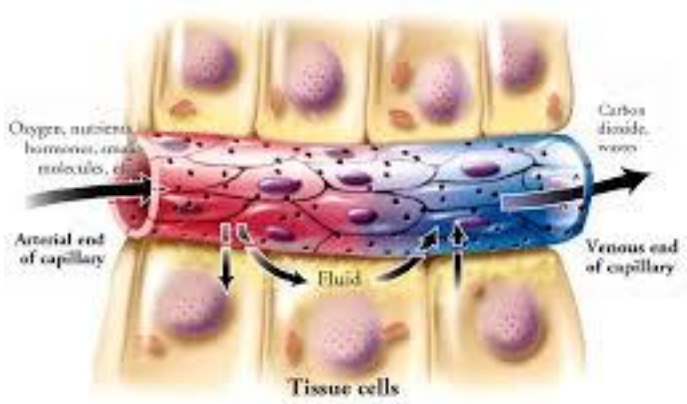
MAP > 65 mmHg.

Fluid Resuscitation

Vasopressor Therapy

Norepinephrine at 0.05-0.5 mcg/kg/min.





Goals:

Diuresis: urine output > 0.3 ml/kg/h.

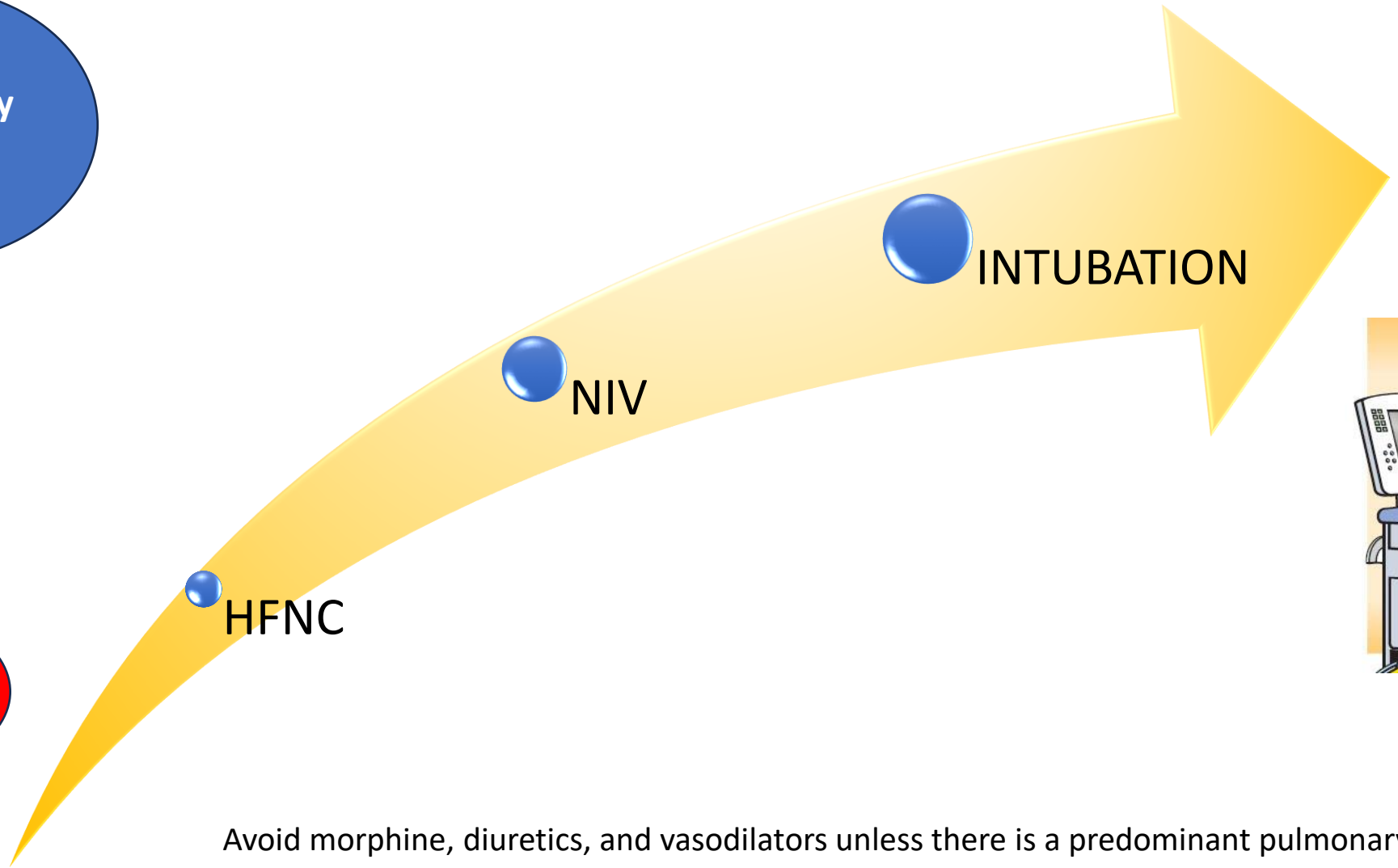
Serum Lactate: reduction in serum lactate levels.

Inotropic support with dobutamine at 2.5-5 mcg/kg/min (+- NA)

Lowest effective doses of inotropes/vasopressors

Restoring Tissue Perfusion

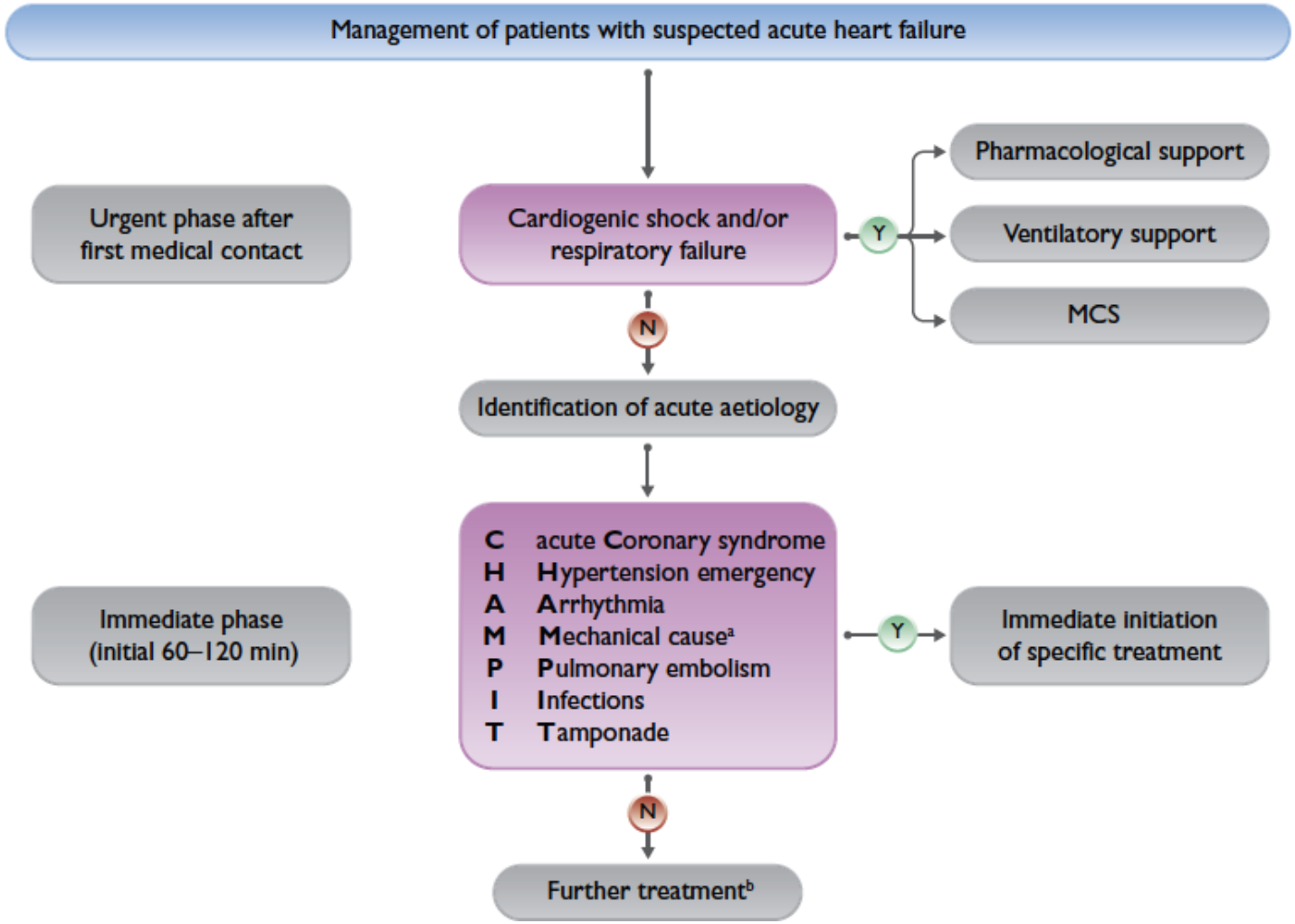
Respiratory Support



SpO2>90%

Avoid morphine, diuretics, and vasodilators unless there is a predominant pulmonary congestion in CS

MANAGEMENT


Management of patients with suspected acute heart failure
Urgent phase after first medical contact
Cardiogenic shock and/or respiratory failure
Y
Pharmacological support
Ventilatory support
MCS
N
Identification of acute aetiology
Immediate phase (initial 60–120 min)
C acute Coronary syndrome
H Hypertension emergency
A Arrhythmia
M Mechanical cause[a]
P Pulmonary embolism
I Infections
T Tamponade
Y
Immediate initiation of specific treatment
N
Further treatment[b]

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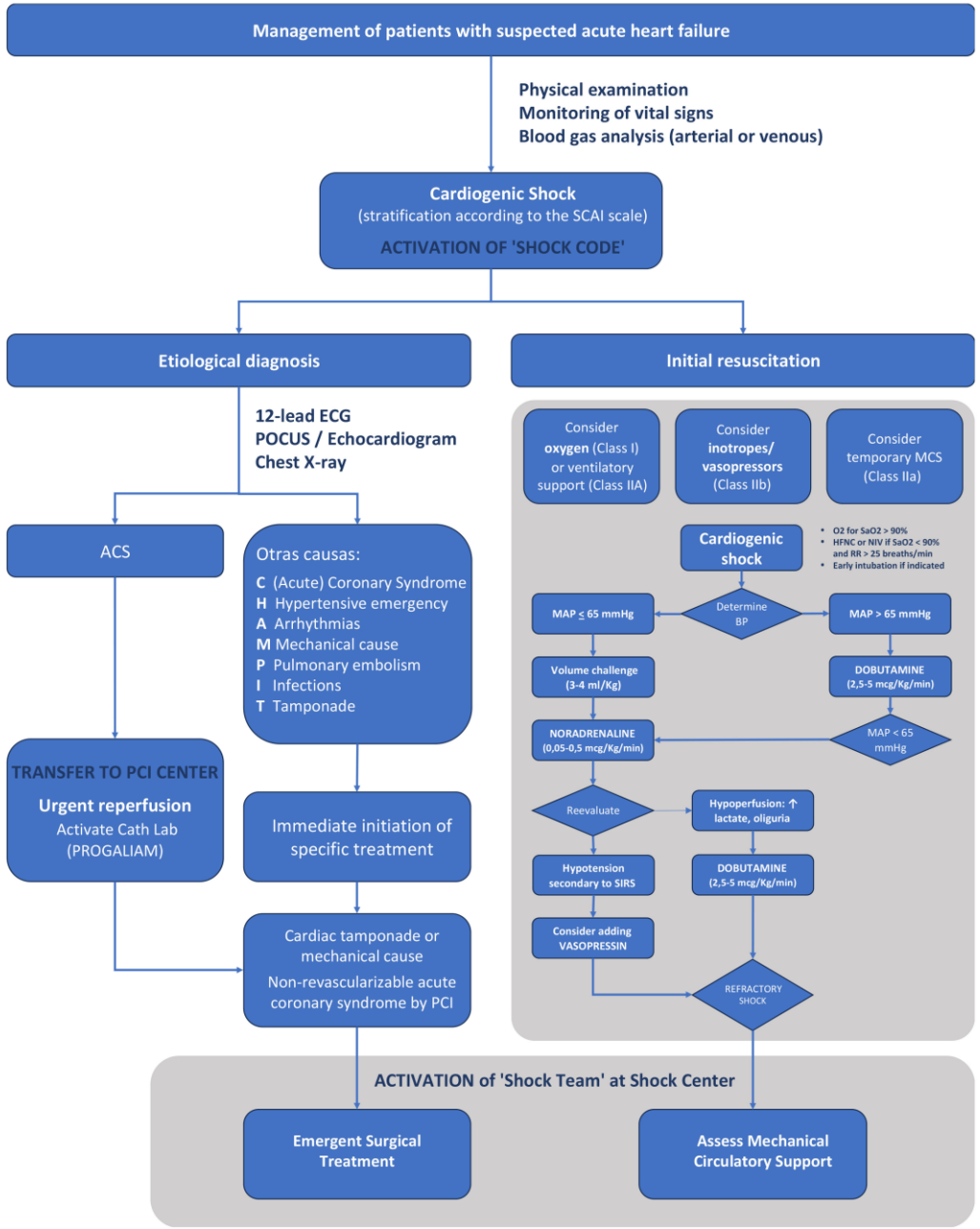
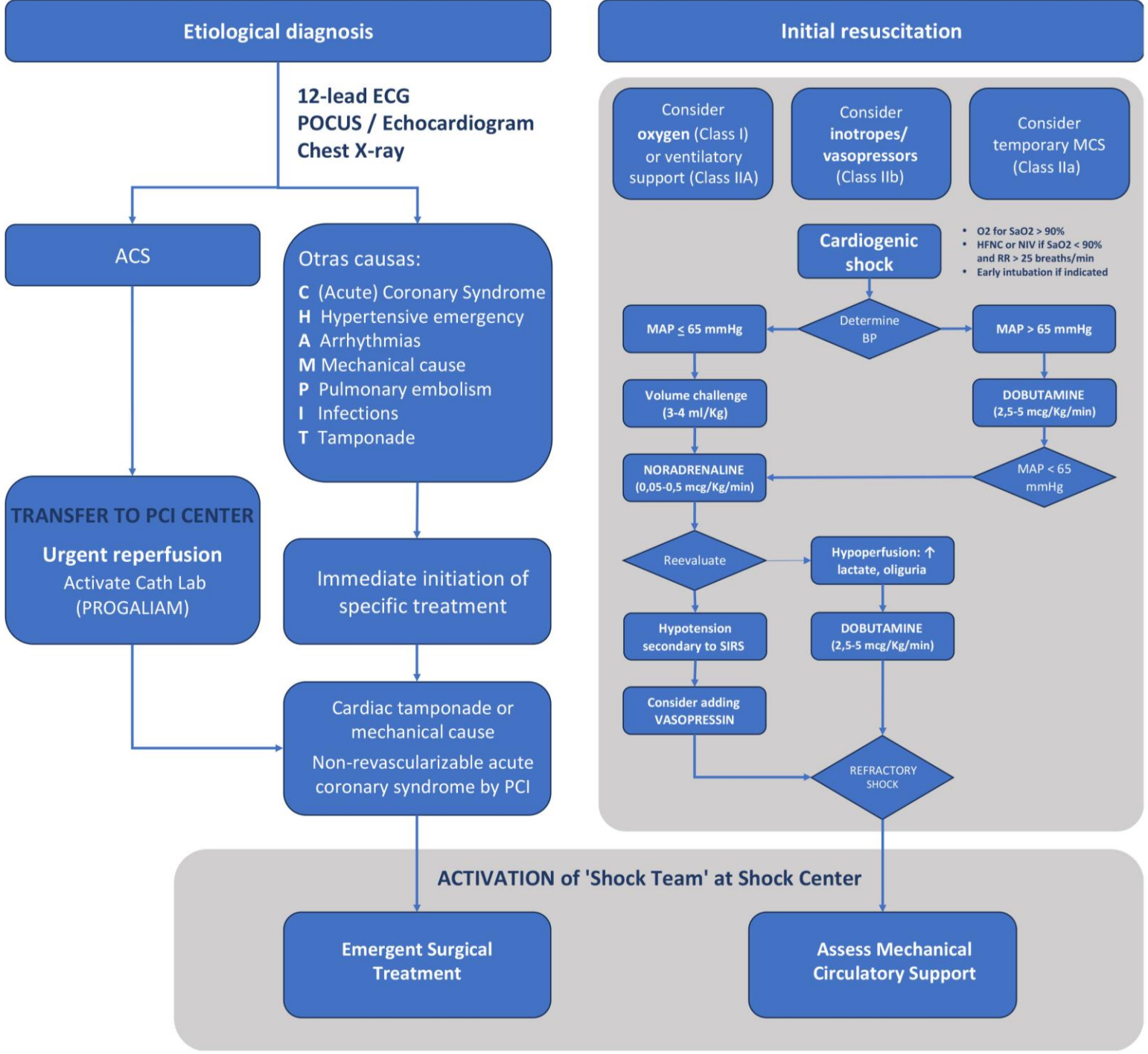
Atención al paciente en Shock Cardiogénico en el Servicio Gallego de Salud




Etiological diagnosis
12-lead ECG
POCUS / Echocardiogram
Chest X-ray
ACS
Otras causas:
C (Acute) Coronary Syndrome
H Hypertensive emergency
A Arrhythmias
M Mechanical cause
P Pulmonary embolism
I Infections
T Tamponade
TRANSFER TO PCI CENTER
Urgent reperfusion
Activate Cath Lab
(PROGALIAM)
Immediate initiation of specific treatment
Cardiac tamponade or mechanical cause
Non-revascularizable acute coronary syndrome by PCI
Initial resuscitation
Consider oxygen (Class I) or ventilatory support (Class IIA)
Consider inotropes/ vasopressors (Class IIb)
Consider temporary MCS (Class IIa)
Cardiogenic shock
O2 for SaO2 > 90%
HFNC or NIV if SaO2 < 90% and RR > 25 breaths/min
Early intubation if indicated
Determine BP
MAP ≤ 65 mmHg
MAP > 65 mmHg
Volume challenge (3-4 ml/Kg)
DOBUTAMINE (2,5-5 mcg/Kg/min)
NORADRENALINE (0,05-0,5 mcg/Kg/min)
MAP < 65 mmHg
Reevaluate
Hypoperfusion: ↑ lactate, oliguria
Hypotension secondary to SIRS
DOBUTAMINE (2,5-5 mcg/Kg/min)
Consider adding VASOPRESSIN
REFRACTORY SHOCK
ACTIVATION of 'Shock Team' at Shock Center
Emergent Surgical Treatment
Assess Mechanical Circulatory Support

Interhospital transfer in the initial management of Cardiogenic Shock

Cardiogenic Shock associated with ACS (PROGALIAM action protocol)

- ACS Diagnosis at the Pre-hospital Level
- ACS Diagnosis Community Hospital
- 24/7 Cath Lab + Partial MCS
- Mechanical complication prior to transfer to PCI center. (Transfer delay < 30 min)
- Mech. complication or refractory shock after revascularization
- Shock center Cardiovascular surgery (CVS) + complete MCS

Cardiogenic Shock of non-ischemic origin

- Shock of unidentified etiology at pre-hospital level - Comm. hosp., no ICU
- Community hospital ICU (CHAMPIT Assessment)
- Indication for urgent cardiac surgery: Acute aortic syndrome, valvulopathy, cardiac tamponade, etc.
- Severe Cardiogenic Shock: SCAI ≥ C and VIS > 20
- Suspected ischemic cause: (NSTEMI)
- 24/7 Cath Lab + Partial MCS
- Shock center Cardiovascular surgery (CVS) + complete MCS

CONCLUSIONS

The management of CS requires a deep understanding of the complexity of the syndrome and a rapid multidisciplinary approach.

Rapid identification and ongoing evaluation of patients with cardiogenic shock are the cornerstones of an appropriate treatment plan.

The emergency department, which occupies a crucial position, together with the fundamental performance of the shock team, is a promising ensemble to improve the mortality of cardiogenic shock.

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