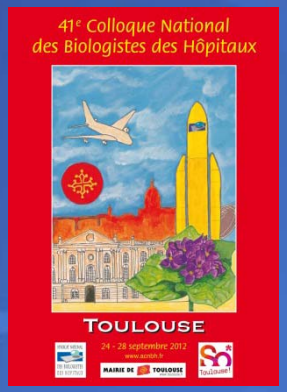
Christine Morin
Laboratoire C.H. Calais



41e Colloque SNBH
Toulouse 26 sept 2012

La Copeptine

nouveau marqueur du syndrome coronaire aigu ?

ACNBH

Agrément FMC
N° 100 168

41ème Colloque National des Biologistes des Hôpitaux Toulouse, 24-28 septembre 2012

DECLARATION D'INTERET DANS LE CADRE DE MISSIONS DE FORMATION REALISEES POUR L'ACNBH

Melle C. MORIN
Exerçant au CH de Calais
déclare sur l'honneur

ne pas avoir d'intérêt, direct ou indirect (financier) avec les entreprises pharmaceutiques, du diagnostic ou d'éditions
en relation avec le DMDIV et/ou le sujet présenté.

Palmarès mondial actuel

- Dans le monde, la répartition annuelle des causes de décès est :
  - Infections et parasitoses : 17.3 Mns 33%
  - Cardiovasculaires : 15.3 29.5 %
  - Cancers : 6.3 12 %
  - Accidents, violences, … : 6 11.5 %

- Aux USA, la pathologie ischémique cardiaque est la 1ère cause de mortalité.

Murray JL et coll Lancet 1997. Données OMS

Estimation française

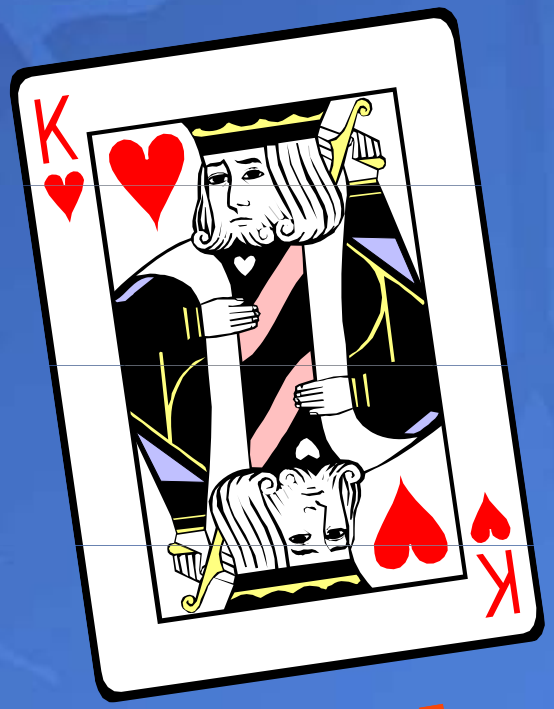
Maladies cardio-vasculaires = 1ère cause de mortalité (32 % des DC)

- 120 000 IDM /an
- Prévalence IDM : 2.5 à 6%
- Létalité : H > 40 %, F > 55 %

- 120 - 150 000 AVC / an

- 1 000 000 insuffisants cardiaques, dont 120 000 nouveaux cas / an
- 30 000 DC / an par I.C.

Les Années 90



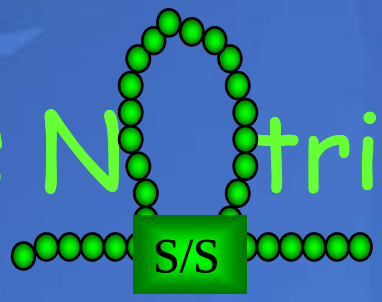
1993
Stratus II Dade

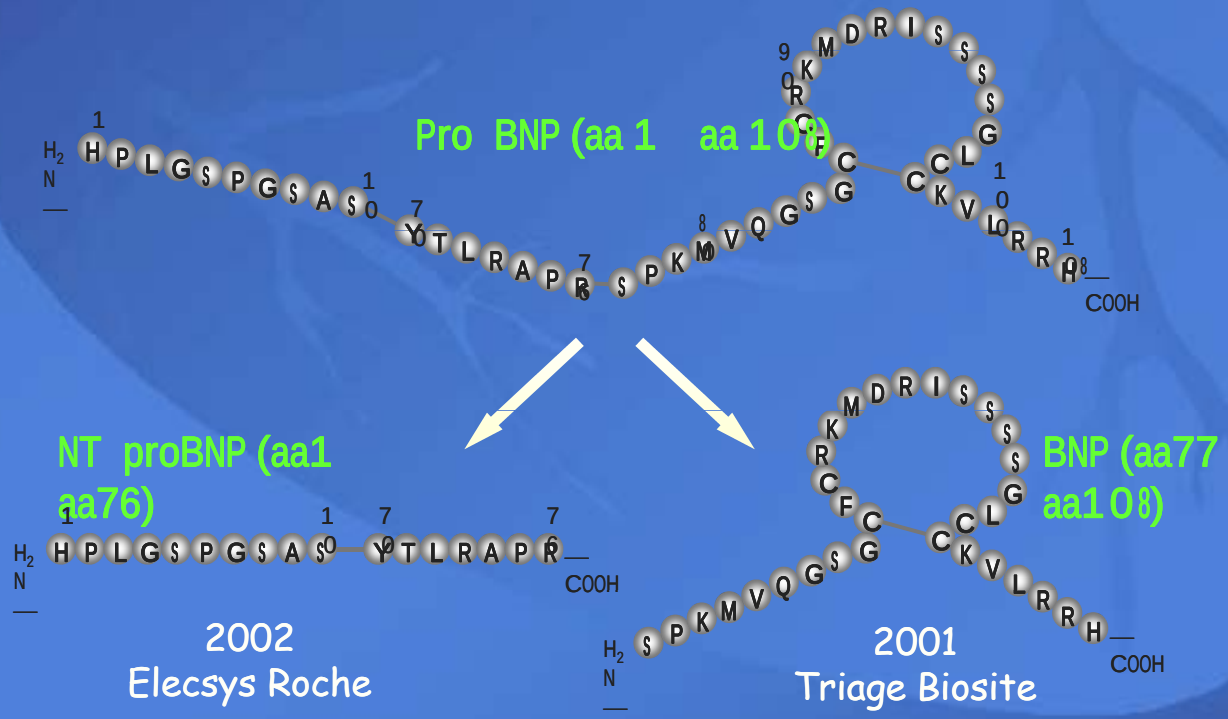
1991
Elecsys Roche

1995
Stratus II Dade

Les Années 2000

Les Peptides Natriurétiques





Pronostic

Situation des SAU

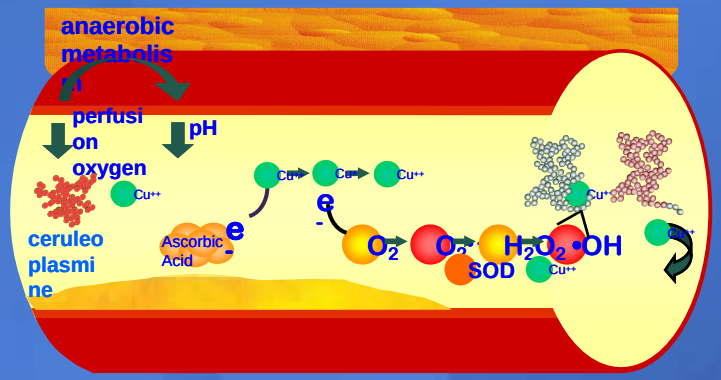
- ~15 Mns de patients /an admis aux USA + EU aux Urgences pour suspicion d'IMD (Bassand JP et al, Eur Heart J. 2007)

- 1/4 à 1/3 les IDM ont un ECG non contributif à l'admission

- Recommandations : suivi cinétique de la Troponine 6 à 9h après l'admission

Les Années 2010 . . .

- h-FABP : Heart-fatty acid binding protein
- IMA : test à l'albumine modifiée par l'ischémie



- Myelopéroxydases
- Stratégies multimarqueurs
- ….
- Copeptine

Les atouts de la Copeptine

- Libération **très précoce** après un stress endogène, mécanisme indépendant d'une lyse cellulaire
- **Cinétique** inverse de celle de la Troponine
- Temps de dosage compatible avec **l'urgence**
- **VPN** qui permet un diagnostic d'exclusion fiable, y compris chez des coronariens connus

La Copeptine

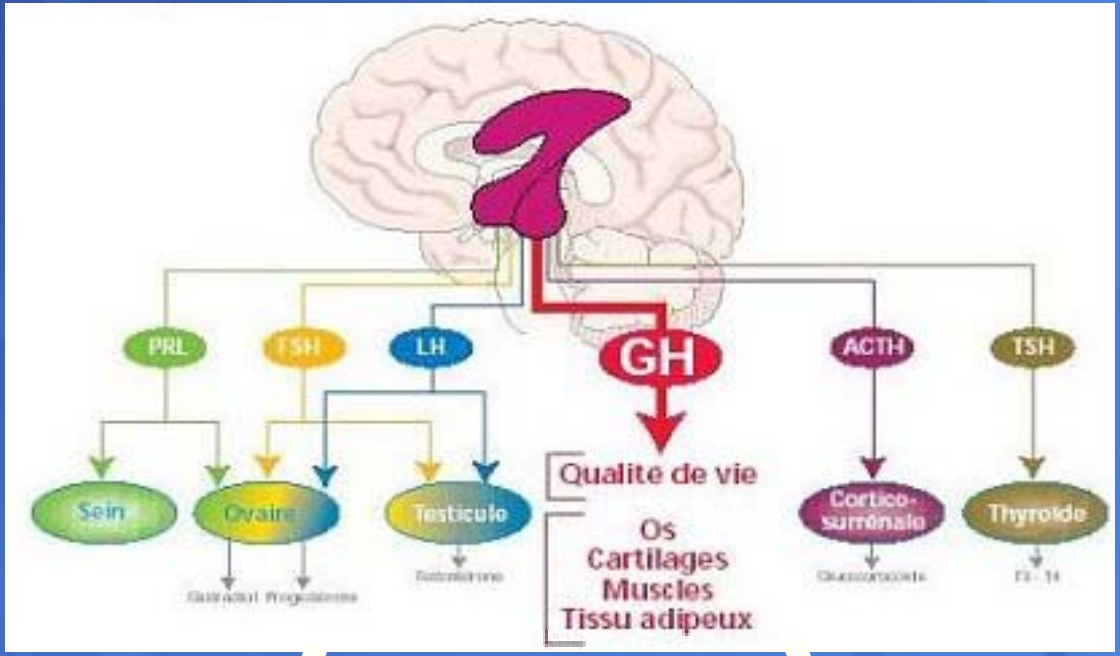
- Glycopeptide de 39 aa (MM~5kDa)
- Partie C-terminale du précurseur de la Vasopressine (proAVP)

Morgenthaler NG. Et al, 2007, vol 19, N°2

La Copeptine : physiologie

La proAVP est synthétisée dans l'hypothalamus puis clivée de façon proportionnelle en vasopressine et copeptine, stockées dans la post-hypophyse, et relarguées très rapidement au niveau de l'ante-hypophyse en cas de stimulation, pex un stress physiologique

Axe hypothalamo-hyophysaire



Vasopressine = AVP arginine-vasopressine = ADH hormone anti-diurétique

- 9 Aa : très petite molécule
- liée aux plaquettes à 90%
- ½ vie 5 à 15 mn
- PE 1 ml

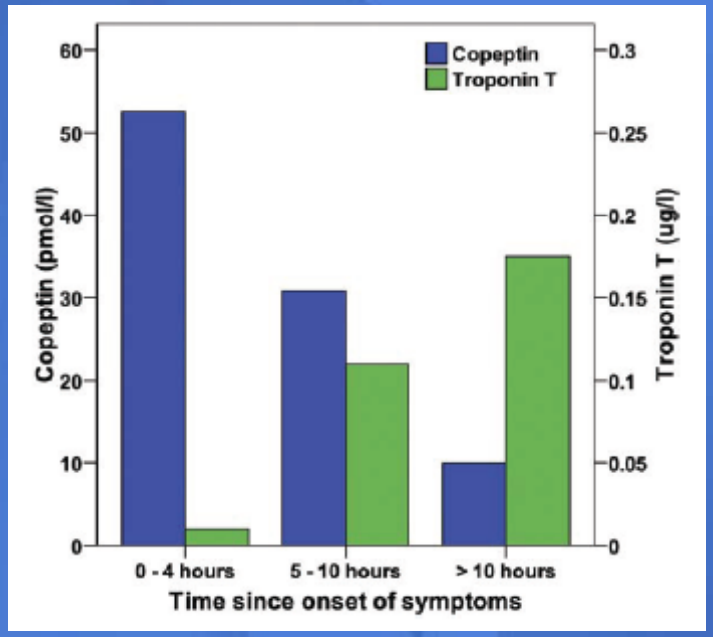
Copeptine

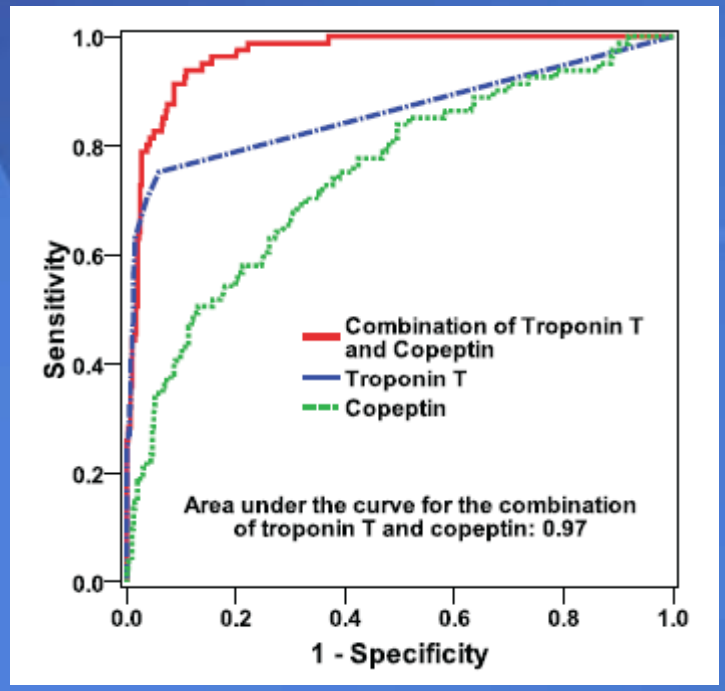
- libre dans la circulation sanguine
- Stable : ½ vie 7h in vivo
- facilement dosable
- PE 50 µl

Reichlin T. & al. JACC 2009 ; 54(1) : 60-8

(Etude APACE 2000 patients)

- Rés prélim : 487 patients aux Urgences
- Douleur thoracique < 12h
- Exclus patients dialysés
- TnT 4e G, cut off 0,01 µg/L
- AMI : 81 (17 %)





- Cutoff 14 pmol/L
- AUC = 0.97
- Sensibilité = 98.9 %
- VPN = 99.7 % pour IDM
- Pas ↗ dans l'AI

Keller T. & al. JACC 2010 ; 55(19) : 2096 - 2106

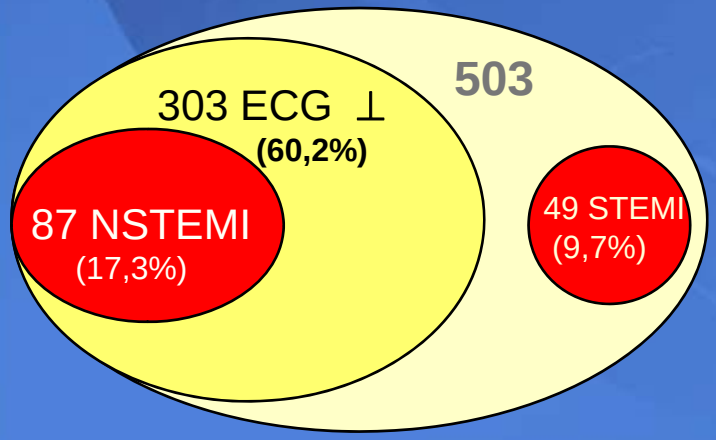
- 1386 patients 18-85 ans
- Suspicion de SCA
- Exclus patients traumatisés/opérés récents, grossesse, drogue ou anémie
- TnT Roche, cut off 0,03 µg/L=CV 10%
- TnI Siemens, cut off 0,14 µg/L= CV 10%
- TnI Centaur, cut off 99e pctl = 0,04
- AMI : 299 (21.6 %)

- L'association TnT-Copeptine est plus performante que TnT-myoglobine dans le diagnostic précoce de l'IDM
- L'association TnT ou TnI conventionnelles + copeptine apporte une aide au diagnostic précoce par son excellente VPN

Giannitsis E. & al. Clin Chem 2011; 57(10) : 1452 - 55

- 503 patients
- Douleur thoracique < 12h
- Exclusion : âge < 18 ans, insuff rénale terminale, trauma ou chir récents
- TnT hs Roche, cut off 14 ng/L (99e pctl)
- Copeptine cut off 14 pmol/L (limite de quantif°)
- AMI : 136 (27 %)

Courbes ROC	AUC
Copept seule	0,697
TnT hs seule	0,903
Copept + TnT hs	0,917



Populat°	Sens	Spéc	VPP	VPN
TnT seule Ts IDM	91.9 %	68.1 %	51.7 %	95.8 %
TnT + Copt Ts IDM	97.8 %	55.9 %	45.1 %	98.6 %
TnT + Copt ST+IDM excl	97.7	55.9	34.4	99.0 %

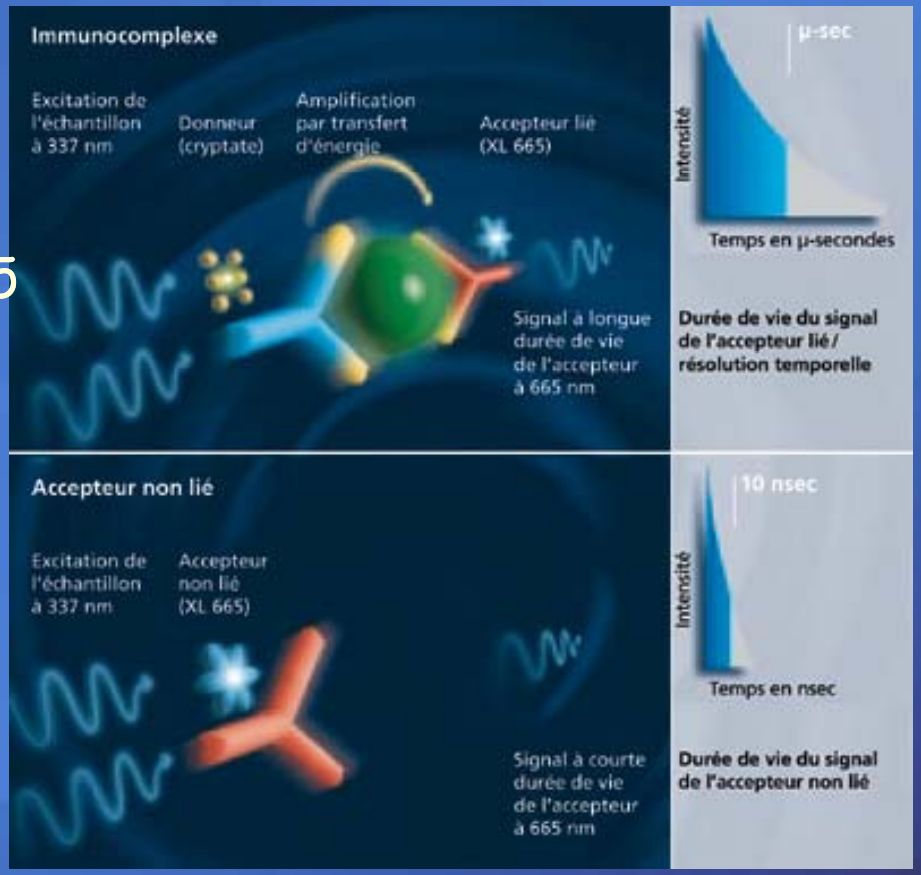
☞ **2 faux négatifs Copept cf par coronarographie**

Déroulement de l'étude au C.H. C

- Mise en place de l'étude avec Cardio et Urg : sept 2011
  - Evaluer la valeur ajoutée de la copeptine aux Urgences pour l'exclusion de l'IDM
  - Vérifier l'absence de faux négatifs
- Personnalisation des documents-support : sept 2011
- Information des cliniciens : oct 2011
- MAD du Kryptor et formation techn. : 3 nov 2011
- Recueil des données : novembre 2011 à avril 2012
- Bilans d'étape en janvier, février, mars et mai 2012
- Exploitation des données : mai-juin 2012

Kryptor Compact (Thermo Fisher)

- Automate de paillasse
- Technologie unique TRACE (Time-Resolved amplified Cryptate Emission)
  - Excitation laser 337 nm
  - Transfert d'énergie
  - Donneur Cryptate Europium
  - Accepteur proteine algue XL665
  - Formation du complexe Ag-Ac
    - ↗ fluorescence donneur
    - ↗ temps signal accepteur
    - Lecture à 665 nm
    - Proport. [] copeptine



Kryptor Compact (Thermo Fisher)

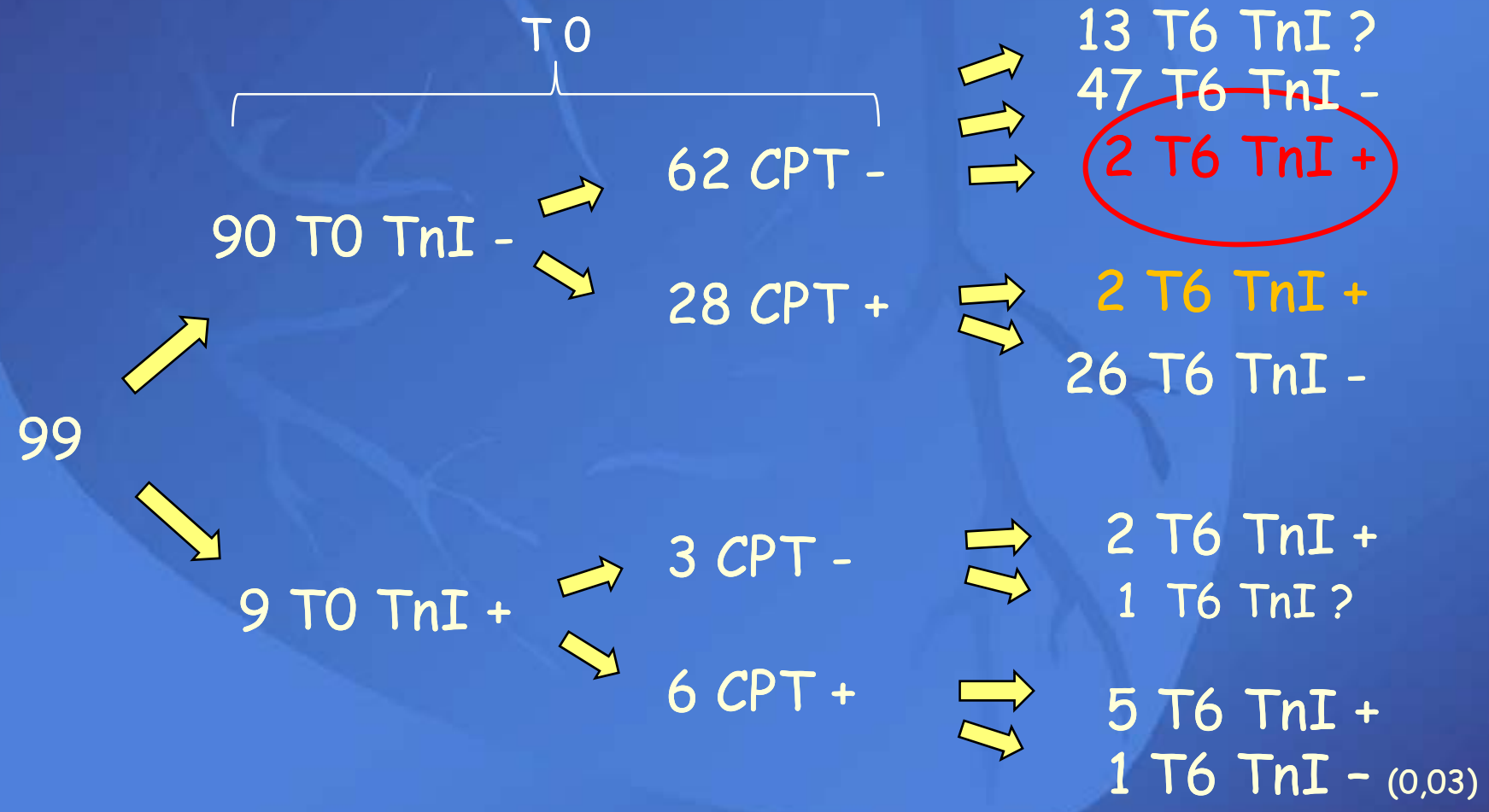
- Calib° usine, 1 point x 2 /15j
- Conditionnement de 50 tests
- PE : 50 µl sérum, plasma (hép, EDTA)
- Stabilité 24h à +4°C ou TA
- Volume mort 150 µl en tube
- Volume mort 100 µl en godet
- Domaine de mesure : 4.6 -500 pmol/L
- Résultat en 19 mn
- Dilution anticipée (2mn) si ⇗⇗
- CV 20 % : 12 pmol/L
- Val réf : 97.5 pctle = 17.4 pmol/L

- Seuil exclusion IDM : 14 pmol/L

Protocole de l'étude

- Admission aux Urgences (ou en cardio) pour DT
- Estimation ~500 patients (~5 % des entrées)
- Inclusion du patient par un sénior
  - Age > 18 ans
  - Suspicion d'IDM
  - ECG non contributif
  - Début des symptômes < 10 h
- Ordonnance spécifique avec h plvt et h début douleur
- Suivi cinétique habituel de la troponine T0 et T6h
- Dosage de la copeptine sur héparine
- Rendu des résultats aux cliniciens
- Suivi à J30 avec rappel systématique des patients

Les résultats à T0



Faux négatifs ?

TnI T0 - et Copeptine - MAIS TnI T6 + : 2 patients

- 1 - H né en 1968. TnI T0 = 0 TnI T6 = 0.11 -> SCA non ST+, pose de 4 stents. Facteurs de risque ++.
- 2 – H né en 1963. TnI T0 = 0.03 TnI T6 = 0.06 -> Douleur atypique. SCAM. RAS à J30.

TnIc Ortho Vitros 5600 : 99e pctl = 0.034 µg/L - CV 10% = 0.034 µg/L
Zaninotto & al, CCA 2012 sous presse : 99e pctl = 0,021 µg/L – CV 10% = 0,028 µg/L

Positifs « utiles » ?

TnI T0 - MAIS Copeptine + et TnI T6 + : 2 patients

- 1 - F née en 1940. TnI T0 = 0.02 ; copt = 29 ; TnI T6 = 0.12 -> SCA non ST+.
- 2 – H né en 1922. TnI T0 = 0.03 ; copt = 756 ; TnI T6 = 0.04 -> colique hépatique ds contexte de déséquilibre diabétique.

TnIc Ortho Vitros 5600 : 99e pctl = 0.034 µg/L

Copeptines élevées

N° patient	DDN	Copeptine	Diagnostic
2	1921	59	Troubles du rythme
3	1960	238	Crise convulsive
8	1966	134	Douleur tho atypique
33	1958	505	Malaise vagal sur troubles du rythme
37	1929	> 500	Malaise vagal hypotensif
55	1955	375	Angor
58	1951	89	Surinfection bronchique
82	1970	185	Crise angoisse
88	1970	203	Douleur thoracique atypique
94	1922	756	Colique hépatique diabète déséquil

Exploitation statistique eCRF

Copeptin-Evaluation

Patient Admission

Patient Evaluation Number	Admission Date _ _ _ _ _ _ _ _ (TTMMYYYY)	Admission Time _ _ : _ _ ❑ not known	Year of Birth

Sex	Height	Weight	Blood Pressure (sys/dia)	Heart Rate
❑ f ❑ m	_ _ _ (cm) ❑ not known	_ _ _ (kg) ❑ not known	_ _ _ _ ❑ not known	_ _ _ _ ❑ not known

Medical History

Patient Complaint (Leading symptom)	❑ Chest Pain ❑ dyspnea ❑ Abdominal Pain ❑ Headache ❑ Other(s) ❑ Indifferent symptoms / initially mixed symptoms		
Onset of symptoms (hours) ❑ 0-3 ❑ 3-6 ❑ 6-12 ❑ >12 ❑ not known	Onset of symptoms (exact date): _ _ _ _ _ (TTMMYYYY) ❑ not known	Onset of symptoms (exact time): _ _ : _ _ ❑ not known	Patient resuscitated on admission or during hospital stay ❑ yes ❑ no ❑ not known
Coronary artery disease (CAD) ❑ yes ❑ no ❑ not known	Angina pectoris in the last 24h ❑ yes ❑ no ❑ not known	ASS/Aspirin medication in the last 7 days ❑ yes ❑ no ❑ not known	Killip class* ❑ I ❑ II ❑ III ❑ IV ❑ not known

* I: No signs of heart failure; II: Rales or Crackles / 3rd heart sound/ Elevated JVP; III: Lung edema; IV: cardiogenic shock

Cardiovascular Risc factors

Family history positive	Arterial hypertension	Nicotine abuse	Diabetes mellitus	Hypercholesterinemia
❑ yes ❑ no ❑ not known	❑ yes ❑ no ❑ not known	❑ yes ❑ no ❑ not known	❑ yes ❑ no ❑ not known	❑ yes ❑ no ❑ not known

ECG

❑ ECG not known	ECG normal/no major irregularities ❑ yes ❑ no	❑ Sinus rhythm ❑ Atrial fibrilation ❑ Other rhythm disorders	ST-elevations of new left-bundle-branch (LBB) ❑ yes ❑ no	ST-depression ❑ yes ❑ no	Other ECG-segment-changes ❑ yes ❑ no

Laboratory (Routine)

	Time of blood draw	Time of lab-oratory result	Na	K	Blood sugar/Glucose	Hb	Leukocytes	Creat	CRP	PCT
Blood sample 1	_ _ : _ _	_ _ : _ _								
Blood sample 2	_ _ : _ _	_ _ : _ _								
Blood sample3	_ _ : _ _	_ _ : _ _								

Laboratory (Cardiac Markers)

	Time of blood draw	Time of lab-oratory result	Troponin	Copeptin (pmol/L) Cut-off: 14 pmol/L	CK	CK-MB	Myoglobin	MR-proANP	MR-proADM
Blood sample1	_ _ : _ _	_ _ : _ _	❑ (hs-)-Trop I ❑ (hs-)-Trop T						
Blood sample 2	_ _ : _ _	_ _ : _ _	❑ (hs-)-Trop I ❑ (hs-)-Trop T						
Blood sample 3	_ _ : _ _	_ _ : _ _	❑ (hs-)-Trop I ❑ (hs-)-Trop T						

Procedure/ Clinical pathway/ Final (ER) diagnosis

Final (ER) diagnosis or disease ❑ not known	Mainly Cardiac Disease ❑ yes ❑ no	If cardiac disease: ❑ Cardiovascular disease/ACS ❑ Mainly rhythm disorders ❑ Other cardiac disorders	Mainly pulmonary disease ❑ yes ❑ no	Mainly gastro-intestinal disease ❑ yes ❑ no	Mainly neurological disease ❑ yes ❑ no	Mainly othe or disease indifferent c mixed disease ❑ yes ❑ no

Urgent coronary angiography or cath within the next 48 hours recommended	❑ yes ❑ no ❑ not known
Urgent Coronary angiography or cath within the next 48 hours has been performed	❑ yes ❑ no ❑ not known
Elective coronary angiography later than 48h post admission recommended/performed	❑ yes ❑ no ❑ not known
Early or late coronary intervention (PCI; e.g. PTCA/stenting) within hospital stay performed	❑ yes ❑ no ❑ not known

Discharge diagnosis: ICD-Code:

Hospital admission / Discharge

Admission or discharge
- ❑ not known
- ❑ Admission to hospital
- ❑ Patient died
- ❑ Patient primarily discharged home

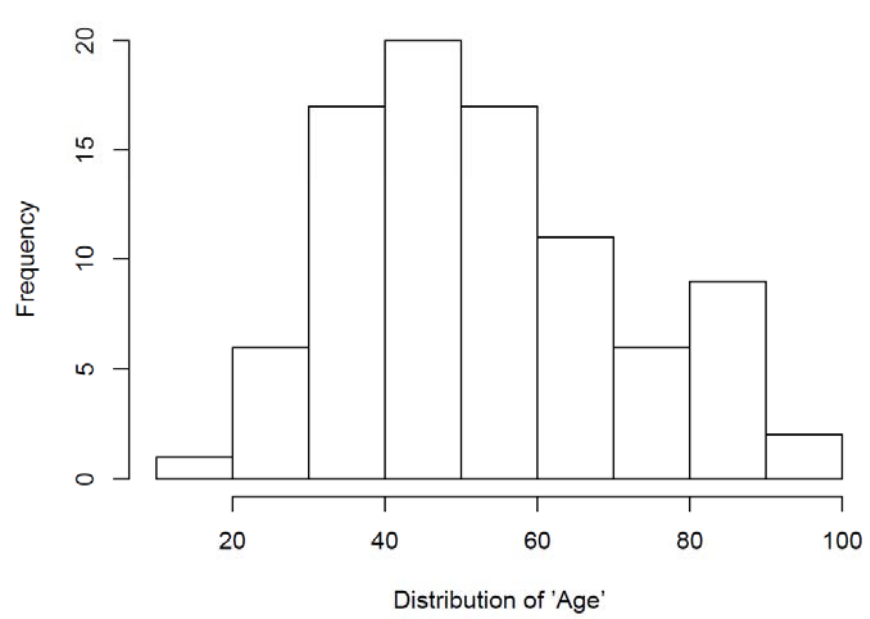
If hospital admission:
- ❑ Admission to (normal) ward
- ❑ Admission to intermediate care unit/IMCU
- ❑ Admission to intensive care unit/ ICU
- ❑ Kind of admission not known
- ❑ Admission to Medical Admission Unit (MAU; English health care system only)

Description de la population

100 patients inclus
90 traités stats

Gender	Frequency	Percentage
f	32	35.6
m	58	64.4
Sum	90	100.0

Variable	Mean	SD	Median
Age	52.933	18.250	51.0
Heart Rate	80.102	15.848	77.5



Histoire médicale

Présentation clinique

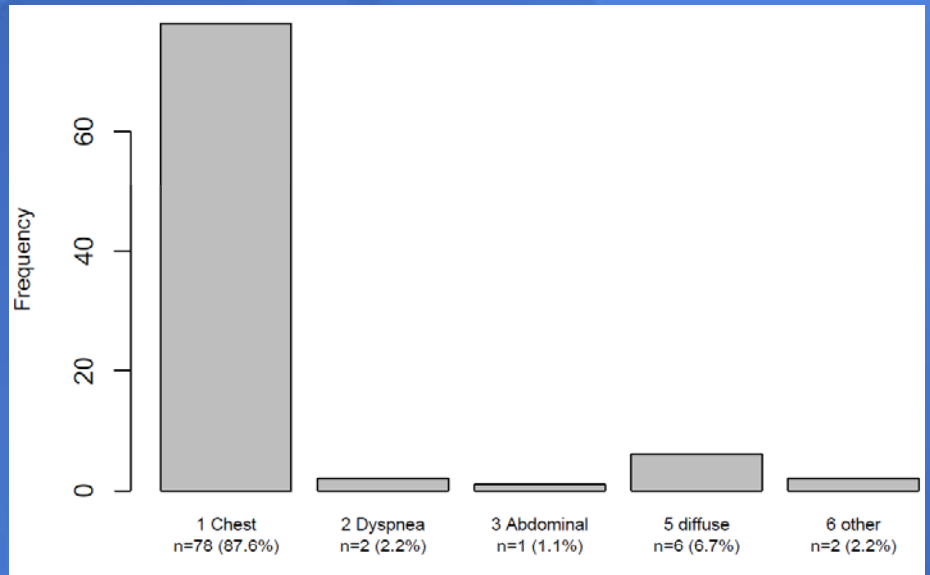


Figure 2.25: Bar chart for variable Disorders.

Antécédents

CAD	no=59 (65.6%), yes=22 (24.4%), missing=9 (10%)
Angina pectoris	no=85 (94.4%), yes=4 (4.4%), missing=1 (1.1%)
ASS	no=65 (72.2%), yes=24 (26.7%), missing=1 (1.1%)

Délais douleur - Admission

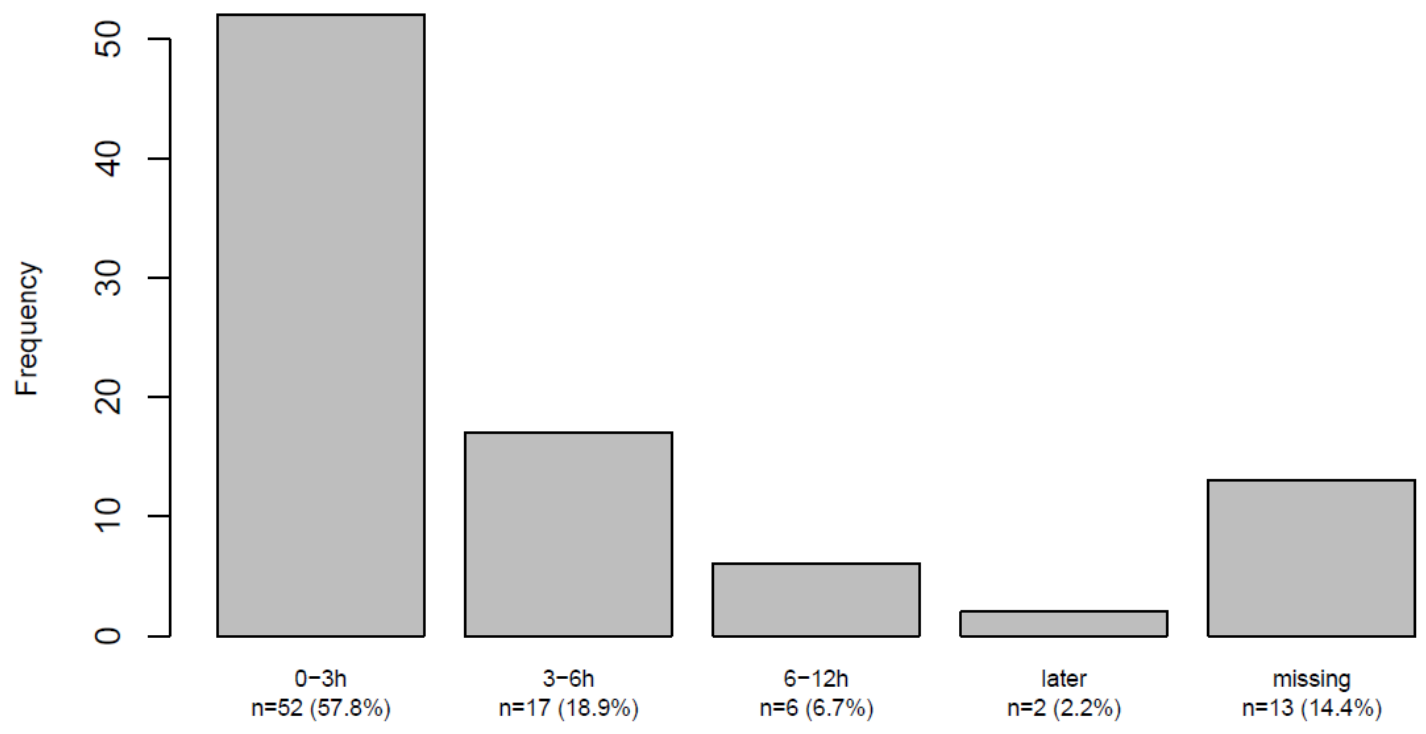
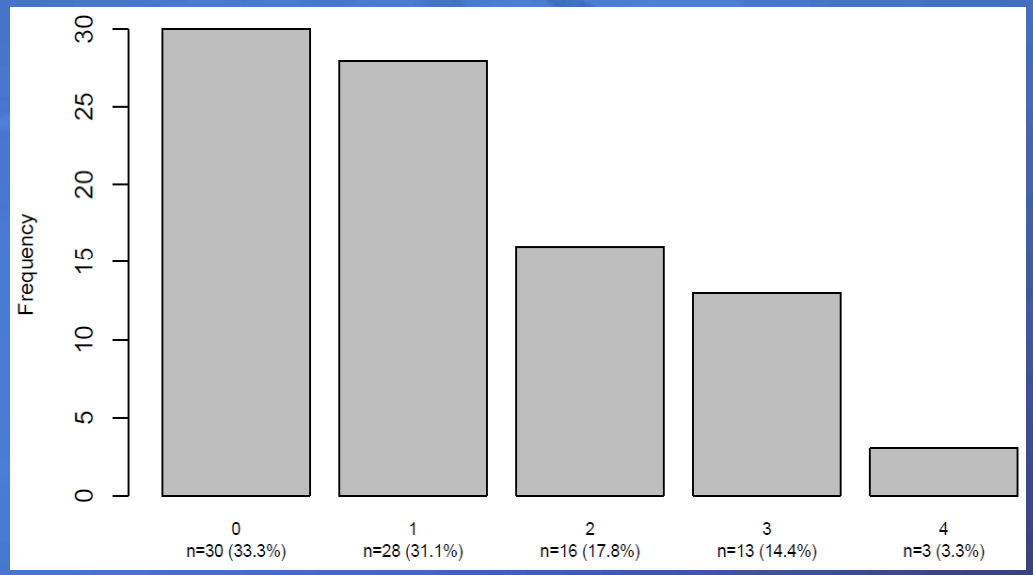


Figure 2.29: Bar chart for variable Start Disorders.

Facteurs de risque CV

Facteurs de risque	Fréquence
Killip	1=9 (10%), 2=81 (90%)
Family History	no=64 (71.1%), yes=7 (7.8%), missing=19 (21.1%)
Art. Hypertonus	no=49 (54.4%), yes=35 (38.9%), missing=6 (6.7%)
Nicotine Abuse	no=60 (66.7%), yes=24 (26.7%), missing=6 (6.7%)
DM	no=70 (77.8%), yes=15 (16.7%), missing=5 (5.6%)
Hypercholesterinemia	no=54 (60%), yes=30 (33.3%), missing=6 (6.7%)

Nbre de facteurs de risque CV :



ECG

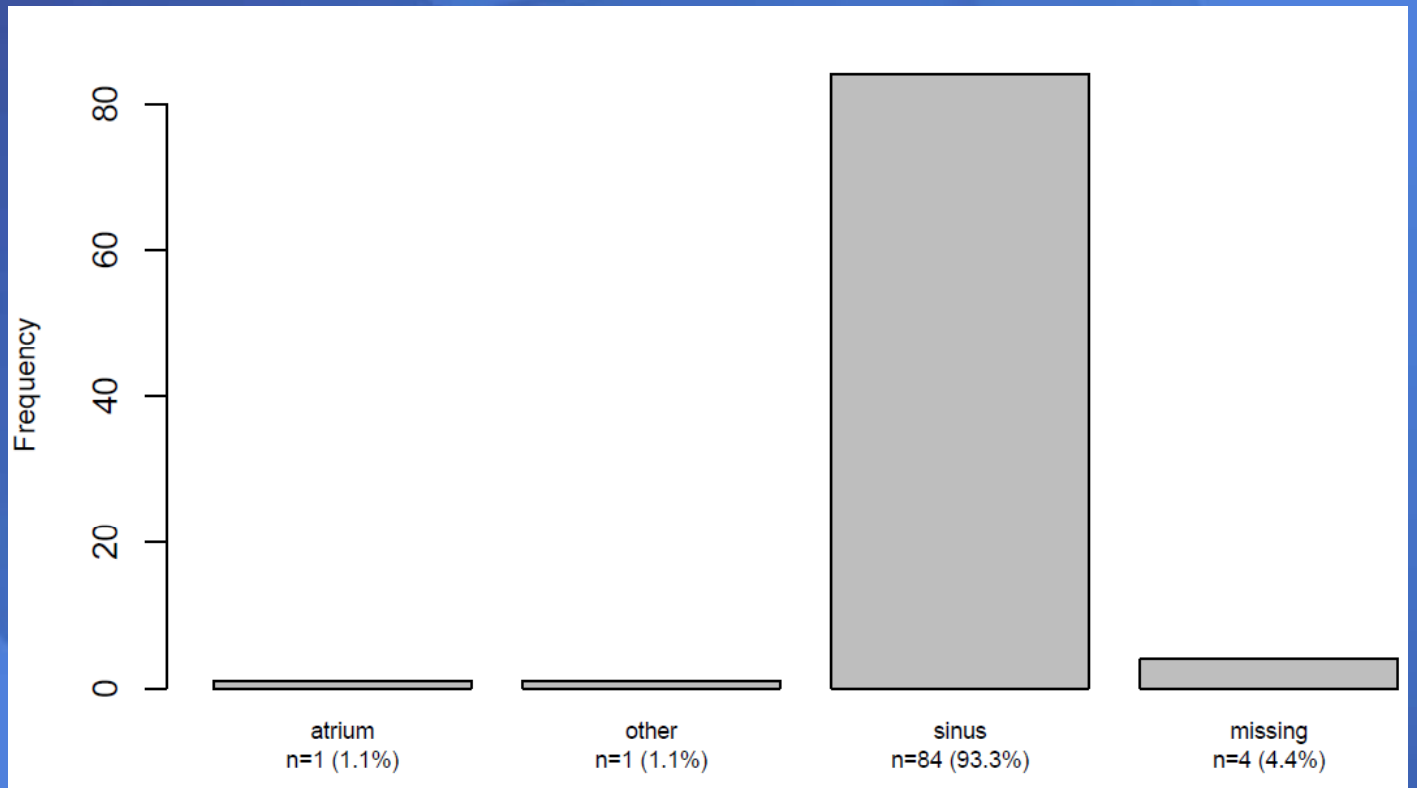


Figure 2.73: Bar chart for variable ECG Type.

Résultats biologiques

Variable	Mean	SD	Median	IQR	Q1	Q3	Q95	Min	Max	n
BA1Copeptin	47.656	119.768	6.00	22.5	2.50	25.00	234.000	2.50	756.0	89
BA1Troponin	0.037	0.157	0.01	0.0	0.01	0.01	0.063	0.01	1.4	88
BA1Crea	9.294	5.599	8.00	3.0	7.00	10.00	14.800	5.00	52.0	85
BA1CRP	9.019	10.849	5.00	6.5	2.50	9.00	36.600	2.50	58.0	77
BA2Troponin	0.151	0.983	0.01	0.0	0.01	0.01	0.130	0.01	8.8	81

Diagnostic final

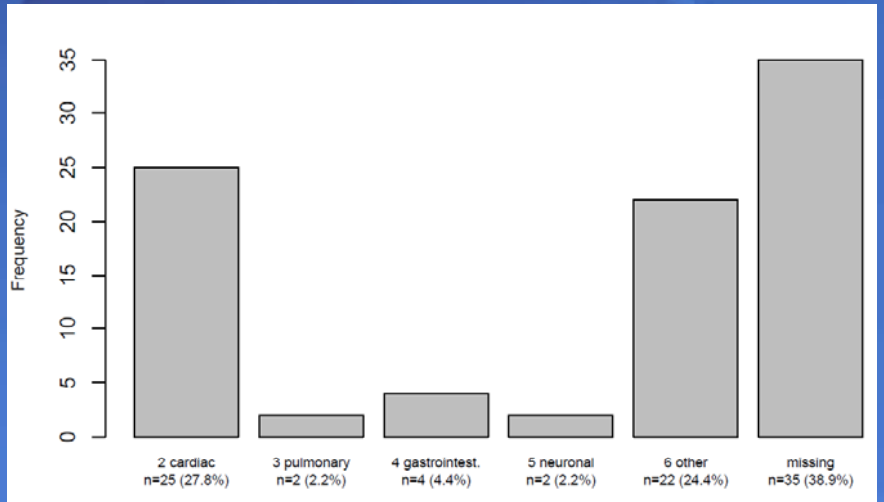


Figure 2.121: Bar chart for variable Predominant Disease.

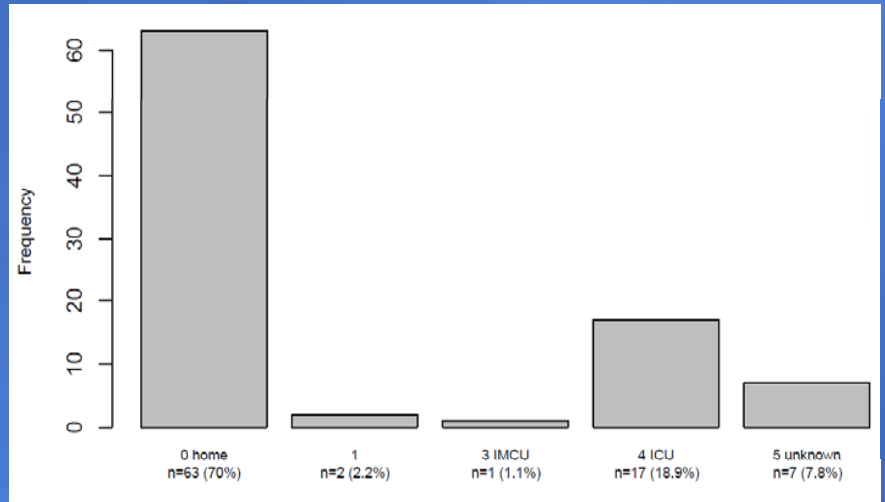
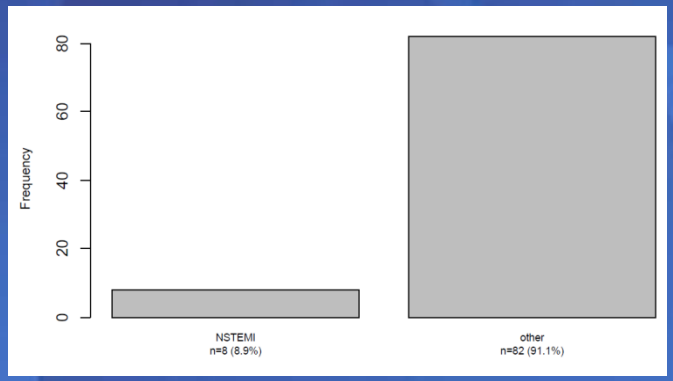
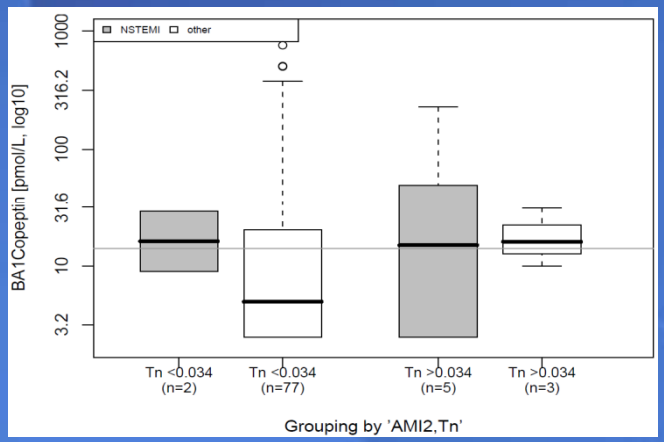


Figure 2.133: Bar chart for variable Admission to.

- 28 % origine cardiaque
- 70 % retour à domicile

Intérêt diagnostique





Troponine < 0.034 µg/L :

- Copeptin <14: n=51, dont 1 IDM ST-
- Copeptin ≥14: n=28, dont 1 IDM ST-

→ **NPV: 98.0%**

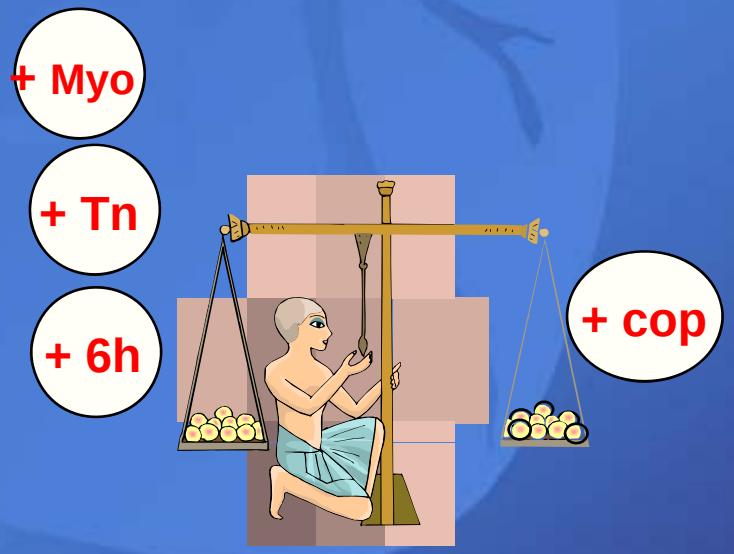
55 % de patients auraient pu sortir après T0

Impact économique

- 1251 patients admis aux Urg pour DT
- Sortie si TnT < 0.01 µg/L et copept < 14 pmol/L
  - Coût ↘ 30 %
  - Délai de sortie ↘ 74 %

R. Twerenbold, T. Reichlin & al, ESC 2010 Stockholm

- Fluidité aux Urg
- Patient rassuré + vite (55 %)

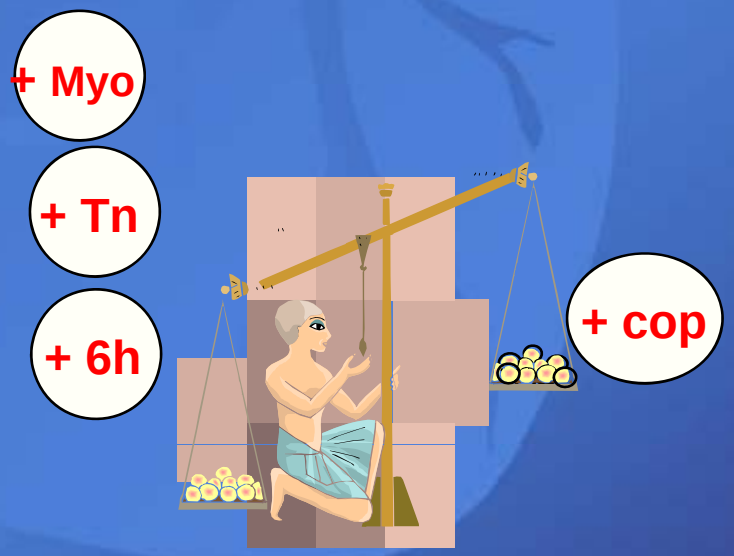


Impact économique

- 1251 patients admis aux Urg pour DT
- Sortie si TnT < 0.01 µg/L et copept < 14 pmol/L
  - ➢ Coût ↘ 30 %
  - ➢ Délai de sortie ↘ 74 %

R. Twerenbold, T. Reichlin & al, ESC 2010 Stockholm

- Fluidité aux Urg
- Patient rassuré + vite



Conclusion

- Intérêt confirmé de la VPN de la copeptine
- Mais nécessité de confrontation aux données cliniques
- Stratégie de prise en charge du patient et de gestion économique à défendre avec les urgentistes

Douleur thoracique aux Urgences la copeptine facteur d'exclusion de l'IDM ?

PG CLARET, A POLGE*, G CAYLA, JE de LA COUSSAYE**

*Sce de Biochimie
**Sce Cardio Interventionelle
D.A.D. - D.U.R. SAMU 30

NIMES

SAMU 30

Laboratoire d'Anesthésie et de Physiologie Cardio-vasculaire
EA 2992

UNIVERSITÉ MONTPELLIER I
FACULTÉ de MÉDECINE
Montpellier-Nîmes

Disclosures of Jean E de La Coussaye

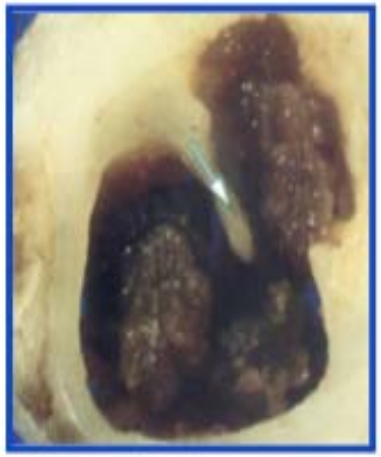
Lectures, Consulting and/or travel :

Astra-Zeneca, Daiichi-Sankyo & Eli-Lilly,

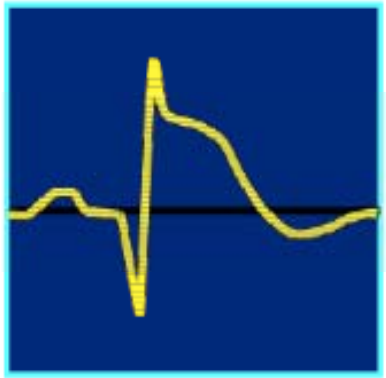
Sanofi-Avantis, Novo-Nordisk,

Thermo Fisher Scientific

ACS with persistent ST-segment elevation

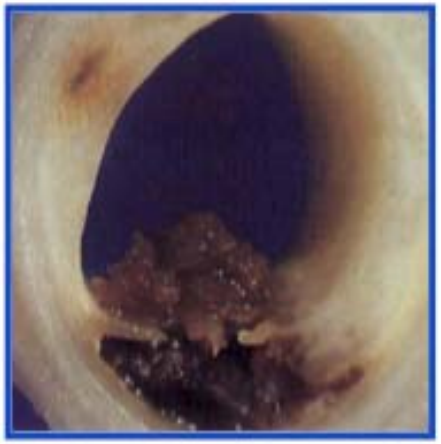


Adapted from Michael Davies

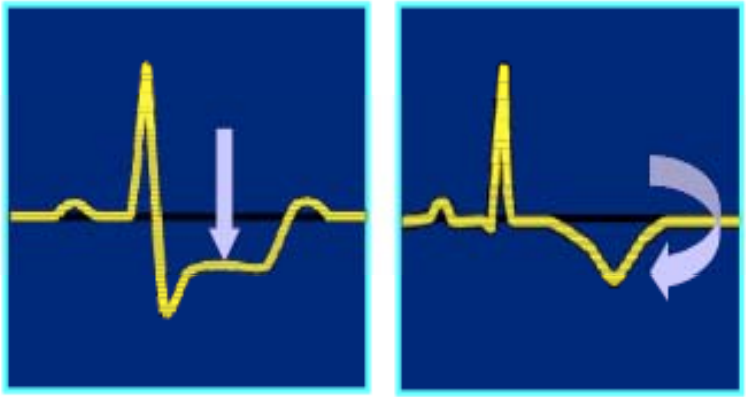


Troponin elevated

ACS without persistent ST-segment elevation



Adapted from Michael Davies



Troponins elevated or not

ESC Guidelines for the Management of NSTE-ACS (18)

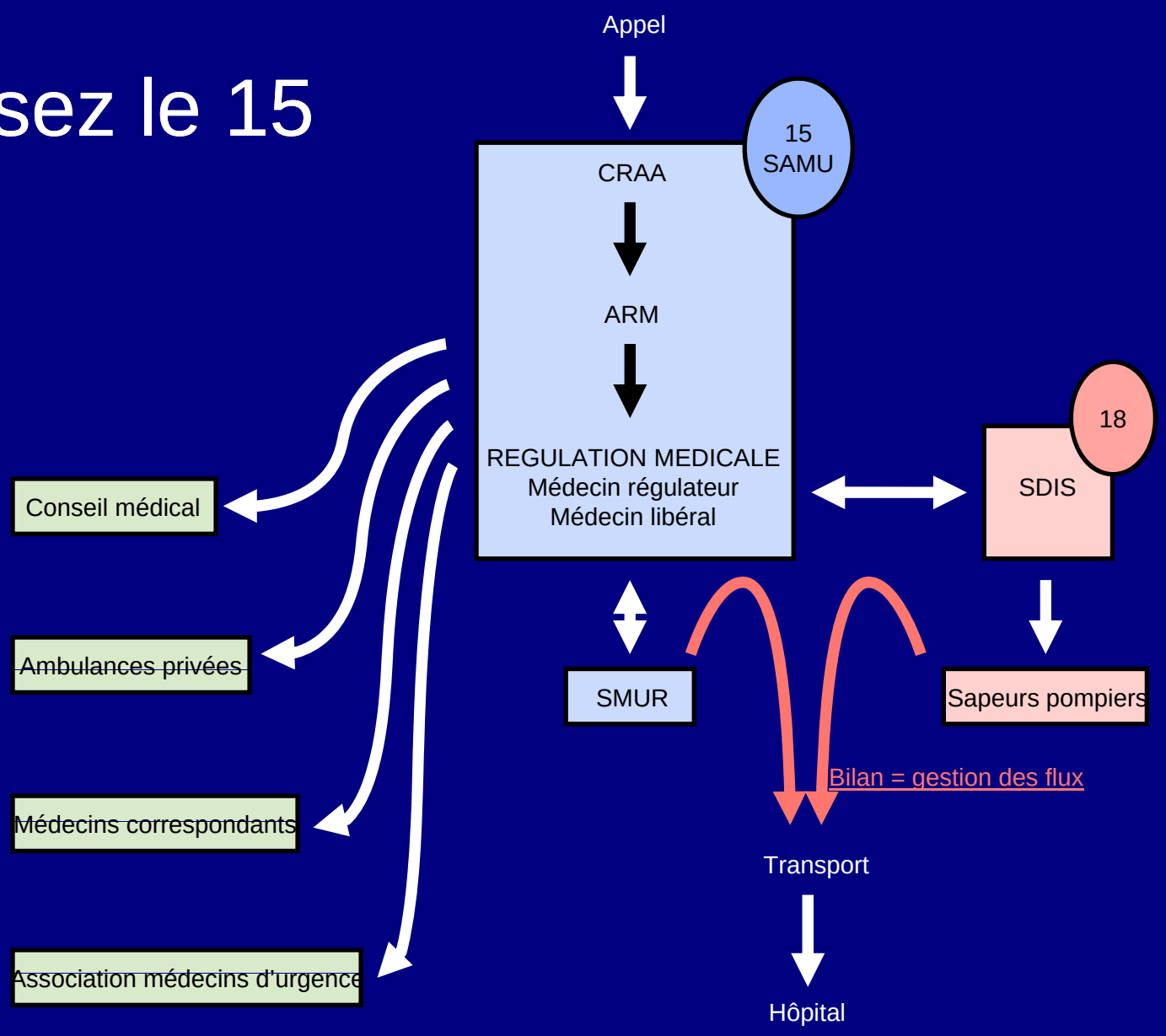
Parcours de soin d’une douleur thoracique

Nombreuses campagnes de communication

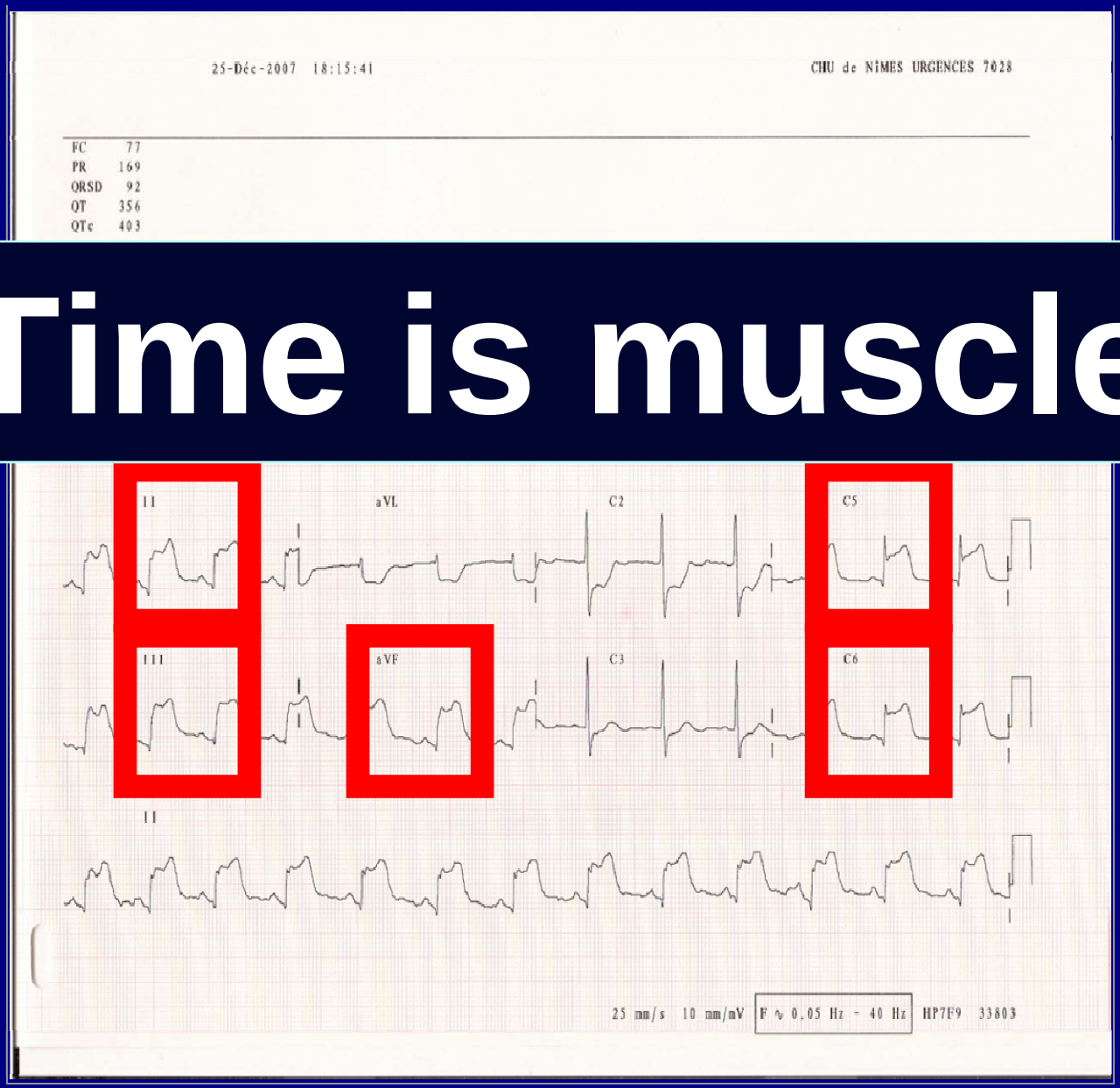
2007

2011

Composez le 15

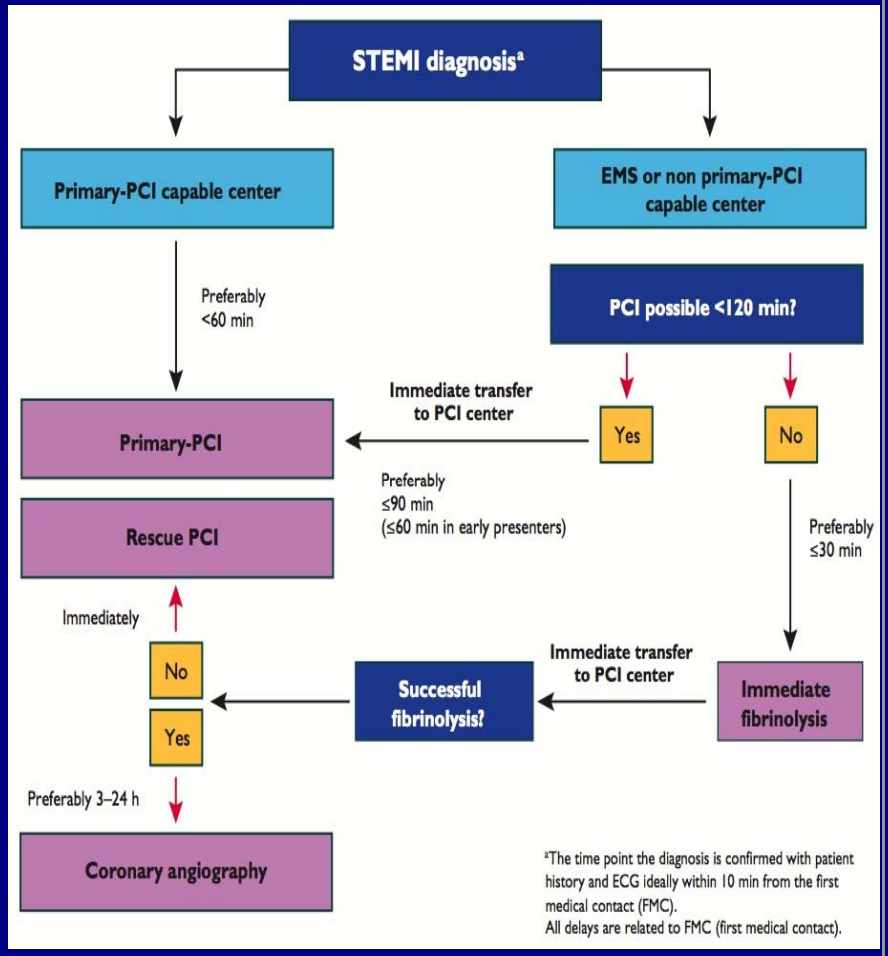


Extrait de «Médecine d'urgence : organisation et principe de base» - Claret PG, de La Coussaye JE - Arnette 2011



« Time is muscle »

Nouvelles recommandations ESC



Delay	Target
Preferred for FMC to ECG and diagnosis	**≤10 min**
Preferred for FMC to fibrinolysis ('FMC to needle')	**≤30 min**
Preferred for FMC to primary PCI ('door to balloon') in primary PCI hospitals	**≤60 min**
Preferred for FMC to primary PCI	**≤90 min** (≤60 min if early presenter with large area at risk)
Acceptable for primary PCI rather than fibrinolysis	**≤120 min** (≤90 min if early presenter with large area at risk) if this target cannot be met, consider fibrinolysis.
Preferred for successful fibrinolysis to angiography	**3–24 h**

Authors/Task Force M, Steg PG, James SK, Atar D, Badano LP, Lundqvist CB, et al. Eur Heart J. 2012

Le triage aux Urgences

- Outils disponibles :
  - Interrogatoire (histoire de la maladie, antécédents)
  - Clinique (paramètres vitaux, caractéristiques de la douleur)
  - Electrocardiogramme
- Niveau 2 de l'ETC :
  - Evaluation immédiate de l'IDE de triage
  - Evaluation par médecin dans les 15 minutes
- Orientation en salle d'accueil des urgences vitales (SAUV)

The Canadian Association of Emergency Physicians / L'Association canadienne des médecins d'urgence
NENA National Emergency Nurses Affiliation Inc. / L'affiliation nationale des infirmiers/infirmières d'urgence incorporée
L'association des Médecins d'urgence du Québec

The Canadian E.D. Triage and Acuity Scale

Patients should have an INITIAL TRIAGE ASSESSMENT WITHIN 10 MINUTES* of arrival

TRIAGE LEVEL I - RESUSCITATION

Time to NURSE Assessment IMMEDIATE*
Time to PHYSICIAN Assessment IMMEDIATE*

USUAL PRESENTATION	SENTINEL DIAGNOSIS
Code / Arrest	Traumatic Shock
Major Trauma	Pneumothorax - Traumatic / Tension
Shock States	Facial Burns with Airway Compromise
Near Death Asthma	Severe Burns > 30% TBS
Severe Respiratory Distress	Overdose with Hypotension / Unconscious
Altered Mental State (unconscious, delerious)	AAA
Seizures	AMI with Complications / CHF / Low BP
	Status Asthmaticus
	Head Injury - Major / Unconscious
	Status Epileptiicus

TRIAGE LEVEL II - EMERGENT

Time to NURSE Assessment IMMEDIATE*
Time to PHYSICIAN Assessment 15 MINUTES*

USUAL PRESENTATION	SENTINEL DIAGNOSIS
Head Injury (Risk Features ± Altered Mental State)	Head Injury
Severe Trauma	Trauma, Multiple Sites, Multiple Rib Fracture, Neck Injury / Spinal Cord
Altered Mental State (lethargic, drowsy, agitated)	
Chemical Exposure - Eyes	Alkaline / Caustic Occular Burns
Allergic Reaction (Severe)	Anaphylaxis
Chest Pain • Visceral, Non-Traumatic + ± Associated Symptoms	AMI, Unstable Angina, CHF, Chest Pain NOS, Gastroesophageal Reflux
Overdose (conscious), Drug Withdrawal	Unspecified Drug / Medicinal Overdose, "d.t.'s"
ABD Pain (Age >50) with Visceral Symptoms	AAA, Appendicitis, Cholecystitis
Back Pain (Non Trauma, Not MSK)	
GI Bleed with Abnormal Vital Signs	Gastrointestinal Bleed, Hypotension
CVA with Major Deficit	CVA
Asthma Severe (PEFR <40%)	Severe Asthma
Moderate / Severe Dyspnea / Difficulty Breathing	COPD, Croup
Vaginal Bleeding • Acute, Pain scale >5 + ± Abnormal Vital Signs	Spontaneous Abortion / Ectopic Pregnancy / Rupture
Vomiting and/or diarrhea (with suspicion of dehydration)	
Signs of serious infection (purpuric rash, toxic)	
Chemotherapy or immunocompromised	
Fever (age ≥ 3 months) Temp ≥ 38.0 (rectal)	Epiglottitis, Meningitis, Sepsis
Acute Psychotic Episode / Extreme Agitation	Acute Psychotic Episode / Agitation
Diabetes: Hypoglycemia, Hyperglycemia	Hypoglycemia, Diabetic Ketoacidosis, Hyperglycemia
Headache (Pain Scale 8 - 10/10)	Migraine
Pain Scale 8-10 (CVA, Back, Eye)	Renal Colic, LBP / Strain (Disc), Keratitis, Iritis
Sexual Assault	
Neonate (≤ 7 days old)	

TRIAGE LEVEL III - URGENT

Time to NURSE Assessment 30 MINUTES*
Time to PHYSICIAN Assessment 30 MINUTES*

USUAL PRESENTATION	SENTINEL DIAGNOSIS
Head Injury, Alert, Vomiting	Head Injury
Moderate Trauma	Anterior Dislocated Shoulder, Tibia / Fibula Fracture, Bimalleolar, Trimalleolar Ankle Fracture
Abuse / Neglect / Assault	
Vomiting and/or diarrhea (≤ 2 years)	
Dialysis problems	
Signs of Infection	Pyelonephritis
Mild / Moderate Asthma (PEFR > 40%)	Asthma without Status / COPD
Mild / Moderate Dyspnea	Bronchiolitis / Croup, Pneumonia
Chest Pain • No Visceral Symptoms (Sharp/MSK) + No Previous Heart Disease	Chest Pain NOS (MSK, GI, Resp)
GI Bleed with Normal Vital Signs	GI Bleed, No complications
Vaginal Bleeding Acute, Normal Vital Signs	Spontaneous Abortion
Seizure, Alert on Arrival	Seizure
Acute Psychosis ± Suicidal Ideation	Acute Psychosis ± Suicidal Ideation
Pain Scale 8 - 10 / 10 with minor injuries	
Pain Scale 4 - 7 / 10 (Headache, CVA, Back)	Migraine, Renal Colic, LBP / Strain (Disc)

TRIAGE LEVEL IV - LESS URGENT

Time to NURSE Assessment 60 MINUTES*
Time to PHYSICIAN Assessment 60 MINUTES*

USUAL PRESENTATION	SENTINEL DIAGNOSIS
Head Injury, Alert, No Vomiting	Head Injury, Alert, No Vomiting
Minor Trauma	Colles Fracture, Ankle Sprain
ABD Pain (Acute)	Appendicitis, Cholecystitis
Earache	Otitis Media / Otitis Externa
Chest Pain, Minor Trauma or MSK, No Distress	Chest Pain NOS (MSK, GI, Resp), Gastroesophageal Reflux
Vomiting and diarrhea (>2 years/no dehydration)	
Suicidal Ideation / Depression	Suicidal Ideation / Depression
Allergic Reaction (Minor)	Urticaria
Corneal Foreign Body	Corneal Foreign Body
Back Pain (Chronic)	LBP /Strain
URI Symptoms	URI
Pain Scale 4 - 7	
Headache (Non Migraine / Not Sudden)	

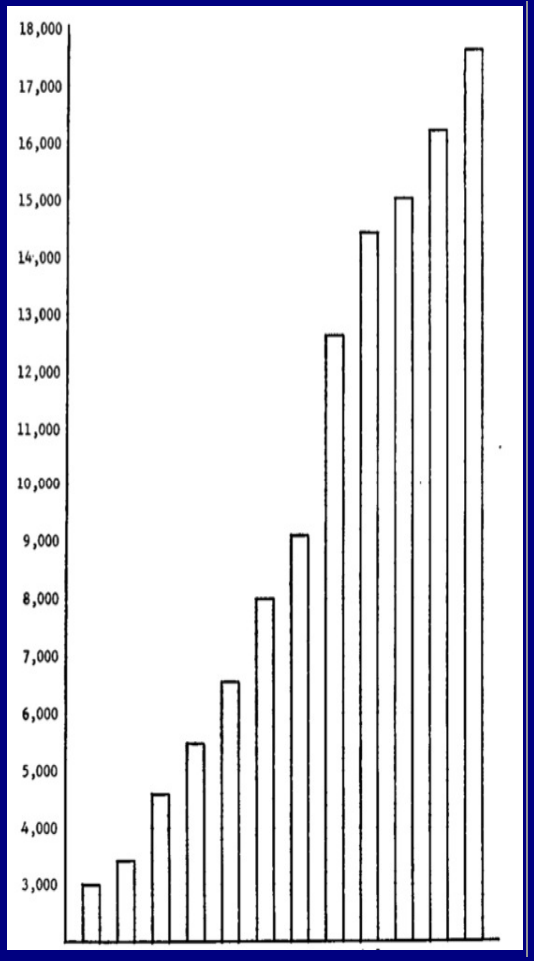
TRIAGE LEVEL V - NON URGENT

Time to NURSE Assessment 120 MINUTES*
Time to PHYSICIAN Assessment 120 MINUTES*

USUAL PRESENTATION	SENTINEL DIAGNOSIS
Minor Trauma, Not Necessarily Acute	LBP / Strain
Sore Throat, No Resp Symptoms	URI
Diarrhea alone (no dehydration)	Gastroenteritis
Vomiting alone normal mental status (no dehydration)	Vomiting
Menses	Disorders of Menstruation
Minor Symptoms	Dressing Changes
ABD Pain (Chronic)	Cast Changes
Psychiatric complaints	Constipation
Pain Scale < 4	Symptoms / Neurotic, Personality and Nonpsychotic Mental Disorders
	Unspecified Superficial Laceration(s)

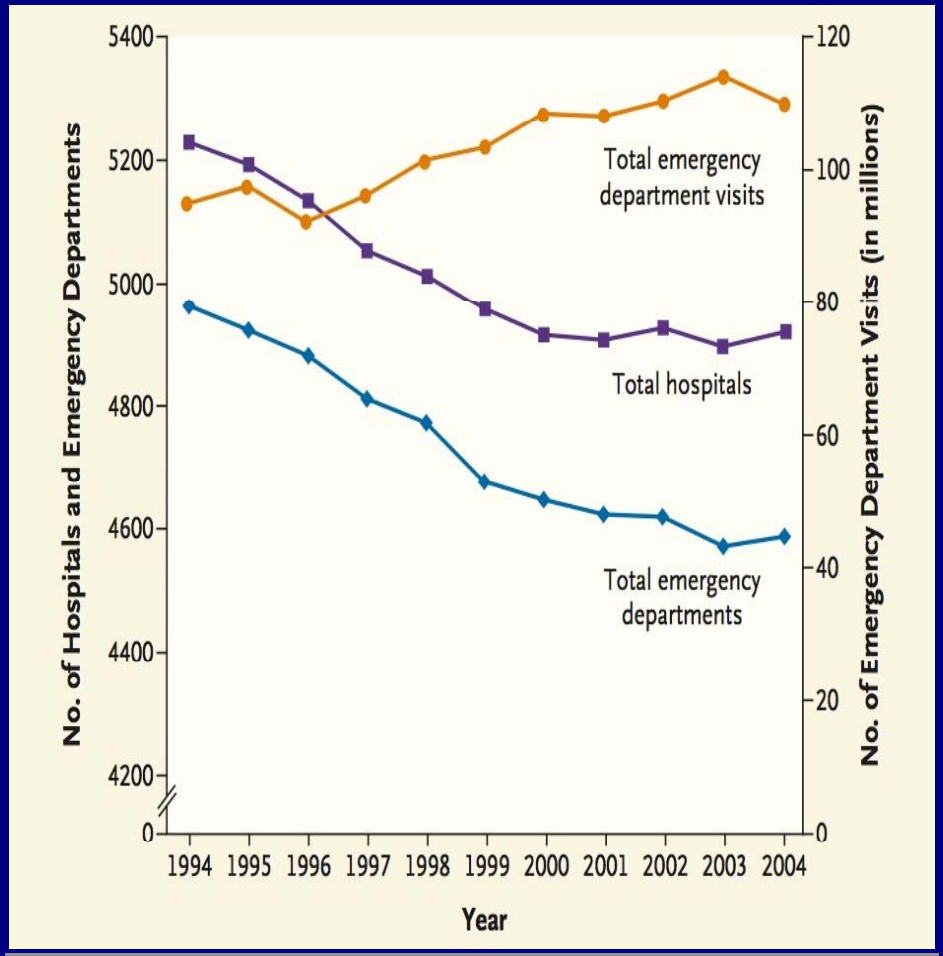
* TIMES TO ASSESSMENT are operating objectives, not established standards of care. Facilities without onsite physician coverage may meet assessment objectives using delegated protocols and remote communication.

Des consultations toujours plus nombreuses

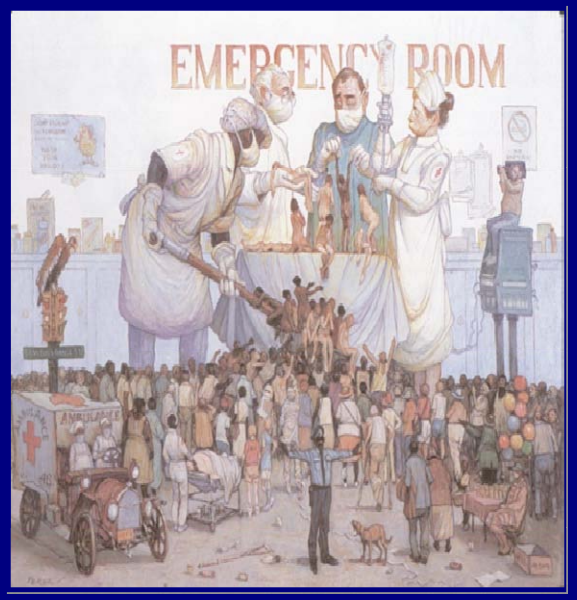


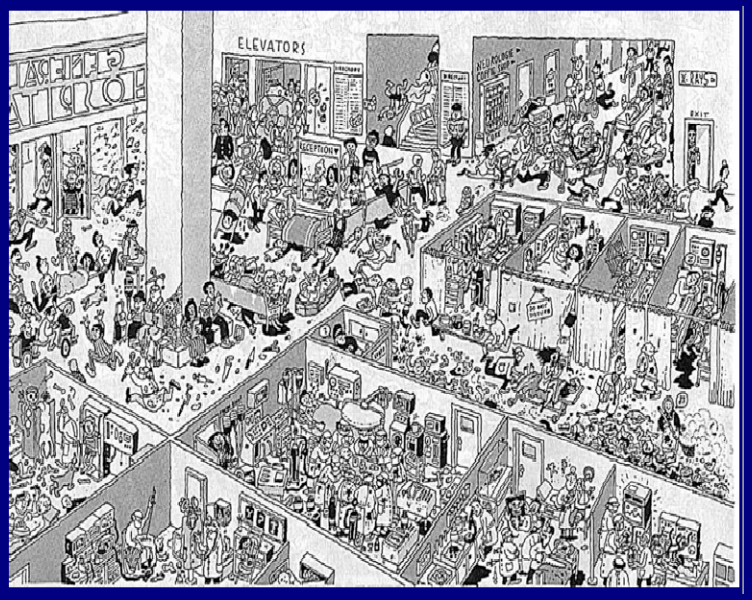
Shortliffe EC, Hamilton TS, Noroian EH. N Engl J Med. 1958

Nombreuses, nombreuses...



Kellermann AL. N Engl J Med. 2006





Lance Iversen / The Chronicle

ED overcrowding is associated with an increased frequency of medication errors☆

Erik B. Kulstad MD, MS*, Rishi Sikka MD, Rolla T. Sweis PharmD,
Ken M. Kelley MD, Kathleen H. Rzechula RN

American Journal of Emergency Medicine (2010) **28**, 304–309

The Effect nt
Crowding itcomes

Steven L. Bernstein, MI Epstein, MD,
Dan Handel, MD, MPH, n McConnell, PhD,
Jesse M. Pines, MD, MI D, Frank Zwemer, MD,
Michael Schull, MD, an ergency Medicine,
Emergency Departmen

MEDICINE 2009; 16:1–10

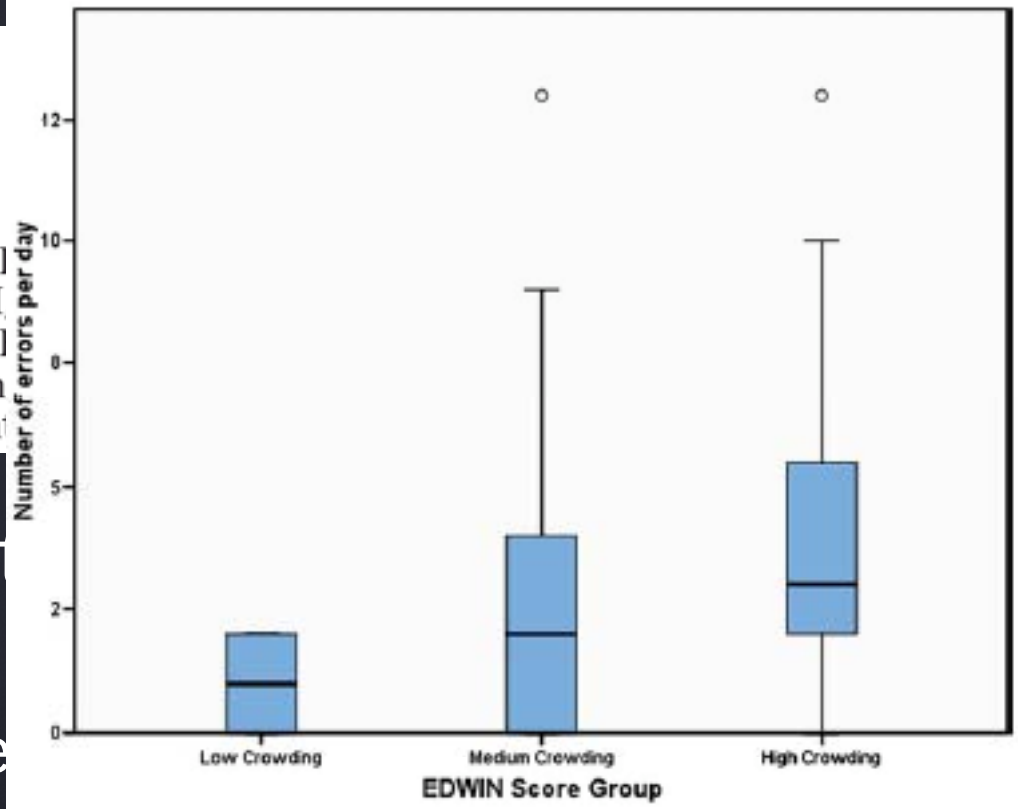


Fig. 3 Daily error frequency observed during low, medium, and high crowding days.

Augmenta

- Mortalité
- Délais de , antalgiques
- SCAM ou

Reperfusio

ED overcrowding is associated with an increased frequency of medication errors☆

Erik B. Kulstad MD, MS*, Rishi Sikka MD, Rolla T. Sweis PharmD, Ken M. Kelley MD, Kathleen H. Rzechula RN

American Journal of Emergency Medicine (2010) **28**, 304–309

The Effect of Emergency Department Crowding on Clinically Oriented Outcomes

Steven L. Bernstein, MD, Dominik Aronsky, MD, Reena Duseja, MD, Stephen Epstein, MD, Dan Handel, MD, MPH, Ula Hwang, MD, MPH, Melissa McCarthy, ScD, K. John McConnell, PhD, Jesse M. Pines, MD, MBA, MSCE, Niels Rathlev, MD, Robert Schafermeyer, MD, Frank Zwemer, MD, Michael Schull, MD, and Brent R. Asplin, MD, MPH, Society for Academic Emergency Medicine, Emergency Department Crowding Task Force

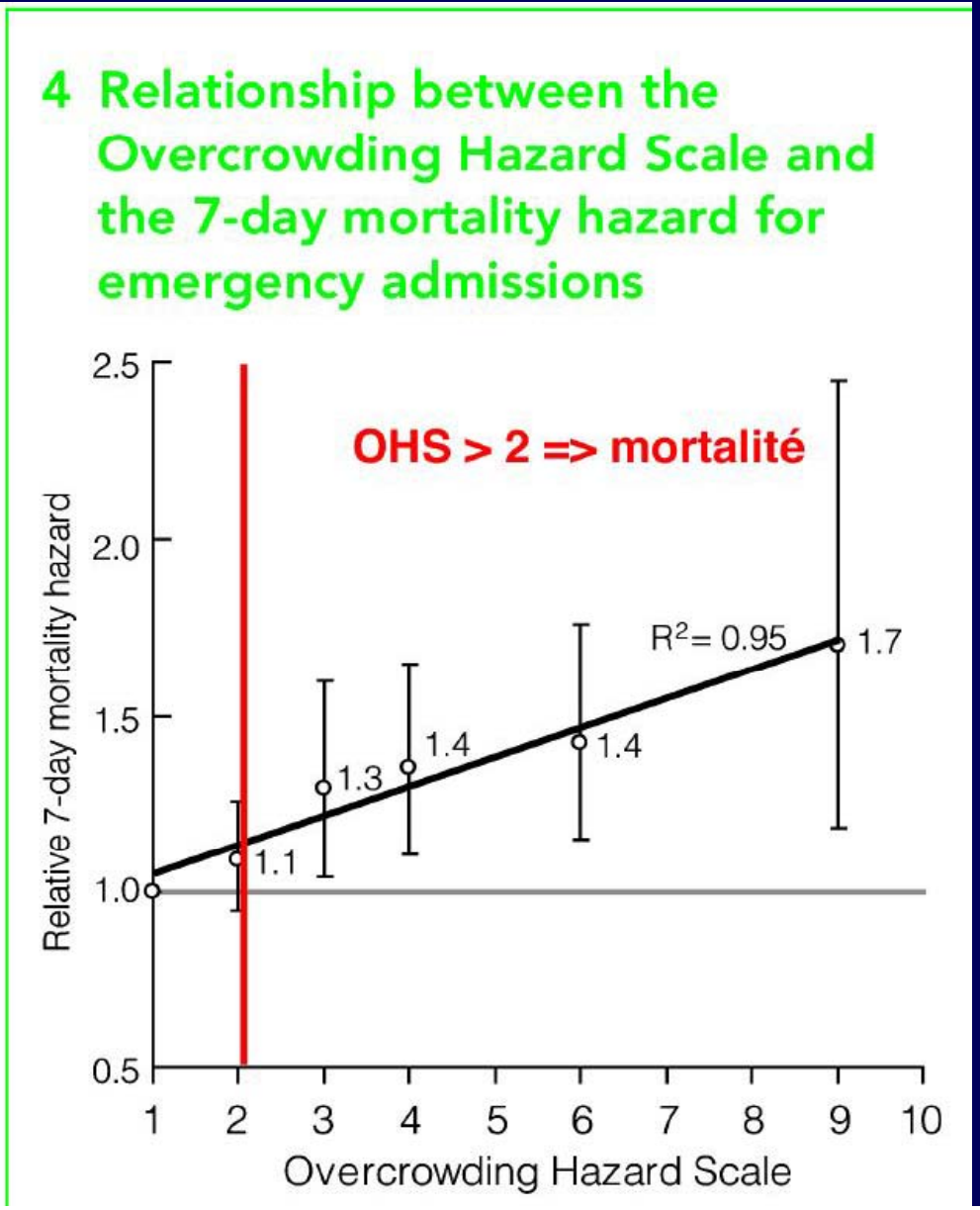
ACADEMIC EMERGENCY MEDICINE 2009; 16:1–10

Augmentation du risque de

- Mortalité hospitalière
- Délais de mise en place des atb (pneumonie), antalgiques
- SCAM ou SAIP

Reperfusion des SCA ST+ non affectée

L'hôpital plein (H.P.) : Conséquences sur la mortalité



Facteurs prédictifs indépendants :

- **durée de séjour plus longue aux urgences**
- **durée d'attente d'un praticien plus longue**

Age, pathologie, niveau d'urgence, mode de transport, d'adressage : NS

Sprivulis PC et al, MJA, 2006

SCA et diagnostics différentiels

- 347229 CS au San Francisco General Hospital Emergency Department
- 8711 douleurs thoraciques (3078 hospitalisations)
- SCA = 11,8 % des douleurs thoraciques

Diagnostic group	Patients	% of Admitted (n = 3078)	95% CI	% of Total (n = 8711)	95% CI
AMI	329	10.7%	9.6%–11.8%	3.8%	3.4%–4.2%
Angina/CAD	693	22.5%	21.0%–24.0%	8.0%	7.4%–8.5%
Atypical CP (MI r/o)	905	29.4%	27.8%–31.0%	—	
Aortic dissection	8	0.3%	0.1%–0.5%	0.09%	0.04%–0.18%
PE	12	0.4%	0.2%–0.7%	0.14%	0.07%–0.24%
Other cardiac	424	13.8%	12.6%–15.0%	4.9%	4.4%–5.3%
Non-PE pulmonary	345	11.2%	10.1%–12.4%	4.0%	3.6%–4.4%
Abdominal causes	49	1.6%	1.2%–2.1%	0.56%	0.42%–0.74%
Other	313	10.2%	9.1%–11.3%	3.6%	3.2%–4.0%

AMI = acute myocardial infarction; CAD = coronary artery disease; CP = chest pain; MI = myocardial infarction; PE = pulmonary embolism.

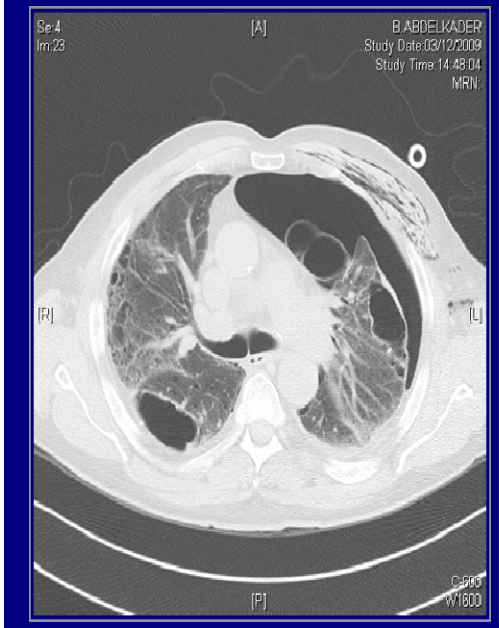
Kohn MA, Kwan E, Gupta M, Tabas JA. J Emerg Med. 2005

SCA et diagnostics différentiels

ESC 2011

Cardiac	Pulmonary	Haematological	Vascular	Gastro-intestinal	Orthopaedic/ infectious
Myocarditis	Pulmonary embolism	Sickle cell crisis	Aortic dissection	Oesophageal spasm	Cervical discopathy
Pericarditis	Pulmonary infarction	Anaemia	Aortic aneurysm	Oesophagitis	Rib fracture
Cardiomyopathy	Pneumonia Pleuritis		Cerebrovascular disease	Peptic ulcer	Muscle injury/ inflammation
Valvular disease	Pneumothorax			Pancreatitis	Costochondritis
Tako-Tsubo cardiomyopathy				Cholecystitis	Herpes zoster
Cardiac trauma					

Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H, et al. Eur Heart J. 2011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B.ABDELKADER
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C-500
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MEDCOM RESAMPLED
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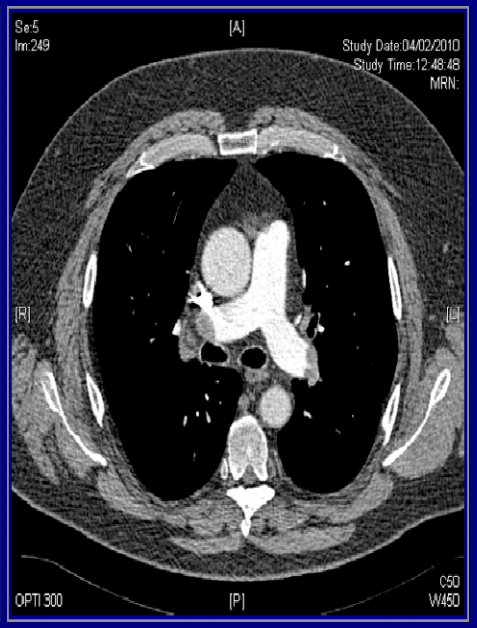
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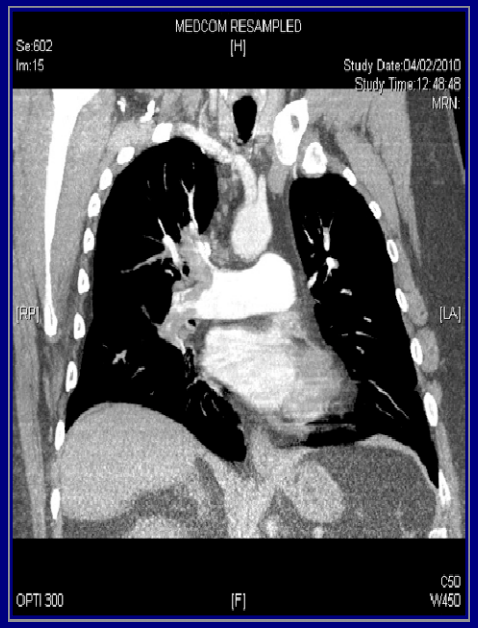
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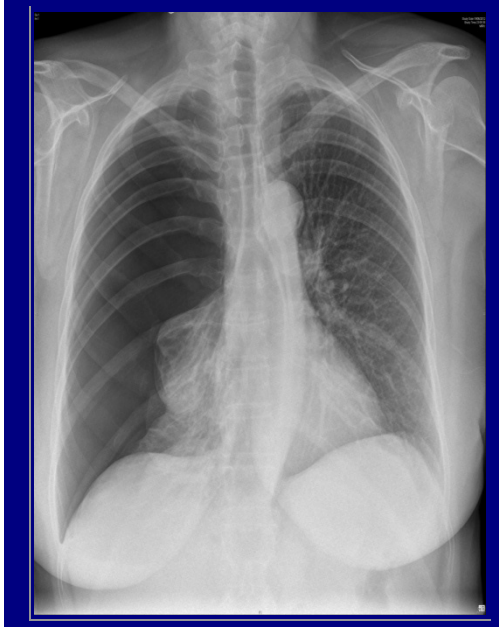

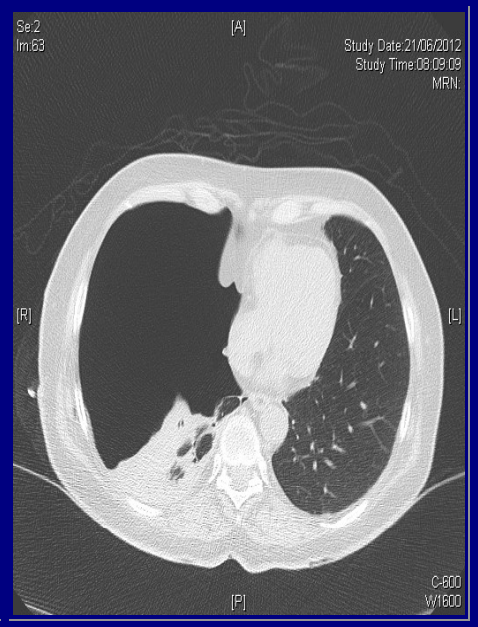
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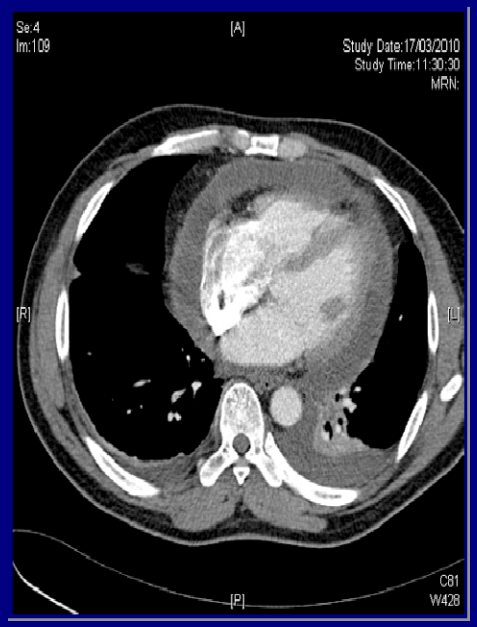
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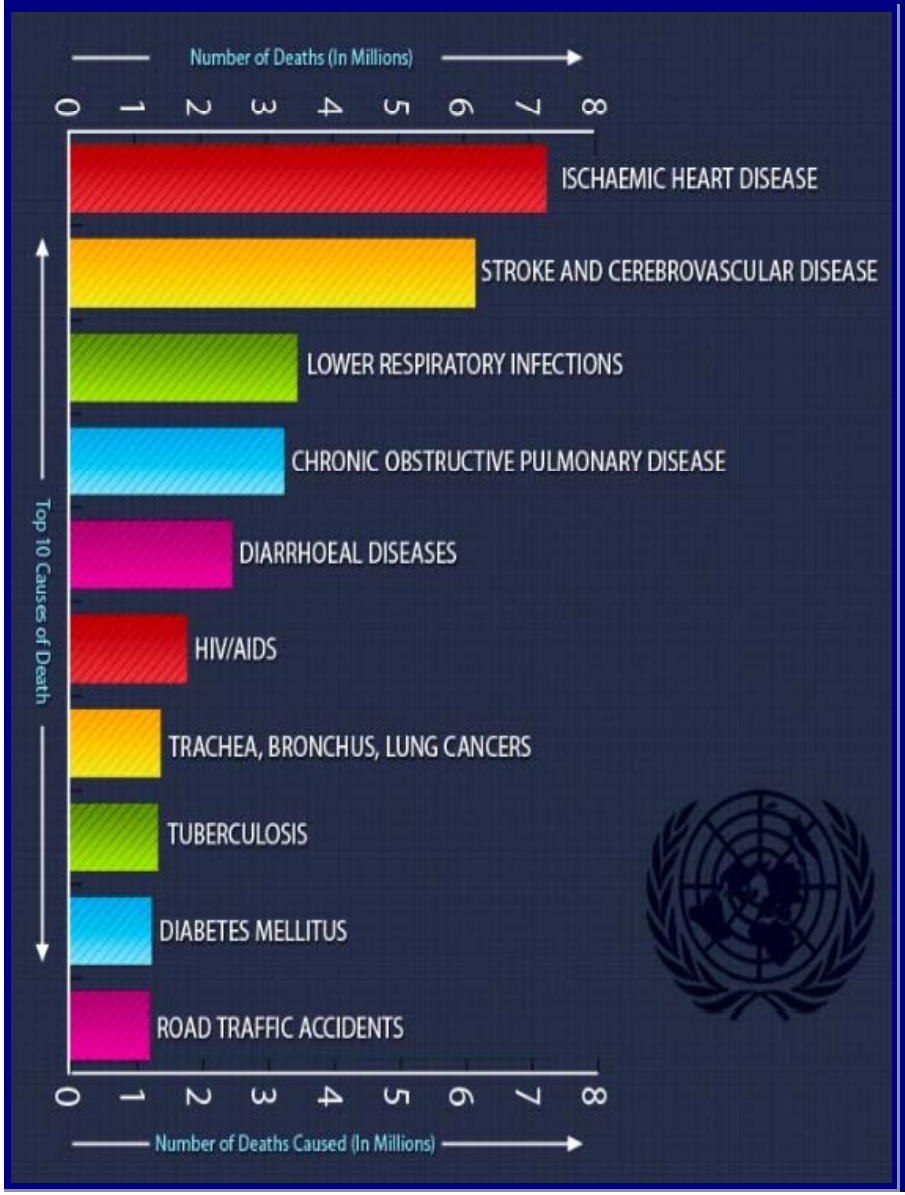
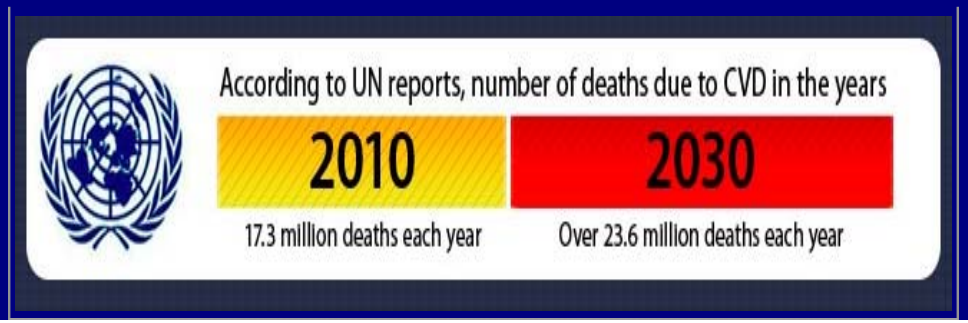
Syndromes coronariens aigus

(sans sus décalage permanent du segment ST)

Une épidémie mondiale en expansion





Epidémiologie

- La plus grande cause de mortalité
- En France, 10 % de l'ensemble des décès
- Cardiopathie la plus fréquente : 25 % des hommes après 65 ans
- Aux USA, 1 décès toutes les 13 secondes d'origine cardiovasculaire
- Aux USA, 1 adulte sur 3 vit avec une pathologie cardiaque
- Aux USA et en 2010, les pathologies CV ont couté 444 milliards de $

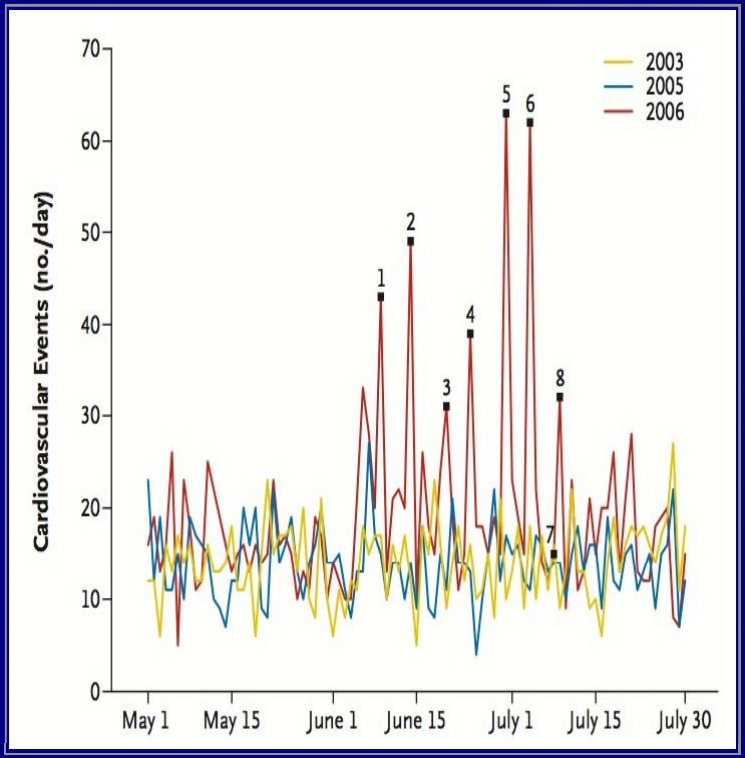
Rosamond W, Flegal K, Friday G, Furie K, Go A, Greenlund K, et al. Circulation. 2007

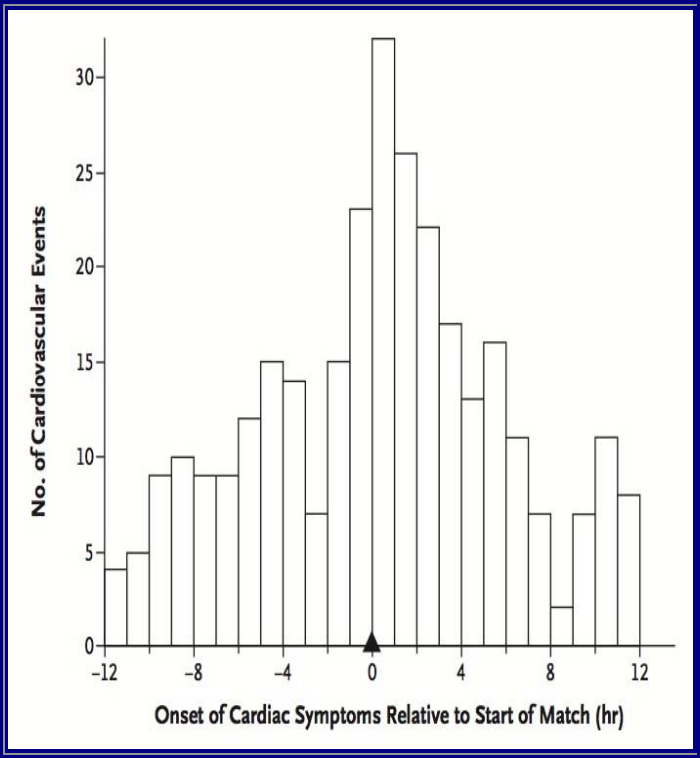
Facteurs de risque cardio-vasculaire

- Hypercholestérolémie
- HTA
- Tabac
- Diabète

- Génétique, surpoids, stress, sédentarité, sexe masculin, âge, hyperfibrinogènémie, hyperhomocystéinémie

Le football est un facteur de risque





Wilbert-Lampen U, Leistner D, Greven S, Pohl T, Sper S, Volker C, et al. N Engl J Med. 2008

Prise en charge initiale

ESC 2011

Recommendations	Class[a]	Level[b]	Ref[c]
In patients with a suspected NSTE-ACS, diagnosis and short-term ischaemic/bleeding risk stratification should be based on a combination of clinical history, symptoms, physical findings, ECG (repeated or continuous ST monitoring), and biomarkers.	I	A	16, 18, 27, 30, 58 56, 57
ACS patients should be admitted preferably to dedicated chest pain units or coronary care units.	I	C	47
It is recommended to use established risk scores for prognosis and bleeding (e.g. GRACE, CRUSADE).	I	B	50, 83
A 12-lead ECG should be obtained within 10 min after first medical contact and immediately read by an experienced physician. This should be repeated in the case of recurrence of symptoms, and after 6–9 and 24 h, and before hospital discharge.	I	B	17, 18
Additional ECG leads (V_{3R}, V_{4R}, V_7–V_9) are recommended when routine leads are inconclusive.	I	C	18
Blood has to be drawn promptly for troponin (cardiac troponin T or I) measurement. The result should be available within 60 min. The test should be repeated 6–9 h after initial assessment if the first measurement is not conclusive. Repeat testing after 12–24 h is advised if the clinical condition is still suggestive of ACS.	I	A	27, 30
A rapid rule-out protocol (0 and 3 h) is recommended when highly sensitive troponin tests are available (see *Figure 5*).	I	B	20, 21, 23
An echocardiogram is recommended for all patients to evaluate regional and global LV function and to rule in or rule out differential diagnoses.	I	C	-
Coronary angiography is indicated in patients in whom the extent of CAD or the culprit lesion has to be determined (see Section 5.4).	I	C	-
Coronary CT angiography should be considered as an alternative to invasive angiography to exclude ACS when there is a low to intermediate likelihood of CAD and when troponin and ECG are inconclusive.	IIa	B	37–41
In patients without recurrence of pain, normal ECG findings, negative troponins tests, and a low risk score, a non-invasive stress test for inducible ischaemia is recommended before deciding on an invasive strategy.	I	A	35, 54, 55

Prévalence variable

	MG	Centre 15	SAU
Cardiaque	20 %	60 %	45 %
Pariétale	43 %	6 %	14 %
Pulmonaire	4 %	4 %	5 %
Digestive	5 %	6 %	6 %
Psychosomatique	11 %	5 %	8 %
Autres	16 %	19 %	26 %

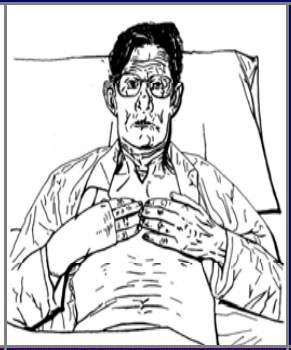
Caractéristiques de la douleur thoracique

«Où et comment avez-vous mal ?»

orpy JM, Burke AE, Glass RM. JAMA. 2010

Edmondstone WM. BMJ. 1995

Caractéristiques de la douleur thoracique

				
Cardiaque (n=138)	19	64	27	28
Non cardiaque (n=21)	4	4	2	11
Incertain (n=44)	3	13	7	21

80 % des patients cardiaques répondent par ces trois gestes pour caractériser la DT

Edmondstone WM. BMJ. 1995

Douleur thoracique et SCA

- Lee et al, Am J Cardiol, 1989
  - Patients sortant par erreur des urgences avec un IDM non diagnostiqué # 4%
  - Mortalité = 25% vs < 10%
- Pope et al, NEJM, 2000
  - Patients sortant par erreur des urgences avec
    - Un IDM non diagnostiqué # 2,1 % , mortalité x 1,9
    - Un angor instable # 2,3 %, mortalité x 1,7

Douleur thoracique

Pope et al, NEJM, 2000

TABLE 2. FACTORS ASSOCIATED WITH FAILURE TO HOSPITALIZE PATIENTS WITH ACUTE CARDIAC ISCHEMIA WHO PRESENTED TO THE EMERGENCY DEPARTMENT, ACCORDING TO MULTIVARIABLE MODELS.*

FACTOR	ODDS RATIO FOR DISCHARGE (95% CI)	P VALUE
All patients (n=1855)†		
Chief symptom of shortness of breath	2.7 (1.1–6.5)	0.02
Male sex ≥55 yr	3.7 (0.8–16.2)‡	0.08
Female sex <55 yr	6.7 (1.4–32.5)‡	0.02
Female sex ≥55 yr	1.9 (0.4–9.1)‡	0.40
Nonwhite race	2.2 (1.1–4.3)	0.03
Normal ECG	3.3 (1.7–6.3)	<0.001
Patients with acute myocardial infarction (n=889)§		
Nonwhite race	4.5 (1.8–11.8)	0.002
Normal ECG	7.7 (2.9–20.2)	<0.001

*Patients with incomplete data were not included. CI denotes confidence interval, and ECG electrocardiogram.

Mais d'autres signes possibles

Table 1.
ED visits resulting in AMI diagnosis by chief complaint.

Complaint	No. of Presentations for AMI	%	95% CI, %
Chest pain	380	53	49–56
Shortness of breath	121	17	14–20
Cardiac arrest	50	7	5–9
Dizziness/weakness/syncope	32	4	3–6
Abdominal pain	14	2	1–3
Other	124	17	15–20
Total	721	100	

Gupta M, Tabas JA, Kohn MA. Ann Emerg Med. 2002

Des ECG parfois atypiques

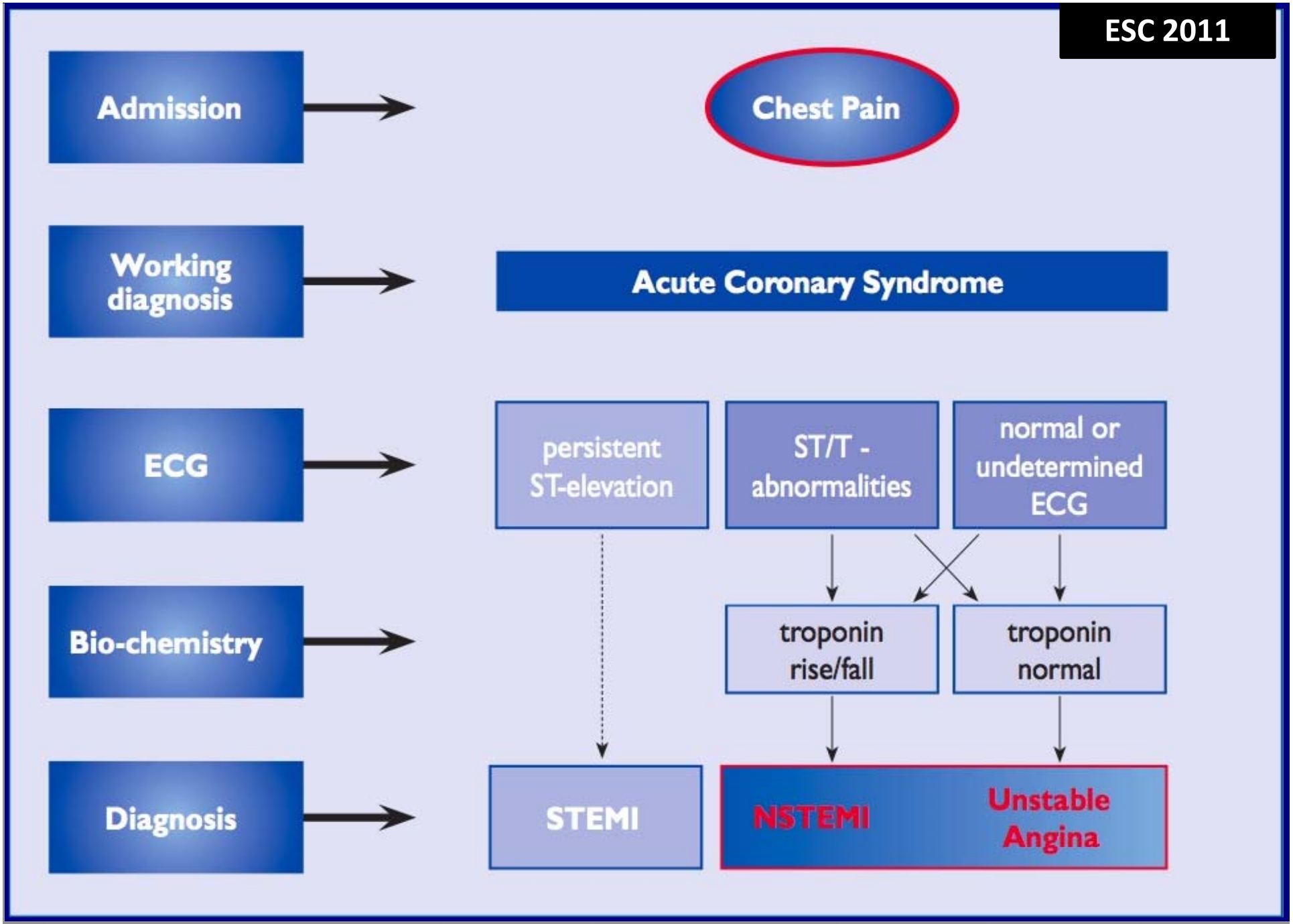
TABLE 1. The Medical Literature With Rates of AMI Diagnosis With Both Normal and Nonspecifically Abnormal ECGs on Presentation to the ED

Investigation	% AMI With Normal ECG	% AMI With NSSTTW ECG
Lee et al[1]	1	4
Rouan et al[2]	3	—
Fesmire et al[4]	2	5
Gibler et al[5]	3	21
Brady (personal communication)	3	6

Moy. = 2,4 % **Moy. = 9 %**

Brady WJ, Roberts D, Morris F. Am J Emerg Med. 1999

Total = 11,4 %

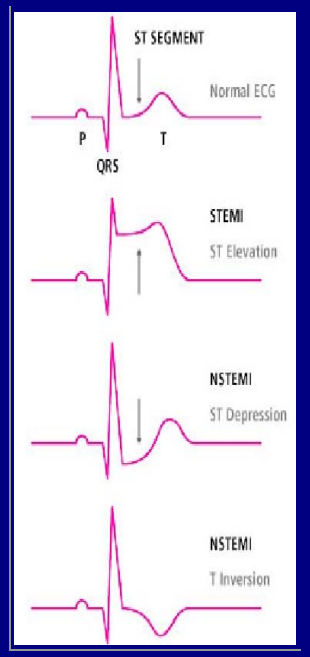


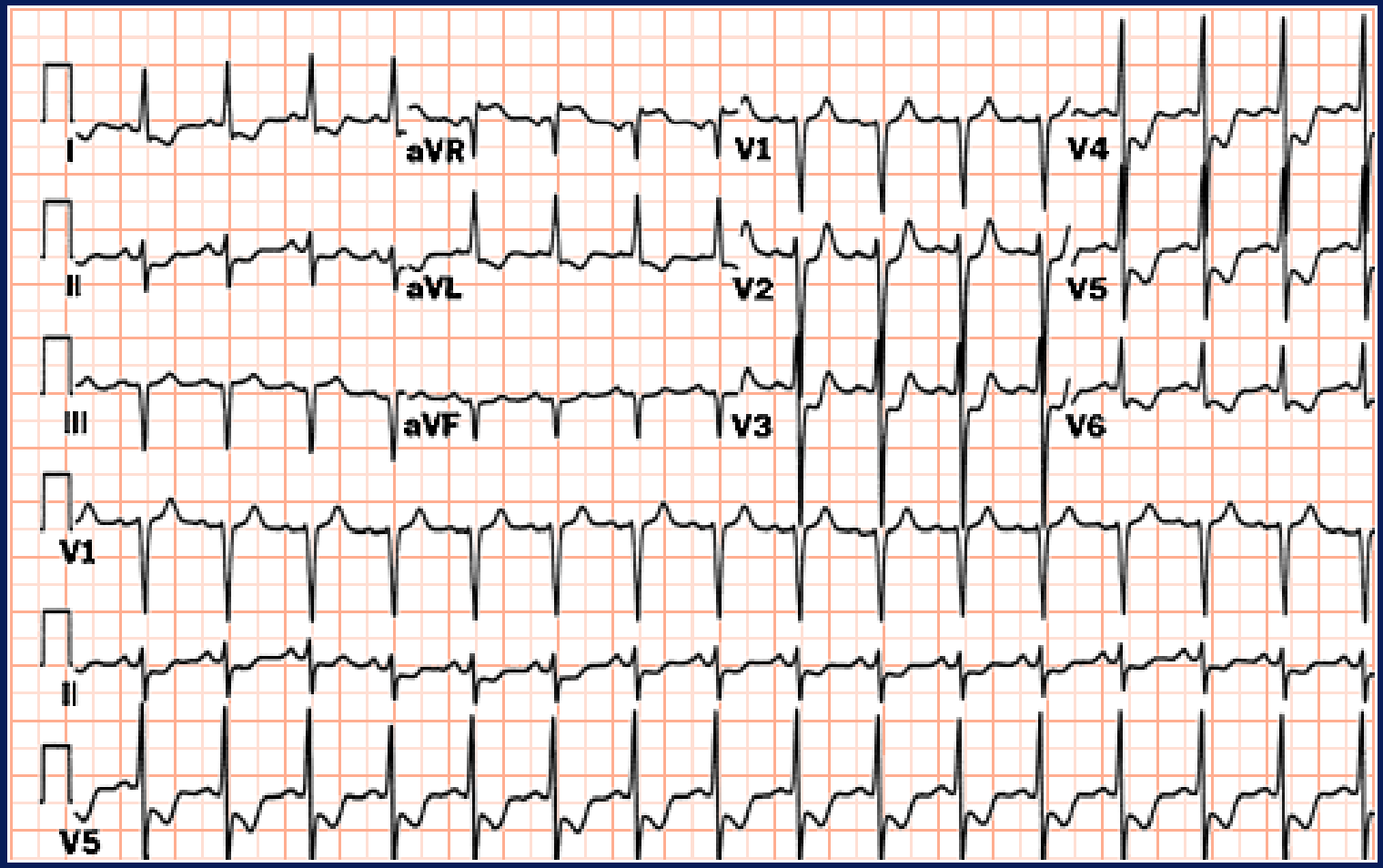
Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H, et al. Eur Heart J. 2011

Définition

- SCA ST + = douleur angineuse trinitro-résistante continue et récente (moins de 6h) avec un sus décalage de ST dans 2 dérivations adjacentes > 1mm dans les standards ou > 2mm dans les précordiales avec des images en miroir

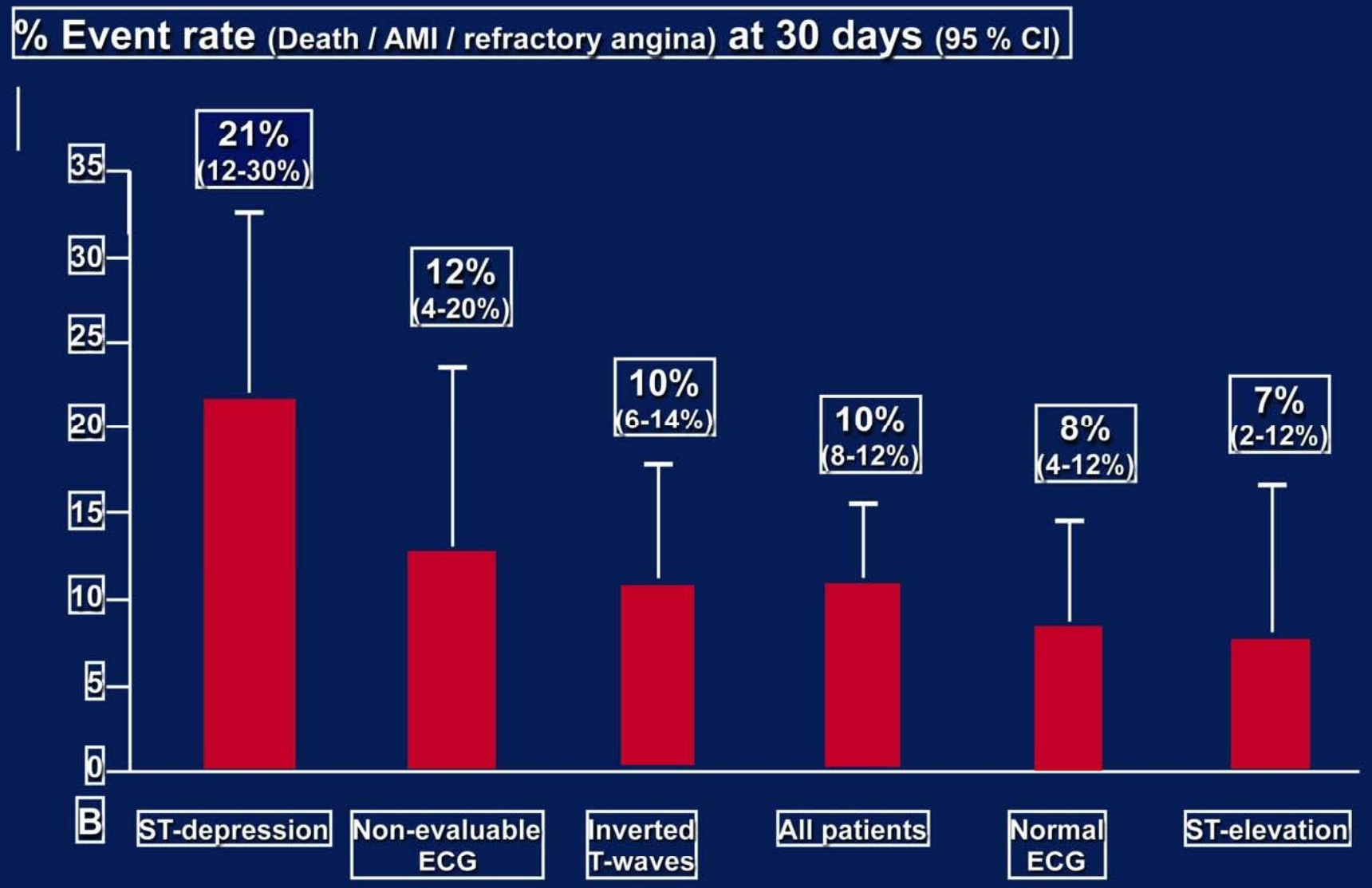
- SCA non ST+ = douleur angineuse trinitro-résistante continue et récente (moins de 6h) sans sus décalage de ST





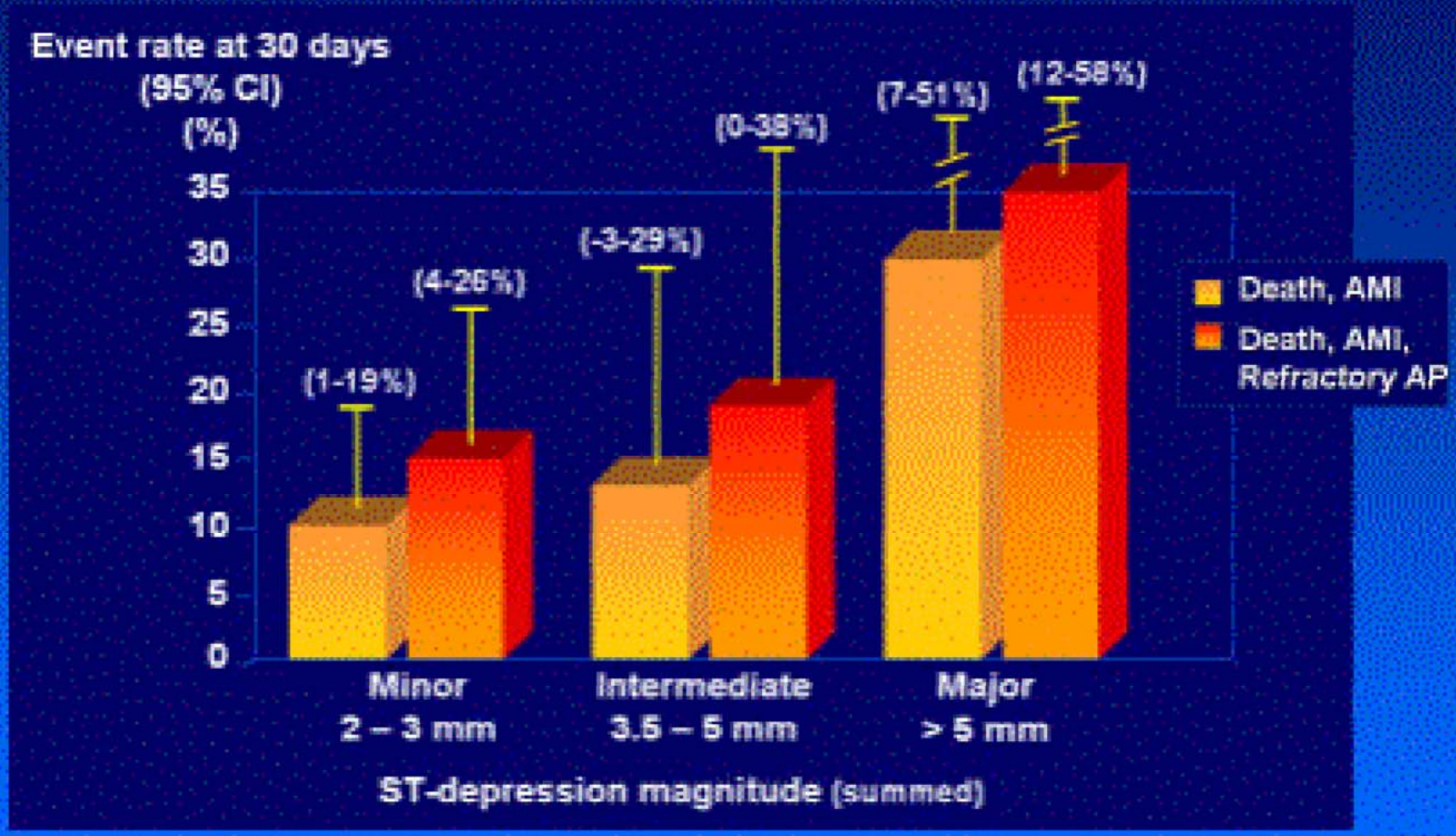
Sous décalage de ST en dérivations antéro-latérales

Baseline ECG & MACE at 30 days



Holmvang et al. TRIM study *Am Heart J 1999;137:24-33*

Magnitude of ST-segment depression & Prognosis



Distribution of magnitude of ST-segment depression in relation to cardiac events at 30 days

Holmvang et al. TRIM study *Am Heart J 1999;137:24-33*

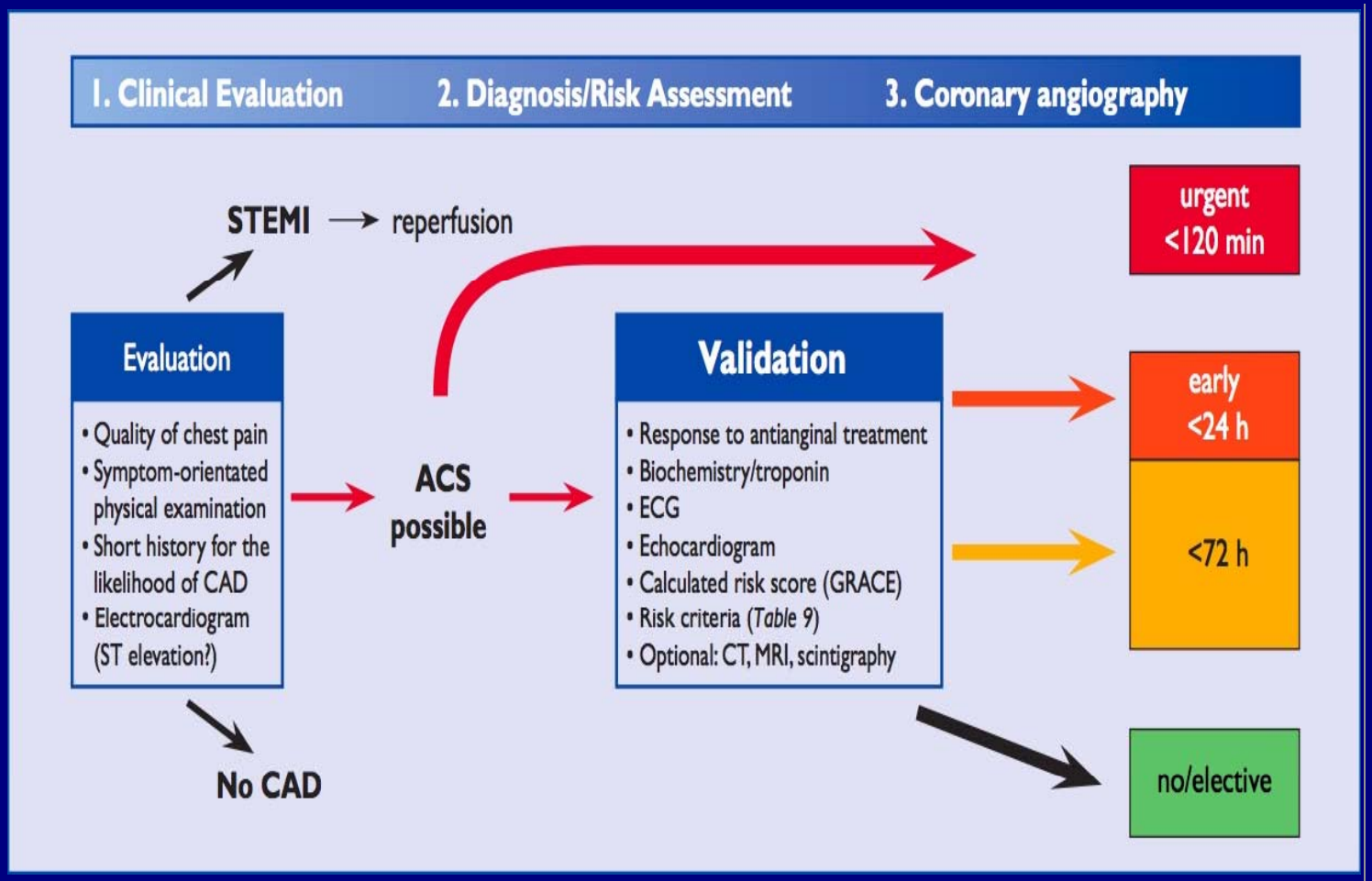
Stratification du risque

ESC 2011

Table 9 Criteria for high risk with indication for invasive management

Primary
• Relevant rise or fall in troponin[a] • Dynamic ST- or T-wave changes (symptomatic or silent)
Secondary
• Diabetes mellitus • Renal insufficiency (eGFR <60 mL/min/1.73 m^2) • Reduced LV function (ejection fraction <40%) • Early post infarction angina • Recent PCI • Prior CABG • Intermediate to high GRACE risk score (*Table 5*)

Recommandations ESC



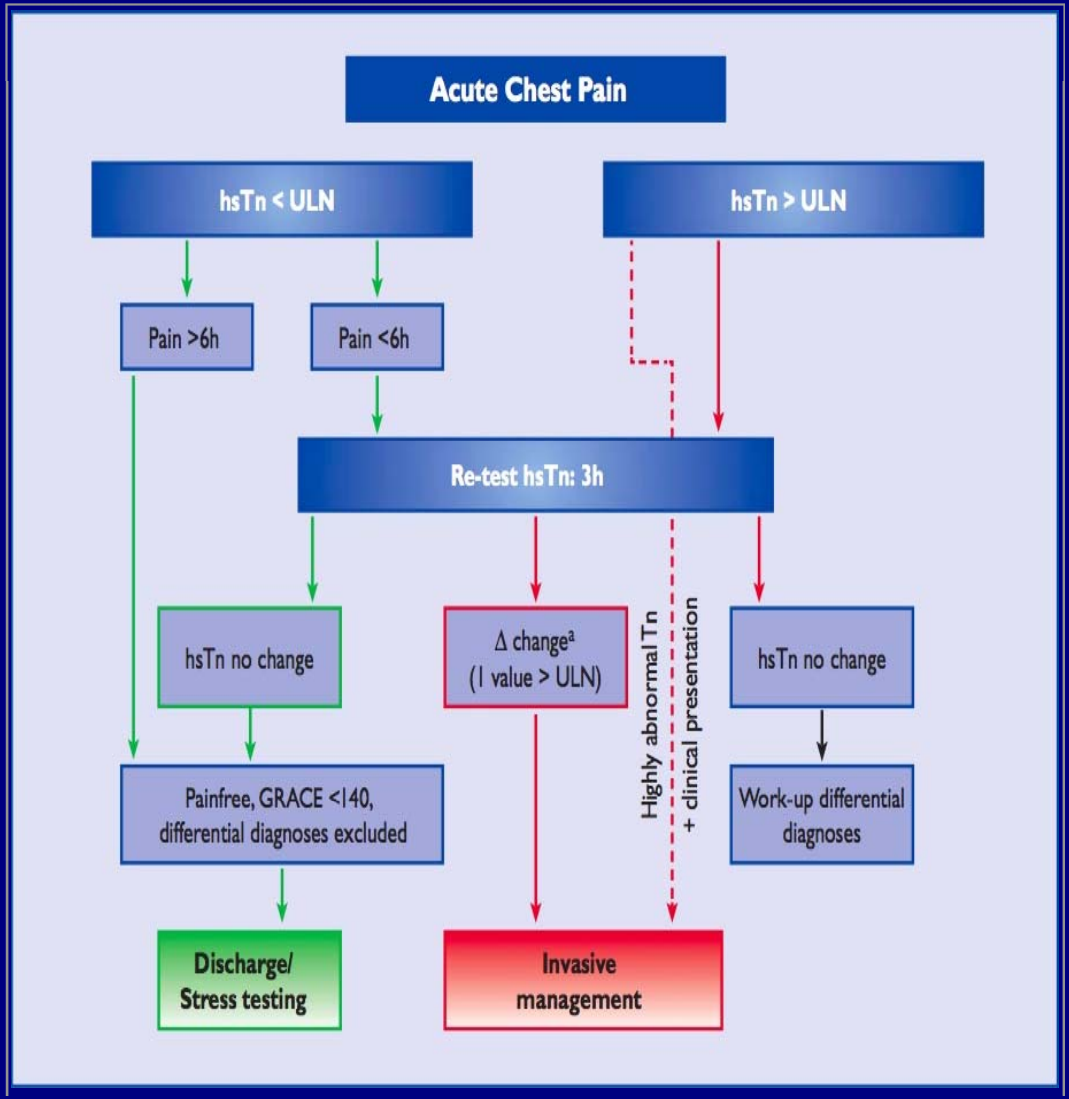
Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H, et al. Eur Heart J. 2011

Coronarographie Quand?

ESC 2011

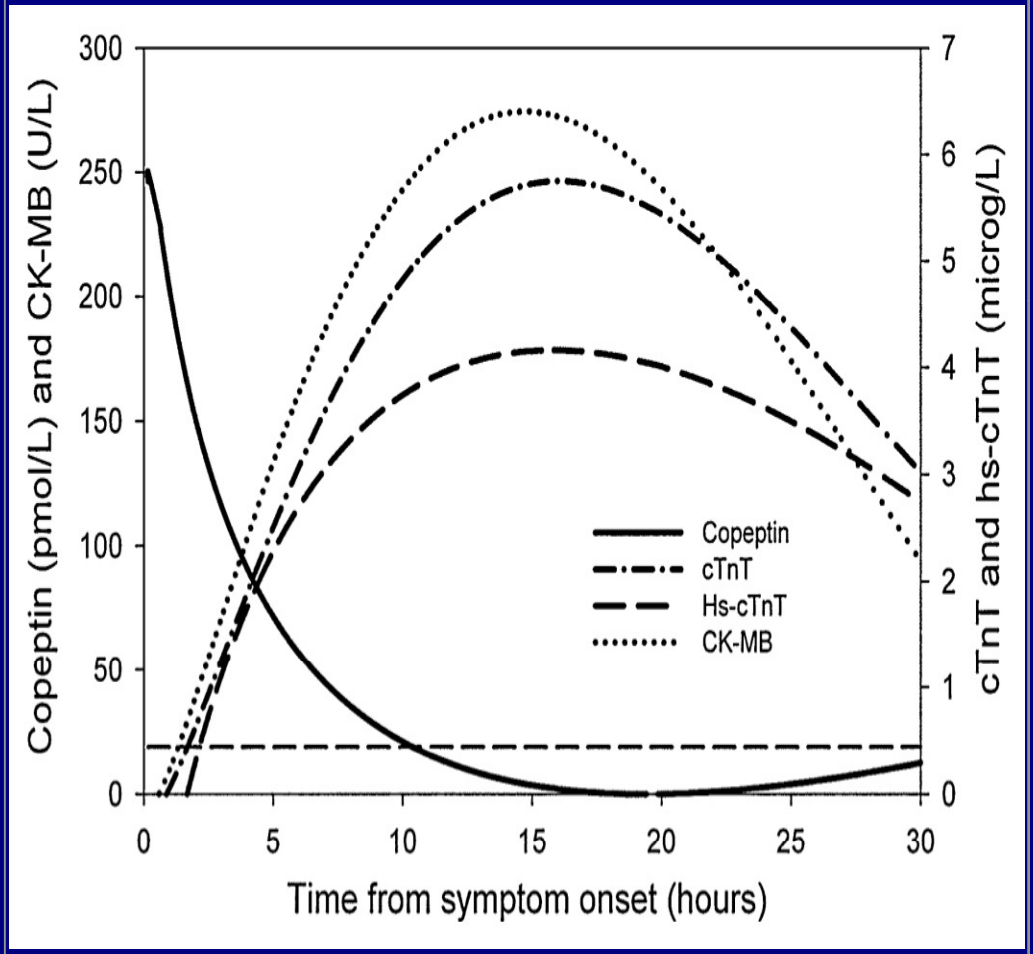
Recommendations	Class [a]	Level [b]	Ref [c]
An invasive strategy (within 72 h after first presentation) is indicated in patients with: • at least one high-risk criterion (*Table 9*); • recurrent symptoms.	I	A	148
Urgent coronary angiography (<2 h) is recommended in patients at very high ischaemic risk (refractory angina, with associated heart failure, life-threatening ventricular arrhythmias, or haemodynamic instability).	I	C	148, 209
An **early** invasive strategy (<24 h) is recommended in patients with a GRACE score >140 or with at least one primary high-risk criterion.	I	A	212, 215
Non-invasive documentation of inducible ischaemia is recommended in low-risk patients without recurrent symptoms before deciding for invasive evaluation.	I	A	54, 55, 148
The revascularization strategy (*ad-hoc* culprit lesion PCI/ multivessel PCI/CABG) should be based on the clinical status as well as the disease severity, i.e. distribution and angiographic lesion characteristics (e.g. SYNTAX score), according to the local 'Heart Team' protocol.	I	C	-
As there are no safety concerns related to the use of DESs in ACS, DESs are indicated based on an individual basis taking into account baseline characteristics, coronary anatomy, and bleeding risk.	I	A	225, 226
PCI of non-significant lesions is not recommended.	III	C	-
Routine invasive evaluation of low-risk patients is not recommended.	III	A	148, 208

Recommandations ESC



Hamm CW, Bassand JP, Agewall S, Bax J, Boersma E, Bueno H, et al. Eur Heart J. 2011

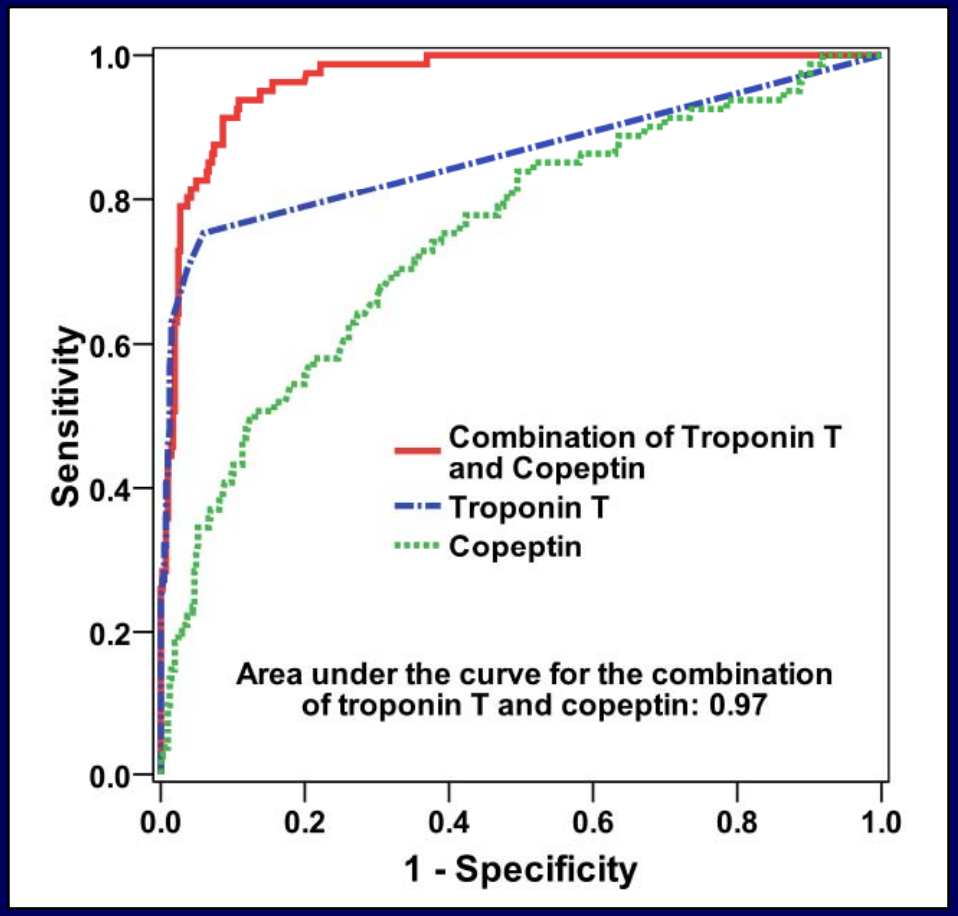
Cinétiques



Gu YL, Voors AA, Zijlstra F, Hillege HL, Struck J, Masson S, et al. Clin Res Cardiol. 2011

Copeptine

Etude APACE



ROC troponine T = 0,86 vs ROC troponine + copeptine = 0,97

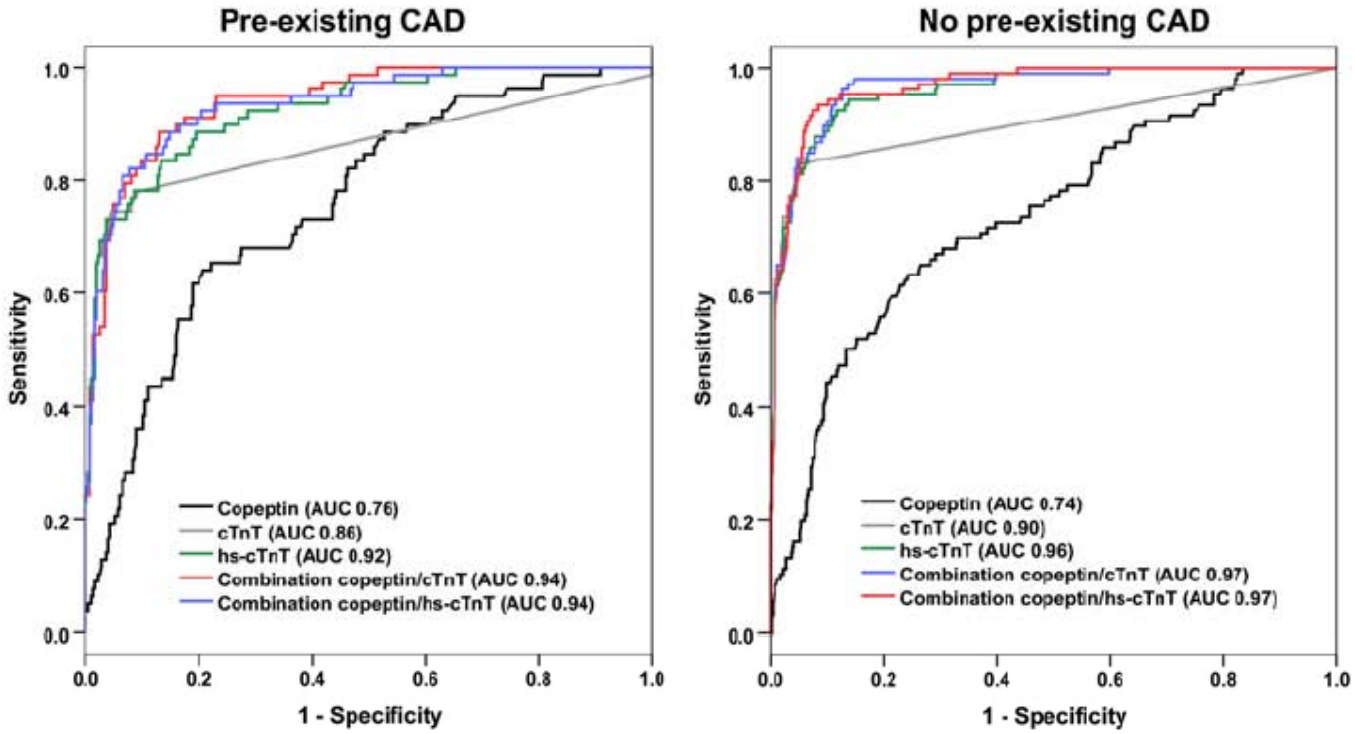
vs

Reichlin T, et al. J Am Coll Cardiol 2009

Diagnostic and prognostic impact of copeptin and high-sensitivity cardiac troponin T in patients with pre-existing coronary artery disease and suspected acute myocardial infarction

Mihael Potocki,[1] Tobias Reichlin,[1,2] Simone Thalmann,[1] Christa Zellweger,[1,3] Raphael Twerenbold,[1,3] Miriam Reiter,[1,3] Stephan Steuer,[4] Stefano Bassetti,[5]

Figure 2 Receiver operating characteristic curves at presentation for the diagnosis of acute myocardial infarction. AUC, area under the curve; CAD, coronary artery disease; cTnT, cardiac troponin T; hs-cTnT, high-sensitivity cardiac troponin T.



n = 1177 dont 433 coronariens connus

Heart. 2012;98:558-65

Diagnostic and prognostic impact of copeptin and high-sensitivity cardiac troponin T in patients with pre-existing coronary artery disease and suspected acute myocardial infarction

Mihael Potocki,[1] Tobias Reichlin,[1,2] Simone Thalmann,[1] Christa Zellweger,[1,3]

Table 3 Diagnostic performance of copeptin and different troponin assays and their combination at presentation in patients with and without pre-existing coronary artery disease (CAD)

	Sensitivity (95% CI)	Specificity (95% CI)	Negative predictive value (95% CI)	Positive predictive value (95% CI)
Patients with pre-existing CAD				
Copeptin 9 pmol/l (cut-off)	75.6 (64.6 to 84.7)	56.3 (51.0 to 61.6)	91.3 (86.8 to 94.7)	27.6 (21.7 to 34.1)
Roche troponin T fourth generation (cTnT)				
cTnT 0.01 μg/l (cut-off)	78.2 (67.4 to 86.8)	90.1 (86.6 to 93.0)	95.0 (92.1 to 97.0)	63.5 (53.1 to 73.1)
+ Copeptin 9 pmol/l (cut-off)	98.7 (93.0 to 99.8)	53.5 (48.2 to 58.8)	99.5 (97.1 to 99.9)	31.8 (26.0 to 38.1)
Roche high-sensitive troponin T (hs-cTnT)				
hs-cTnT 0.014 μg/l (cut-off)	93.6 (85.7 to 97.9)	60.2 (55.0 to 65.4)	97.7 (94.8 to 99.3)	34.1 (27.8 to 40.9)
+ Copeptin 9 pmol/l (cut-off)	98.7 (93.0 to 99.8)	41.4 (36.2 to 46.7)	99.3 (96.3 to 99.9)	27.0 (22.0 to 32.6)
Patients without pre-existing CAD				
Copeptin 9 pmol/l (cut-off)	67.9 (58.2 to 76.7)	69.4 (65.7 to 73.0)	92.8 (90.1 to 95.0)	27.2 (21.9 to 33.0)
Roche troponin T fourth generation (cTnT)				
cTnT 0.01 μg/l (cut-off)	83.0 (74.5 to 89.6)	94.6 (92.6 to 96.2)	97.1 (95.4 to 98.3)	72.1 (63.3 to 79.9)
+ Copeptin 9 pmol/l (cut-off)	98.1 (93.3 to 99.7)	66.9 (63.1 to 70.5)	99.5 (98.3 to 99.9)	33.2 (28.0 to 38.8)
Roche high-sensitive troponin T (hs-cTnT)				
hs-cTnT 0.014 μg/l (cut-off)	94.3 (88.1 to 97.9)	81.8 (78.5 to 84.7)	98.9 (97.5 to 99.6)	46.5 (39.7 to 52.4)
+ Copeptin 9 pmol/l (cut-off)	99.1 (94.8 to 99.8)	60.1 (56.1 to 63.9)	99.7 (98.5 to 100.0)	29.4 (24.7 to 34.4)

n = 1177 dont 433 coronariens connus

Heart. 2012;98:558-65

Combined copeptin and troponin to rule out myocardial infarction in patients with chest pain and a history of coronary artery disease☆,☆☆

American Journal of Emergency Medicine (2012) 30, 440–448

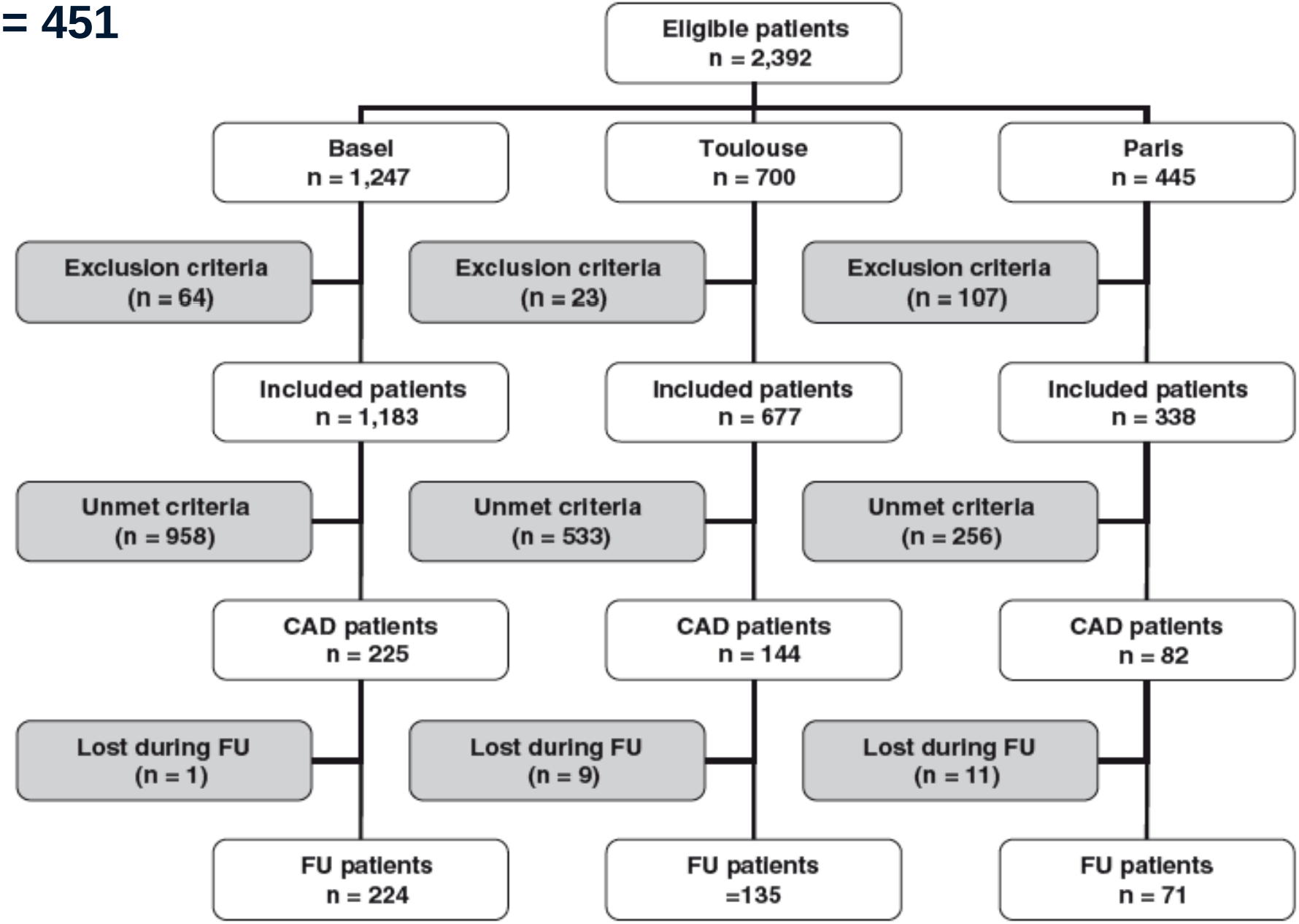
Patrick Ray MD, PhD[a,*], Sandrine Charpentier[b,c], Camille Chenevier-Gobeaux PharmD[d], Tobias Reichlin[e], Raphael Twerenbold[e], Yann-Erick Claessens[f,g], Patrick Jourdain[h], Bruno Riou[a], Christian Mueller[e]

Patients

- **coronariens**
- **avec douleur thor ≤ 6 h**
- **Avec suspicion de SCA non ST+**
- **Et Tn négative**

Combined copeptin and troponin to rule out myocardial

n = 451



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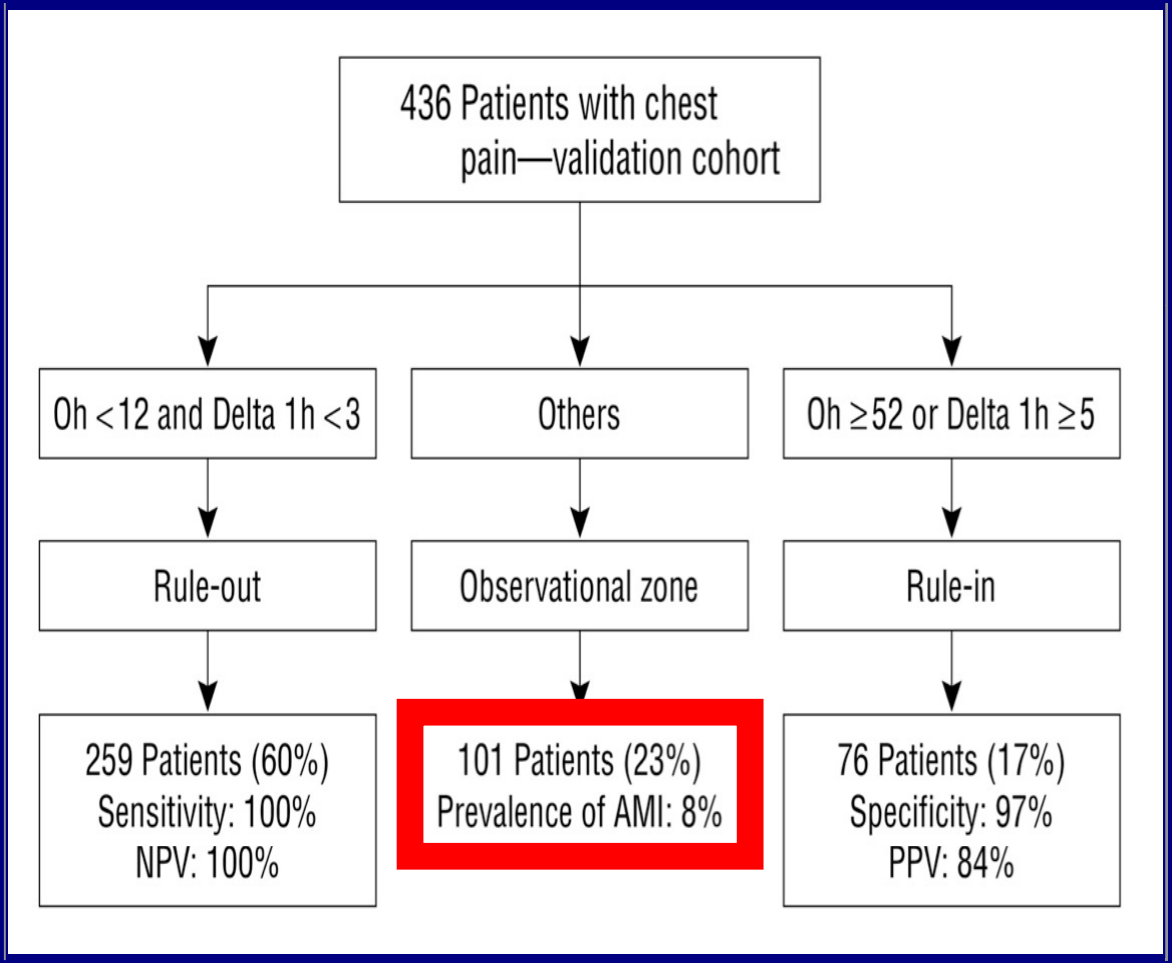
cTn négative + copeptine < 10.7 pmol/L

=> VPN d'IDM = 98% (IC 95 = 95%-99%)

Persistance d'une zone grise

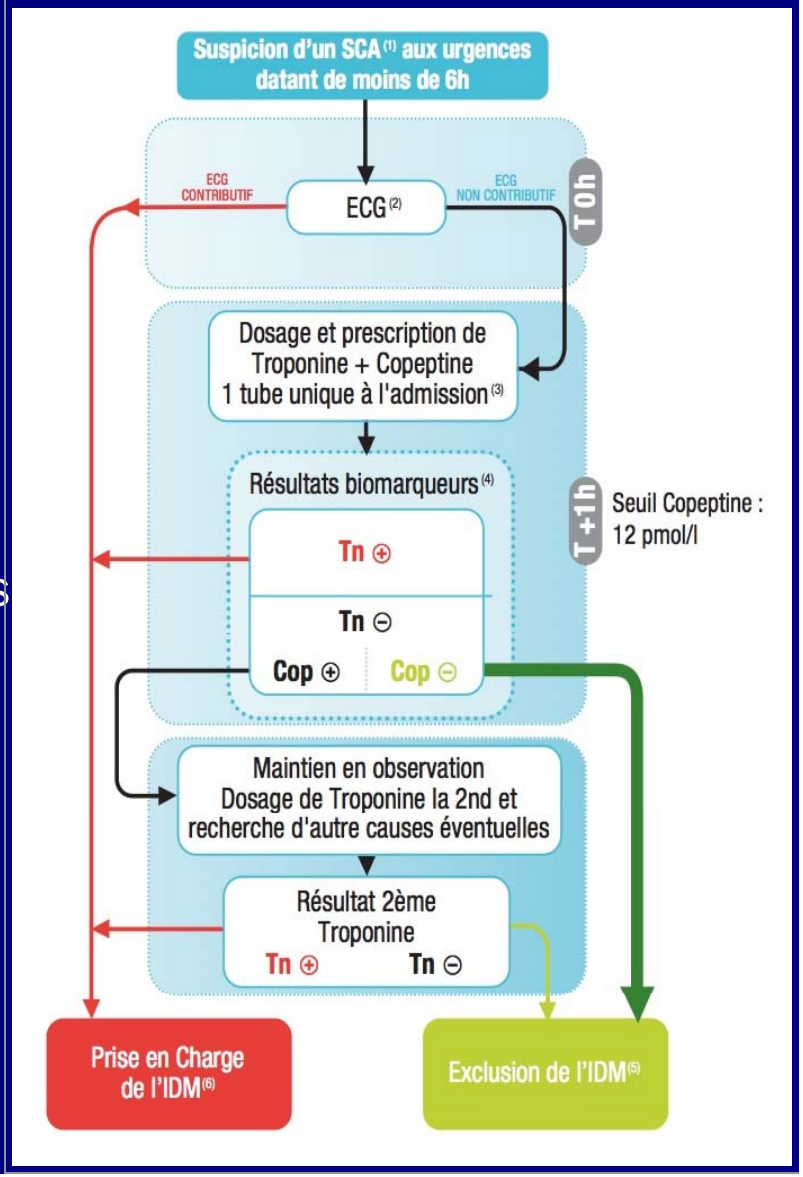


Reichlin T, Schindler C, Drexler B, Twerenbold R, Reiter M, Zellweger C, et al. Arch Intern Med. 2012

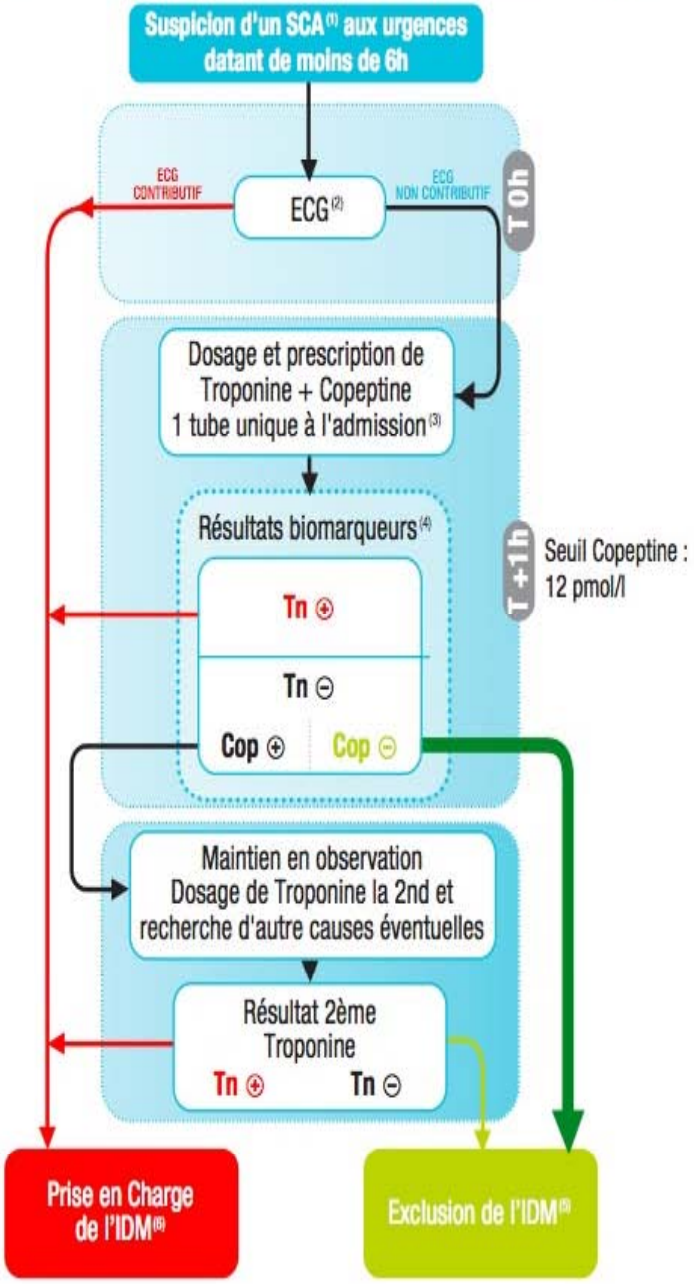
Les débuts de la copeptine au CHU de Nîmes

Algorithme et analyse des données

- Premier dosage le 10/07/2012
- Première phase «confidentielle»
- Seconde phase, réunion médecins urgentistes
- Extraction des données du laboratoire
- 29 patients du 10/07 au 30/08/2012
- Analyse rétrospective des dossiers médicaux



Algorithme décisionnel pour la prise en charge de l'IDM aux urgences



Notes

(1) Douleur de type angineuse constrictive en étau, non traumatique évoluant depuis moins de 6 heures, ou douleur atypique chez un patient connu pour antécédents coronariens. Siège : médiothoracique, rétro sternale en barre entre les deux seins, irradiant au bras gauche ou aux deux bras, au cou, à la mâchoire, plus rarement à la région sous-mammelonnaire gauche, parfois au creux épigastrique.

(2) Réalisation d'un ECG systématique devant des manifestations type dyspnée, douleur abdominale, anxiété, malaise et / ou chez tous patients présentant des facteurs de risque cardiovasculaire admis pour un autre motif d'hospitalisation.

(3) Le laboratoire ne lancera la Copeptine si seulement si la Troponine est négative.

(4) Une valeur positive ou négative de Troponine et de Copeptine est définie par rapport au seuil décisionnel utilisé par le laboratoire de biochimie.

(5) Discussion de la possibilité de retour à domicile ou d'hospitalisation en fonction du tableau clinique et de l'avis cardiologique pour suivi médical à postériori (évaluation secondaire, test d'effort…)

(6) Prise en charge rapide avec avis cardiologique pour choix de la stratégie de reperfusion et / ou orientation en cardiologie.

SCA : *Syndrome Coronarien Aigu*
ECG : *ElectroCardioGramme*
Tn : *Troponine*
Cop : *Copeptine*
IDM : *Infarctus Du Myocarde*

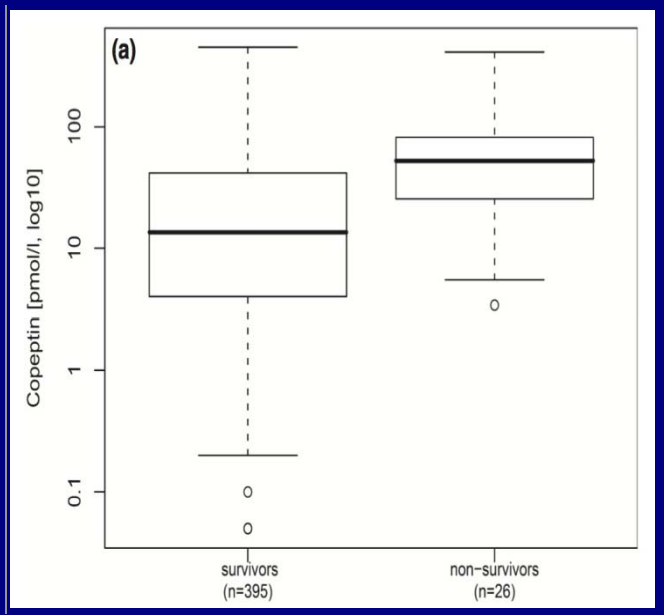
	Age	Copeptine	1ère tropo.	CS SAU	Histoire de la maladie	2nde tropo.
Patient 1	67	2,89	0,03	Non	DT depuis 1 semaine > CS URG cardio.	Non
Patient 2	51	3,41	0,01	Non	DT atypique (19:55) > CS URG cardio. + copeptine (21:23) > RAD	Non
Patient 3	45	3,64	0,01	Non	DT depuis 48h > CS URG cardio. > troponine H6 négative	Oui
Patient 4	48	5,21	0,01	Non	DT depuis 4 jours > CS URG cardio.	Non
Patient 5	86	5,25	0,01	Non	DT (08:30) > CS URG cardio. + copeptine (10:30) > 2nde troponine nég.	Oui
Patient 6	43	6,01	0,01	Non	DT (16:00) > CS URG cardio. + copeptine (17:40) > RAD	Non
Patient 7	44	7,12	0,01	Non	DT (05:00) > CS URG cardio. + copeptine (06:30) > 2nde troponine nég.	Oui
Patient 8	45	7,14	0,02	Oui	DT le matin > CS SAU + copeptine (15:49) > pneumopathie	Non
Patient 9	46	8,05	0,01	Non	DT (12:00) > CS URG cardio. + copeptine (15:29) > RAD	Non
Patient 10	50	9,07	0,02	Non	DT (14:00) > CS URG cardio. + copeptine (17:13)	Oui
Patient 11	61	9,31	0,01	Non	DT (02:00) > CS URG cardio. + copeptine (16:00) > 2nde troponine nég.	Oui
Patient 12	77	11,4	0,02	Non	DT (10:00) > CS URG cardio. + copeptine (13:20) > RAD	Non
Patient 13	79	12,65	0,02	Non	DT (14:00) > CS URG cardio. + copeptine (23:21)	Oui
Patient 14	60	13,46	0,02	Oui	DT (10:00) > SMUR (traitement SCA) > SAU + copeptine (13:15) > coronarographie	Oui
Patient 15	26	17	0,01	Oui	DT (01:00) > CS SAU = copeptine (02:49) > 2nde troponine nég. > RAD	Oui
Patient 16	41	17,17	0,01	Non	DT le matin > CS SAU + copeptine (15:01) > 2nde troponine nég. > coronarographie	Oui
Patient 17	24	17,35	0,01	Non	DT (05:00 > CS URG cardio. + copeptine (10:40) > 2nde troponine nég. > RAD	Oui
Patient 18	89	19,48	0,03	Oui	Malaise (07:00) > CS SAU + copeptine (14:29) > 2nde troponine 0,11 > RAD	Oui
Patient 19	64	21,66	0,02	Non	DT (12:00) > CS URG cardio. + copeptine (16:03) > 2nde et 3eme troponines nég. > RAD	Oui
Patient 20	55	21,95	0,02	Non	DT (09:00) > CS URG cardio. + copeptine (13:45) > 2nde troponine 0,1 > coronarographie	Oui
Patient 21	81	24,33	0,02	Non	DT (07:30) > CS URG cardio. + copeptine (13:45) > 2nde et 3eme troponines nég. > RAD	Oui
Patient 22	62	30,25	0,01	Non	DT dans la soirée > SAMU (traitement SCA) > URG cardio. + copeptine (00:19) > 2nde et 3eme troponines nég. > RAD	Oui
Patient 23	71	31,76	0,01	Non	DT le matin > CS URG cardio. + copeptine (10:30) > RT opacité pulmonaire	Oui
Patient 24	86	57,65	0,02	Non	Dyspnée depuis 24h > CS URG cardio. + copeptine > insuffisance cardiaque	Oui
Patient 25	76	96,18	0,01	Non	Douleur épigastrique (04:00) > CS URG cardio. + copeptine (09:37) > cholecystite	Oui
Patient 26	56	115,4	0,01	Non	DT (15:15) > CS URG cardio. + copeptine (17:09) > 2nde troponine 0,94 > coronarographie + 2 stents	Oui
Patient 27	75	132,5	0,01	Non	DT (14:00) > CS URG cardio. + copeptine (16:25) > 2nde et 3eme troponines neg. > lithiases VB > RAD	Oui
Patient 28	71	399,5	0,04	Non	Malaise (16:30) > CS URG cardio. + copeptine (17:24) > 2nde troponine 0,11 > coonarographie occlusion IVA2	Oui

	Age	Copeptine	1ère tropo.	CS SAU	Histoire de la maladie	2nde tropo.
Patient 1	67	2,89	0,03	Non	DT depuis 1 semaine > CS URG cardio.	Non
Patient 2	51	3,41	0,01	Non	DT atypique (19:55) > CS URG cardio. + copeptine (21:23) > RAD	Non
Patient 3	45	3,64	0,01	Non	DT depuis 48h > CS URG cardio. > troponine H6 négative	Oui
Patient 4	48	5,21	0,01	Non	DT depuis 4 jours > CS URG cardio.	Non
Patient 5	86	5,25	0,01	Non	DT (08:30) > CS URG cardio. + copeptine (10:30) > 2nde troponine nég.	Oui
Patient 6	43	6,01	0,01	Non	DT (16:00) > CS URG cardio. + copeptine (17:40) > RAD	Non
Patient 7	44	7,12	0,01	Non	DT (05:00) > CS URG cardio. + copeptine (06:30) > 2nde troponine nég.	Oui
Patient 8	45	7,14	0,02	Oui	DT le matin > CS SAU + copeptine (15:49) > pneumopathie	Non
Patient 9	46	8,05	0,01	Non	DT (12:00) > CS URG cardio. + copeptine (15:29) > RAD	Non
Patient 10	50	9,07	0,02	Non	DT (14:00) > CS URG cardio. + copeptine (17:13)	Oui
Patient 11	61	9,31	0,01	Non	DT (02:00) > CS URG cardio. + copeptine (16:00) > 2nde troponine nég.	Oui
Patient 12	77	11,4	0,02	Non	DT (10:00) > CS URG cardio. + copeptine (13:20) > RAD	Non
Patient 13	79	12,65	0,02	Non	DT (14:00) > CS URG cardio. + copeptine (23:21)	Oui
Patient 14	60	13,46	0,02	Oui	DT (10:00) > SMUR (traitement SCA) > SAU + copeptine (13:15) > coronarographie	Oui
Patient 15	26	17	0,01	Oui	DT (01:00) > CS SAU = copeptine (02:49) > 2nde troponine nég. > RAD	Oui
Patient 16	41	17,17	0,01	Non	DT le matin > CS SAU + copeptine (15:01) > 2nde troponine nég. > coronarographie	Oui
Patient 17	24	17,35	0,01	Non	DT (05:00 > CS URG cardio. + copeptine (10:40) > 2nde troponine nég. > RAD	Oui
Patient 18	89	19,48	0,03	Oui	Malaise (07:00) > CS SAU + copeptine (14:29) > 2nde troponine 0,11 > RAD	Oui
Patient 19	64	21,66	0,02	Non	DT (12:00) > CS URG cardio. + copeptine (16:03) > 2nde et 3eme troponines nég. > RAD	Oui
Patient 20	55	21,95	0,02	Non	DT (09:00) > CS URG cardio. + copeptine (13:45) > 2nde troponine 0,1 > coronarographie	Oui
Patient 21	81	24,33	0,02	Non	DT (07:30) > CS URG cardio. + copeptine (13:45) > 2nde et 3eme troponines nég. > RAD	Oui
Patient 22	62	30,25	0,01	Non	DT dans la soirée > SAMU (traitement SCA) > URG cardio. + copeptine (00:19) > 2nde et 3eme troponines nég. > RAD	Oui
Patient 23	71	31,76	0,01	Non	DT le matin > CS URG cardio. + copeptine (10:30) > RT opacité pulmonaire	Oui
Patient 24	86	57,65	0,02	Non	Dyspnée depuis 24h > CS URG cardio. + copeptine > insuffisance cardiaque	Oui
Patient 25	76	96,18	0,01	Non	Douleur épigastrique (04:00) > CS URG cardio. + copeptine (09:37) > cholecystite	Oui
Patient 26	56	115,4	0,01	Non	DT (15:15) > CS URG cardio. + copeptine (17:09) > 2nde troponine 0,94 > coronarographie + 2 stents	Oui
Patient 27	75	132,5	0,01	Non	DT (14:00) > CS URG cardio. + copeptine (16:25) > 2nde et 3eme troponines neg. > lithiases VB > RAD	Oui
Patient 28	71	399,5	0,04	Non	Malaise (16:30) > CS URG cardio. + copeptine (17:24) > 2nde troponine 0,11 > coonarographie occlusion IVA2	Oui

Faire attention !

- Inclusion «plaintes non spécifiques» au SU avec paramètres normaux
- Dosage copeptine et Péroxiredoxine-4
- Critère principal = mortalité à J30

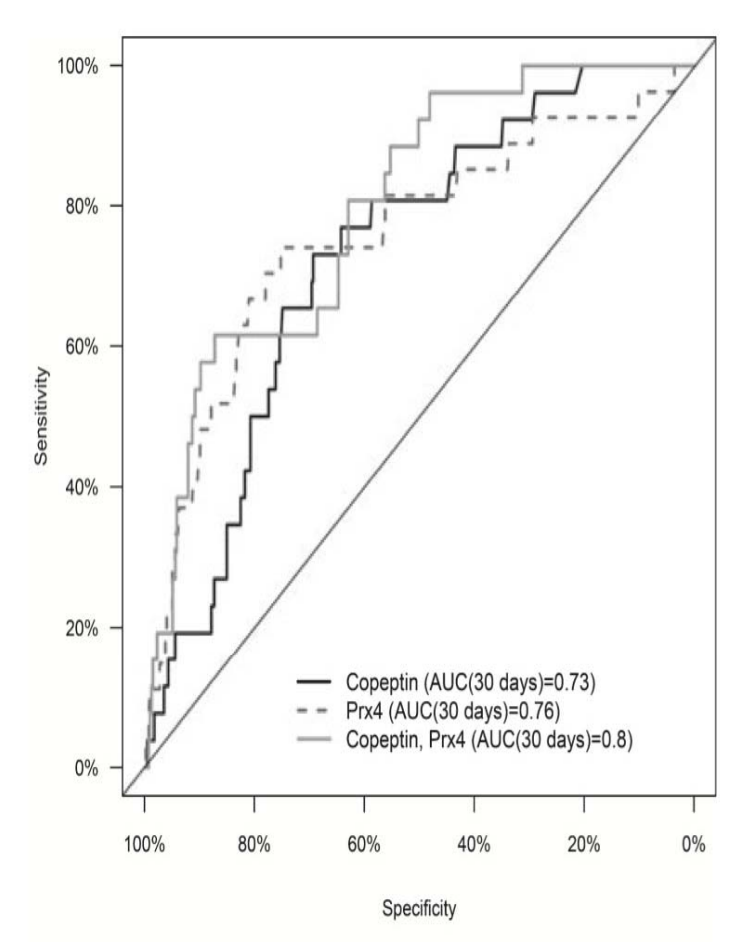
Characteristics	All Patients (*n* = 438)	30-day Survivors (*n* = 410)	Nonsurvivors (*n* = 28)	p-value
Sex, male	154 (35)	138 (34)	16 (57)	0.0207
Age, yr	80 (72–87)	80 (71–87)	83.5 (76–88)	0.1515
Age ≥ 65 yr	375 (85.6)	348 (85)	27 (96)	—
Disposition				0.1284
Discharged	54 (12.3)	54 (12.3)	0 (0)	
Transfer to geriatric hospital	126 (28.8)	117 (28.5)	9 (32.1)	
Admission to tertiary care hospital	258 (58.9)	239 (58.3)	19 (67.9)	
ESI category				0.6375
2	10 (2.3)	9 (2)	1 (4)	
3	428 (97.7)	401 (98)	27 (96)	
Comorbidities	5 (3–6)	5 (3–6)	5 (3–6)	0.7721
CCI	2 (1–4)	2 (1–3)	4 (2–5)	0.0005
Number of medications taken daily	5 (3–8)	5 (3–8)	6 (4–8)	0.4266
Katz ADL	6 (4–6)	6 (4–6)	4.5 (1–6)	0.0126
Katz Index < 6	190 (43.4)	173 (42.2)	17 (60.7)	
Copeptin, pmol/L	14.8 (4.5–45.6)	13.5 (4.0–41.5)	52.6 (26.8–78.6)	0.0001
Prx4, arbU/L	4.5 (2.8–7.3)	4.4 (2.8–6.8)	9.9 (5.8–14.4)	<0.0001



Nickel CH, Ruedinger J, Misch F, Blume K, Maile S, Schulte J, et al. Acad Emerg Med. 2011

Valeur pronostique de la copeptine

- Aire sous la courbe :
  - Copeptine = 0,73
  - Prx4 = 0,76
  - Copetine + Prx4 = 0,80



Nickel CH, Ruedinger J, Misch F, Blume K, Maile S, Schulte J, et al. Acad Emerg Med. 2011

Ce n’est pas mieux les TDM thoraciques ?

A quel cout !

- Coût financier, mais également en terme de santé publique

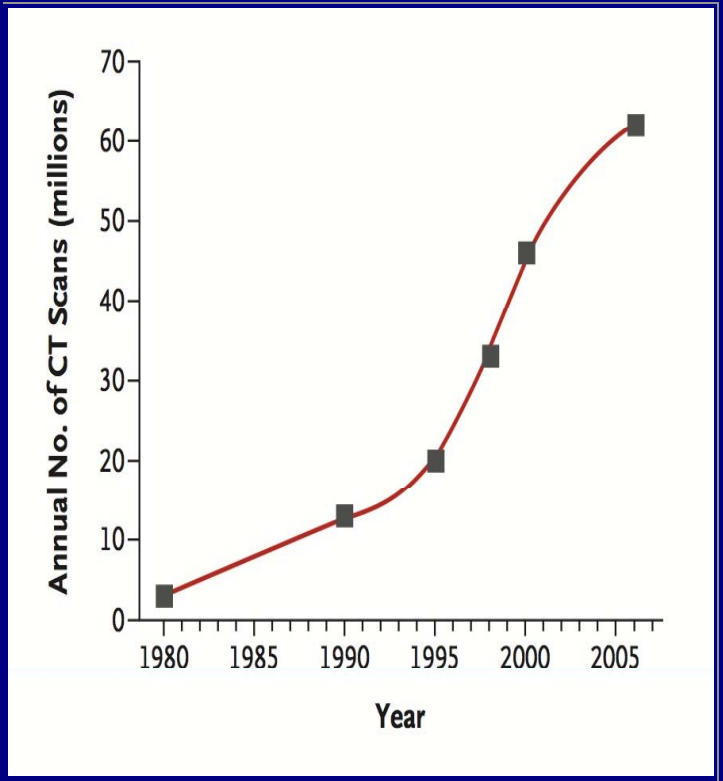
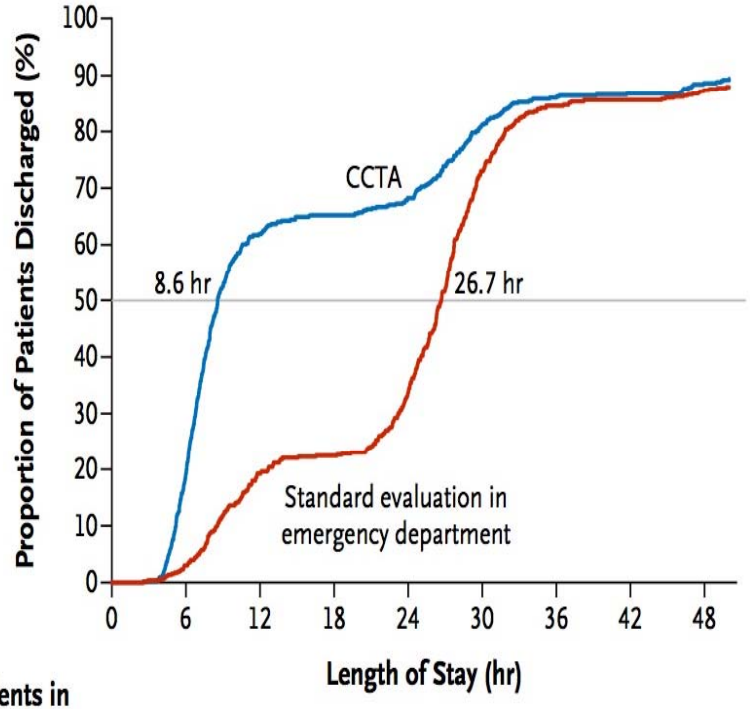


Table 1. Typical Organ Radiation Doses from Various Radiologic Studies.

Study Type	Relevant Organ	Relevant Organ Dose* (mGy or mSv)
Dental radiography	Brain	0.005
Posterior–anterior chest radiography	Lung	0.01
Lateral chest radiography	Lung	0.15
Screening mammography	Breast	3
Adult abdominal CT	Stomach	10
Barium enema	Colon	15
Neonatal abdominal CT	Stomach	20

Brenner DJ, Hall EJ. N Engl J Med. 2007

Gain de temps relatif



No. of Patients in Emergency Department or Hospital									
CCTA	501	404	191	174	159	95	70	66	57
Standard evaluation	499	484	403	387	331	135	77	72	63

Hoffmann U, Truong QA, Schoenfeld DA, Chou ET, Woodard PK, Nagurney JT, et al. N Engl J Med. 2012

Ca ne fait pas partie des dernières guidelines !