# L'interprétation des troponines: comment s'y retrouver

ACQ – Florence

Mai 2017

**Michel NGUYEN M.D. , FRCP(C)**
**Cardiologie Interventionnelle**
**Service de Cardiologie, CHUS**
**Professeur Titulaire, Dépt de Médecine**

UNIVERSITÉ DE SHERBROOKE
Faculté de médecine et des sciences de la santé

# Divulgation de conflit d'intérêt potentiel (2014 – 17)

Conférencier:

- BMS
- Pfizer

Comité Consultatif:

- Bayer

Conférencier et comité consultatif:

- Astra-Zeneca
- Novartis
- Servier

# OBJECTIFS

- Reconnaître l'impact de l'amélioration de la performance des marqueurs sanguins myocardiques jusqu'aux troponines haute sensibilité
- Énumérer les facteurs pouvant affecter la concentration des troponines
- Utiliser le plein potentiel diagnostique et pronostique des troponines en fonction de la clinique et d'un algorithme d'interprétation

# Troponines et Cardiomyocytes

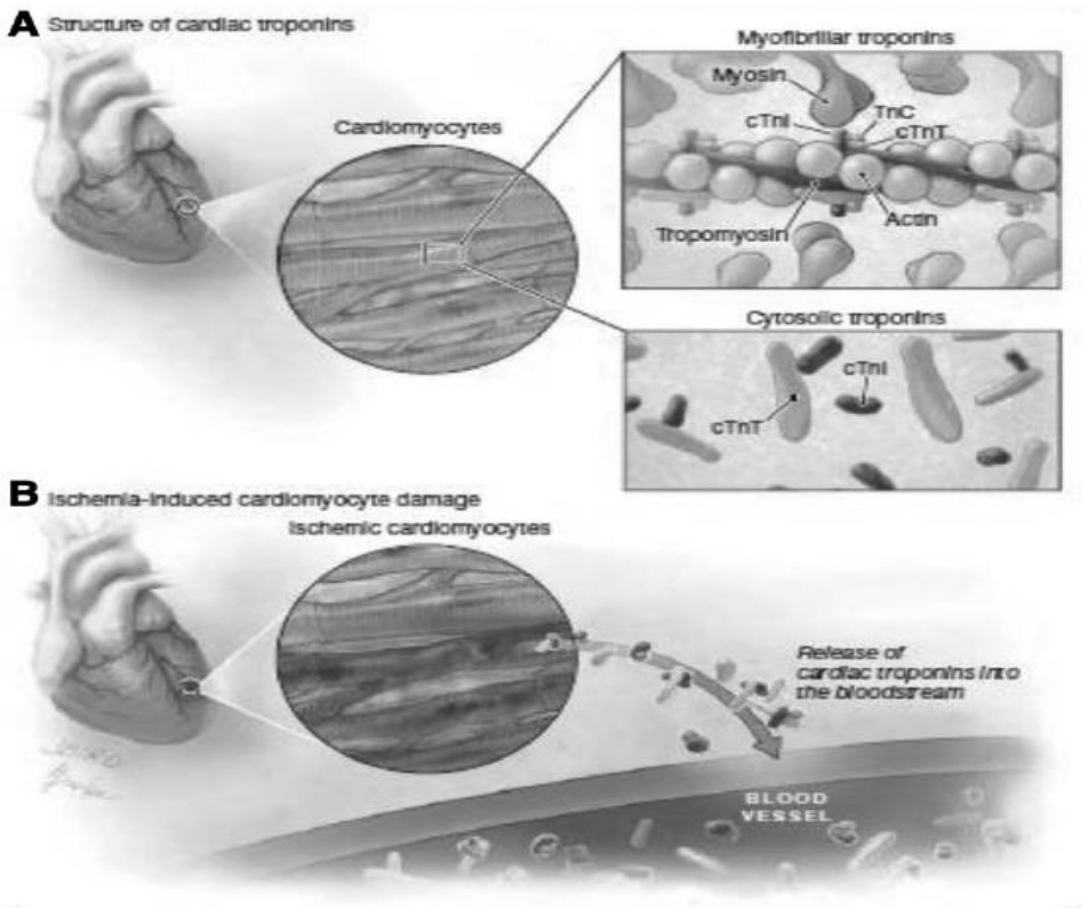
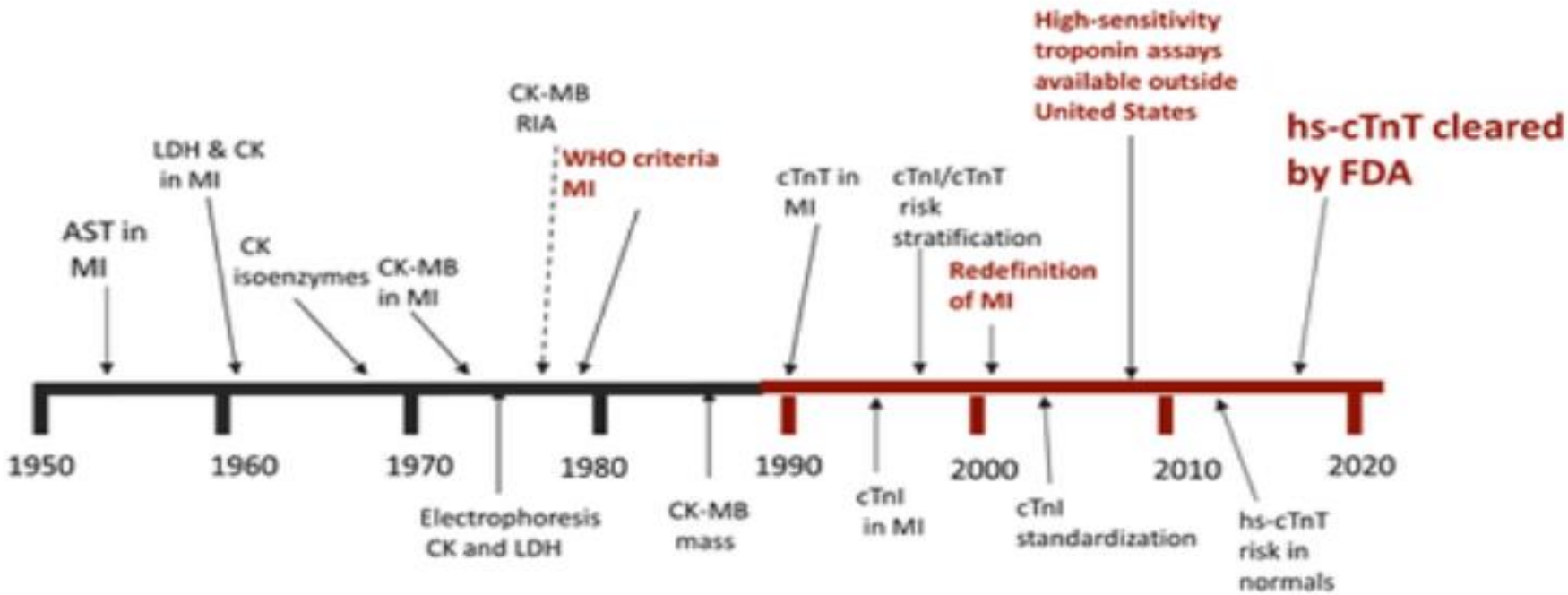



**FIGURE 1.** Release of cardiac troponins after ischemic cardiac injury. TnC, troponin C; cTnI, cardiac troponin I; cTnT, cardiac troponin T. From de Lemos[3] with permission.

# Necrosis Biomarkers Timeline




Courtesy of James L. Januzzi, MD.

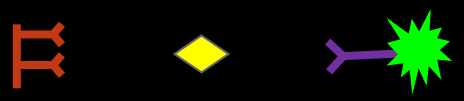
CLIN. CHEM. 38/3, 386–393 (1992)

# Development and In Vitro Characterization of a New Immunoassay of Cardiac Troponin T

**Hugo A. Katus,[1] Siegfried Looser,[2] Klaus Hallermayer,[2] Andrew Remppis,[1] Thomas Scheffold,[1] Anneliese Borgya,[2] Ulrich Essig,[2] and Ursula Geuß[2]**

We describe a new one-step enzyme immunoassay of troponin T that uses two specific monoclonal antibodies and streptavidin-coated tubes as the solid phase. The monoclonal antibodies were obtained by conventional hybridoma technology, with human troponin T as antigen. The identity of the cardiac troponin T antigen was confirmed by analysis of the amino acid composition and by partial sequence analysis. The specificity of the monoclonal antibodies for cardiac troponin T was proved by immunoblot analysis and displacement curves. The capture antibody is labeled with biotin. The second antibody is conjugated to horseradish peroxidase (EC 1.11.1.7). The assay [Enzymun-Test[R] system (Boehringer Mannheim GmbH)] is performed in only 90 min at room temperature; the measuring range for troponin T is 0.1 to 15 μg/L. The assay shows excellent between-run precision (CV = 3.3–4.9%).

21. Katus HA, Remppis A, Looser S, Hallermayer K, Scheffold T, Kübler W. Enzyme linked immunoassay of cardiac troponin T for the detection of acute myocardial infarction in patients. J Mol Cell Cardiol 1989;21:1349–53.



*AC capture*

*Antigènes = Tn*

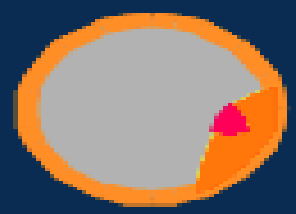
*AC de signal*

# Origine des Troponines en Clinique

- 1989 Hamm C and Katus A H

  Première étude d'environ 100 patients avec Angor Instable
- 1992 Troponines comme marqueur de risque en UA
- 1997 Troponines pour le triage à l'Urgence
- 1999 Troponines pour stratifier le traitement et la stratégie en Syndrome Coronarien Aigu
- 2000 Consensus et définition Universelle de l'Infarctus (deuxième)

# Classification et Nomenclature des syndromes coronariens aigus



**Syndrome coronarien aigu (SCA)**

**Rupture de plaque**

**SCA sans sus-décalage du Segment ST**

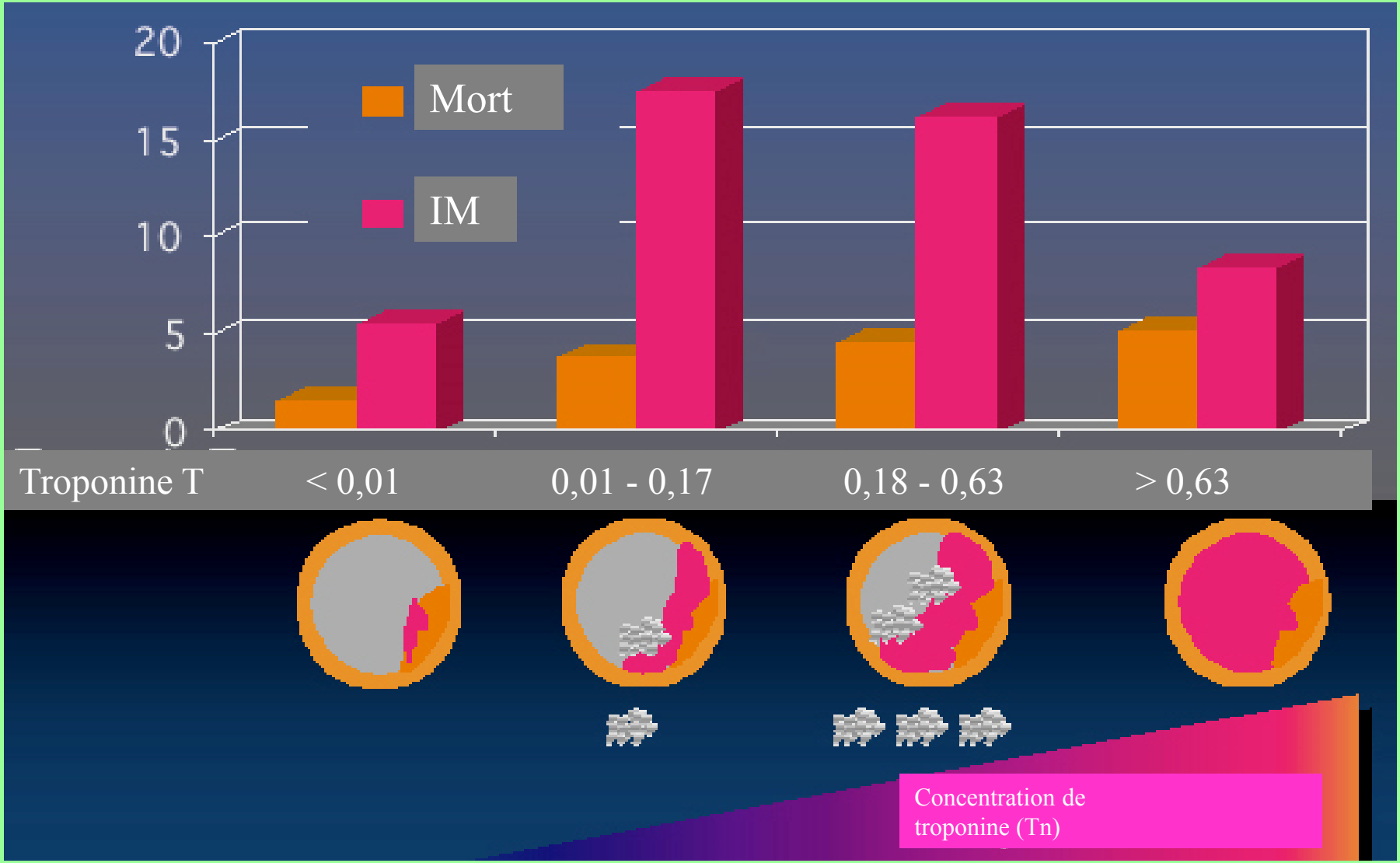
**SCA avec sus-décalage du ST**

**Angine Instable**

**IMA sans onde Q**

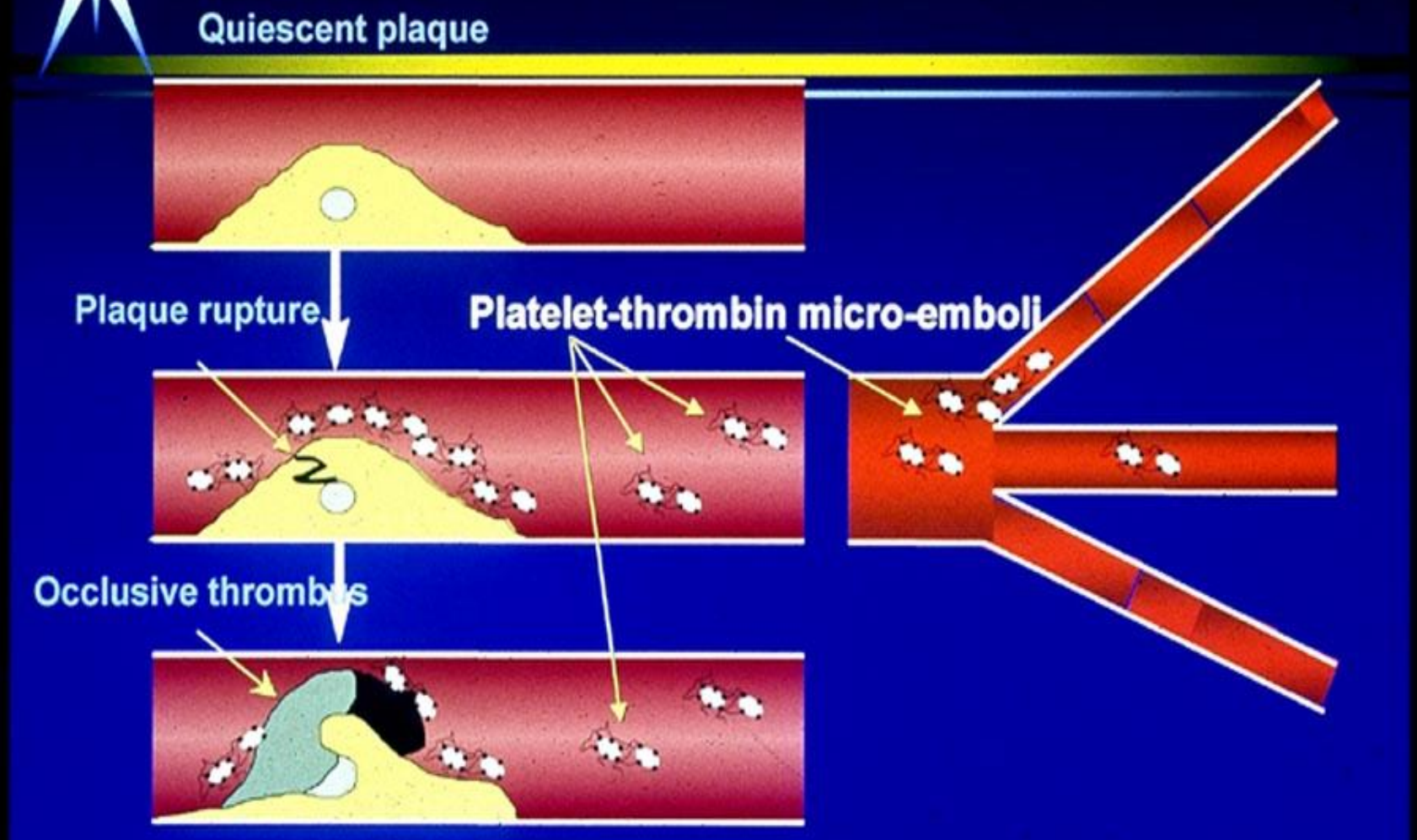
**IMA avec onde Q**

# Une forte concentration de Tn corrèle avec le décès et une concentration intermédiaire avec récurrence de l'IMA

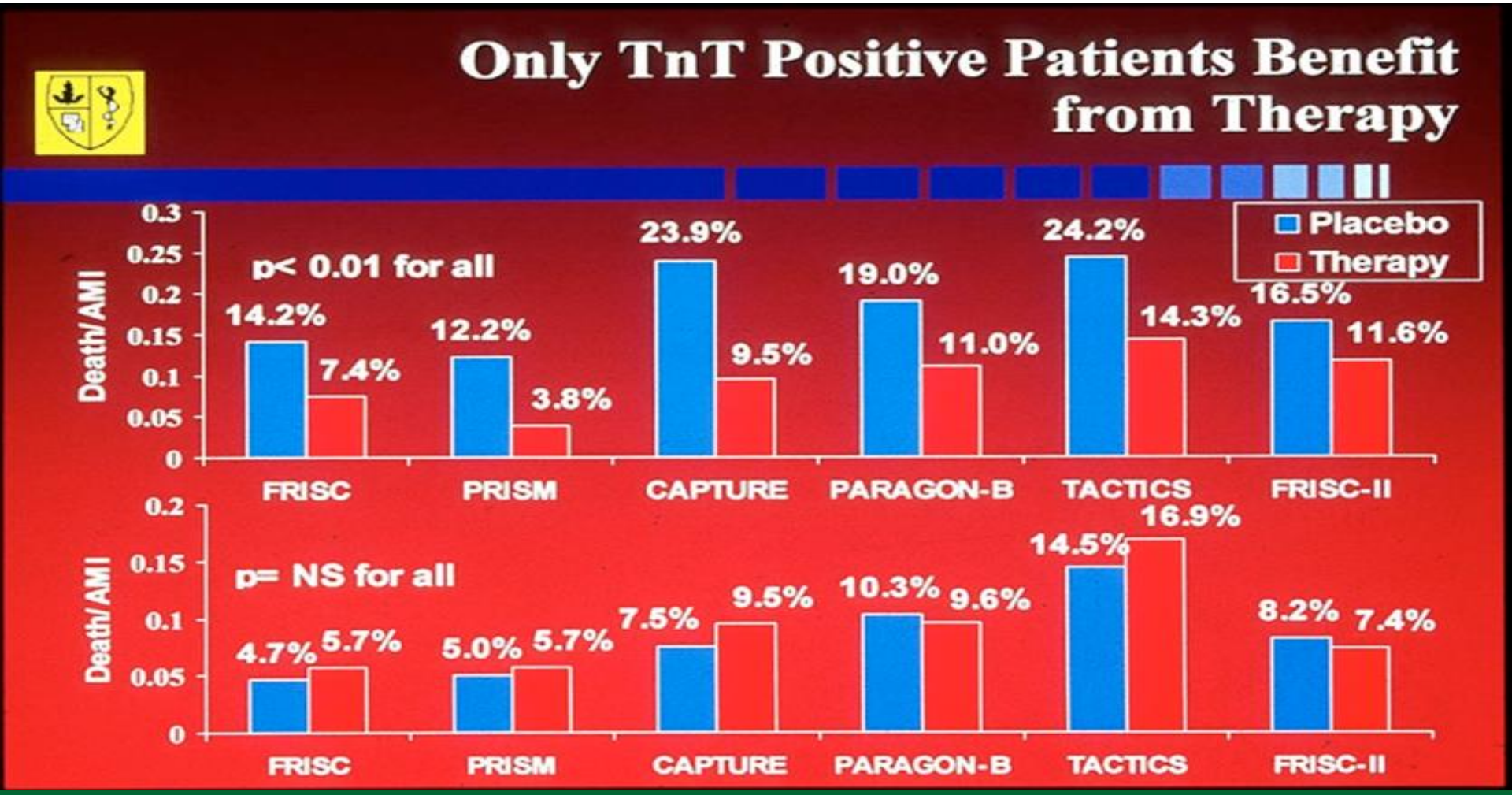



Lidahl B *et al.* *JACC* 2001;38:979

# Rupture and Embolization



# Rx Antiplaquettaires et ATCs bénéfiques surtout quand les troponines sont positives



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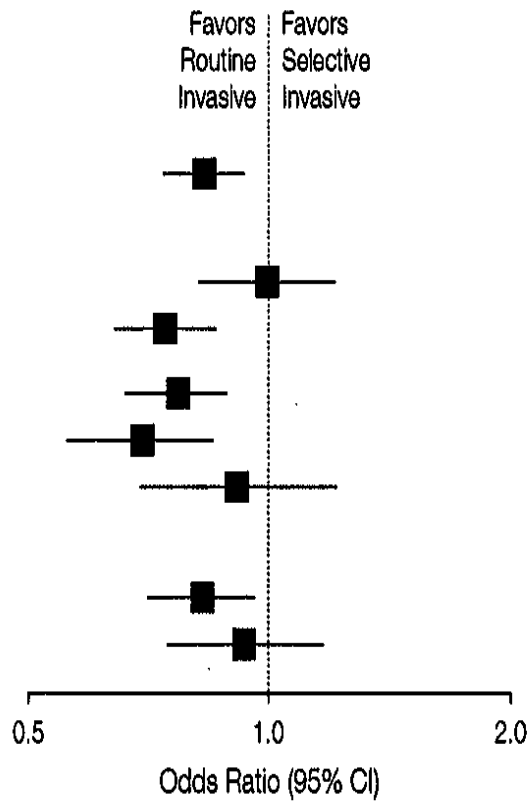
# Méta Analyse INVASIF vs CONSERVATEUR

# 7 Études N=9212 (Mehta SR JAMA 2005 Vol 293 No23)

**Figure 5.** Stratified Analyses of Trials Published Before and After 1999 and According to Baseline Troponin and Cardiac Biomarker Status: Death or Myocardial Infarction From Randomization to Follow-up

| Trial | Routine, No./Total (%) | Selective, No./Total (%) | Odds Ratio (95% CI) | *P* Value |
|---|---|---|---|---|
| Overall | 561/4608 (12.2) | 663/4604 (14.4) | 0.82 (0.72-0.93) | .001 |
| Year of Publication | | | | |
| Before 1999* | 254/1313 (19.3) | 251/1281 (19.6) | 0.99 (0.81-1.21) | .92 |
| After 1999† | 307/3280 (9.4) | 412/3314 (12.4) | 0.73 (0.63-0.85) | <.001 |
| Trials With Troponin Data‡ | 303/2316 (9.4) | 397/3247 (12.2) | 0.75 (0.64-0.88) | <.001 |
| Positive Troponin | 148/1473 (10.0) | 209/1493 (14.0) | 0.69 (0.55-0.86) | 0.001 |
| Negative Troponin | 94/1412 (6.7) | 106/1429 (7.4) | 0.89 (0.67-1.18) | .42 |
| Any Cardiac Biomarker | | | | |
| Positive | 348/2364 (14.7) | 405/2331 (17.4) | 0.82 (0.70-0.96) | .01 |
| Negative | 146/1896 (7.7) | 164/1938 (8.5) | 0.90 (0.72-1.14) | .40 |



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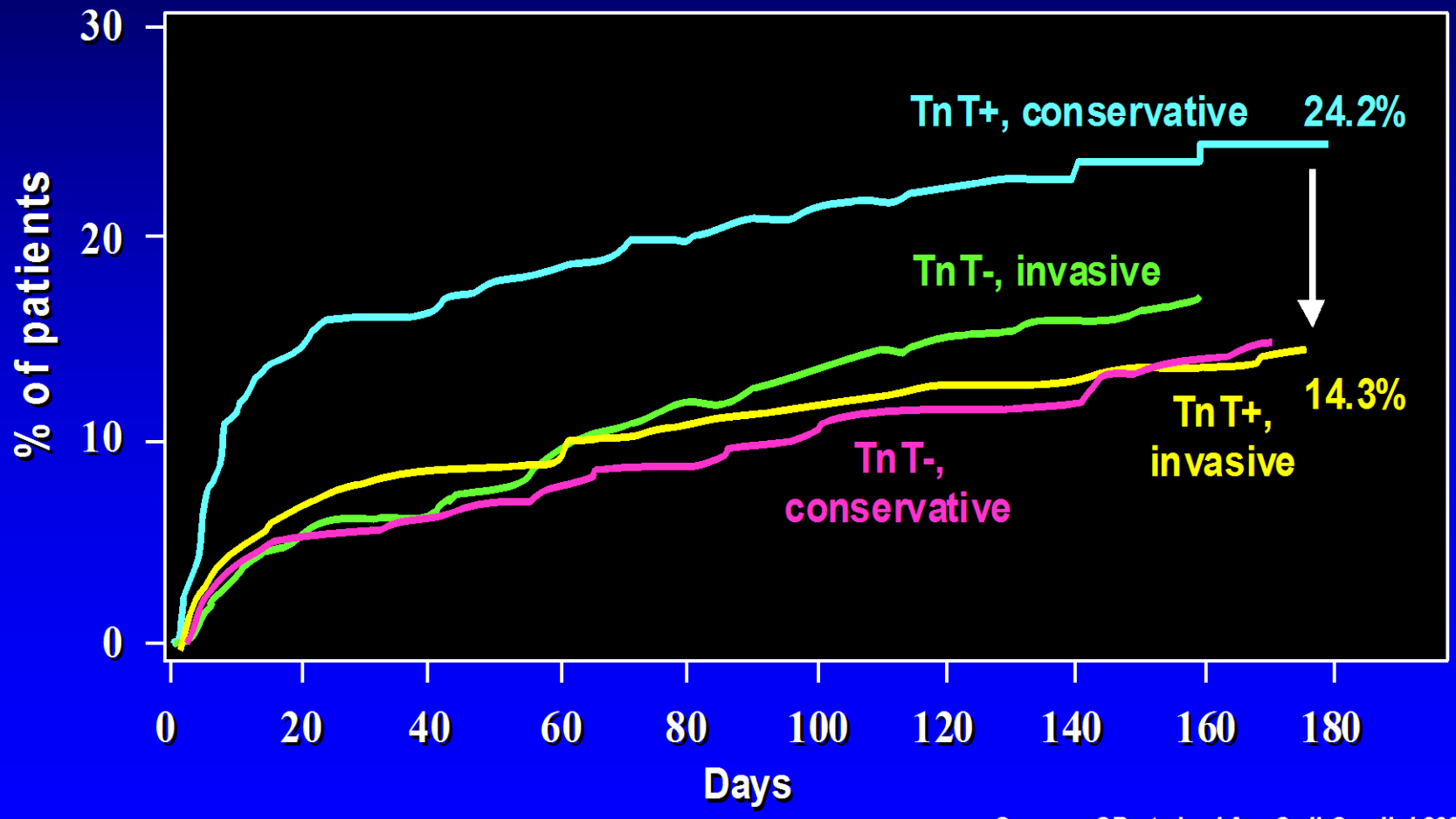
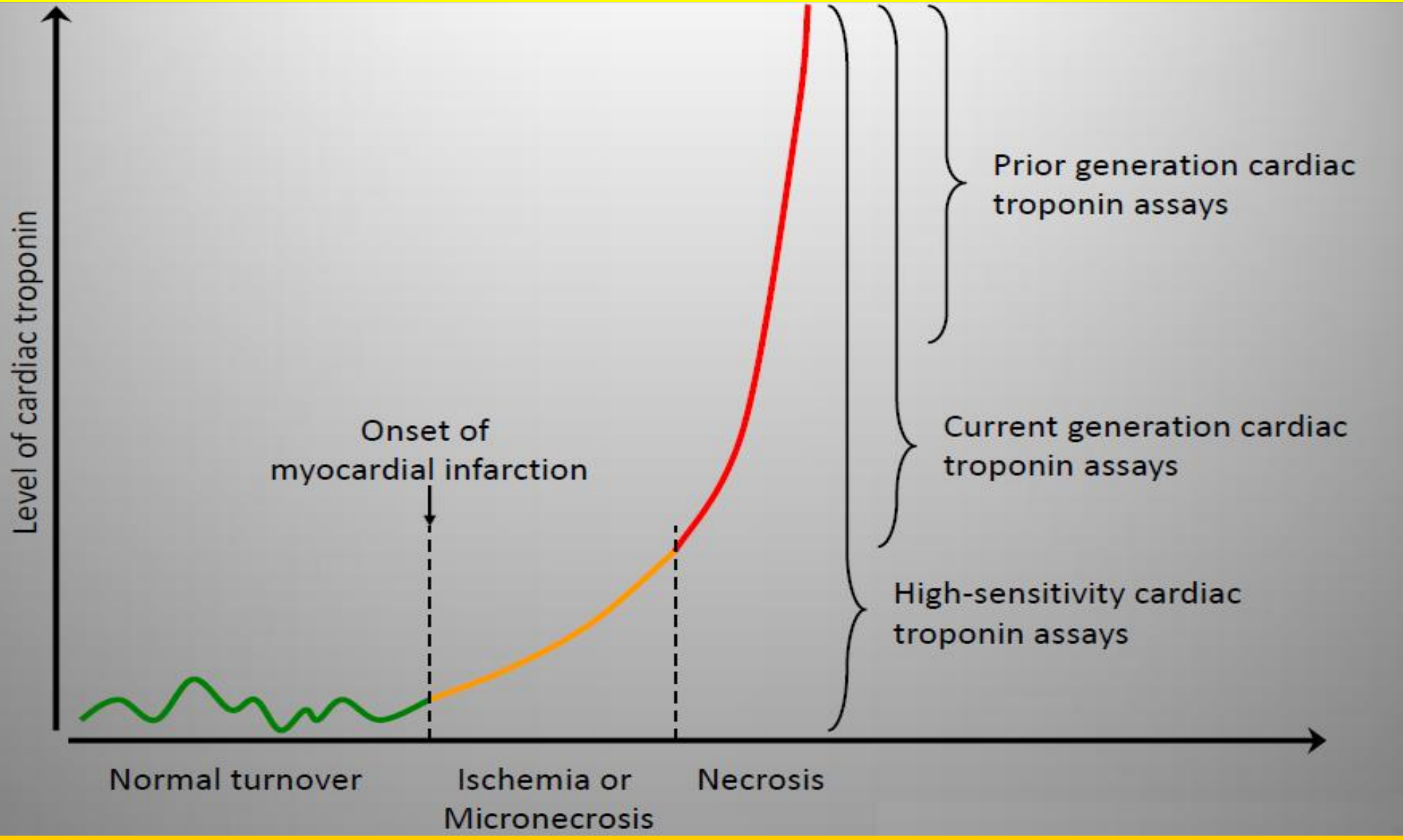
# TACTICS-TIMI 18: Invasive vs conservative (troponin T > 0.1 ng/dL)

## Primary endpoint: Death, MI, Rehosp for ACS




Cannon CP et al. *J Am Coll Cardiol* 2001; 37:325

# TROPONINES HS: MARQUEUR D'ISCHÉMIE ET DE NÉCROSE




Hochholzer et al. Am Heart J 2010

# High-Sensitivity cTn *Distribution in Healthy Reference Population*

Note: 99th percentile values shown are for the FDA-approved hs-cTnT assay.

Frequency, n

140
120
100
80
60
40
20
0

99th percentile
Healthy
Normal

0 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32

Hs-cTnT (ng/L)

Women

Overall

Men

Giannitsis E, et al. *Clin Chem*. 2010;56:254-261; Elecsys Troponin T Gen 5 STAT® PI 2017.

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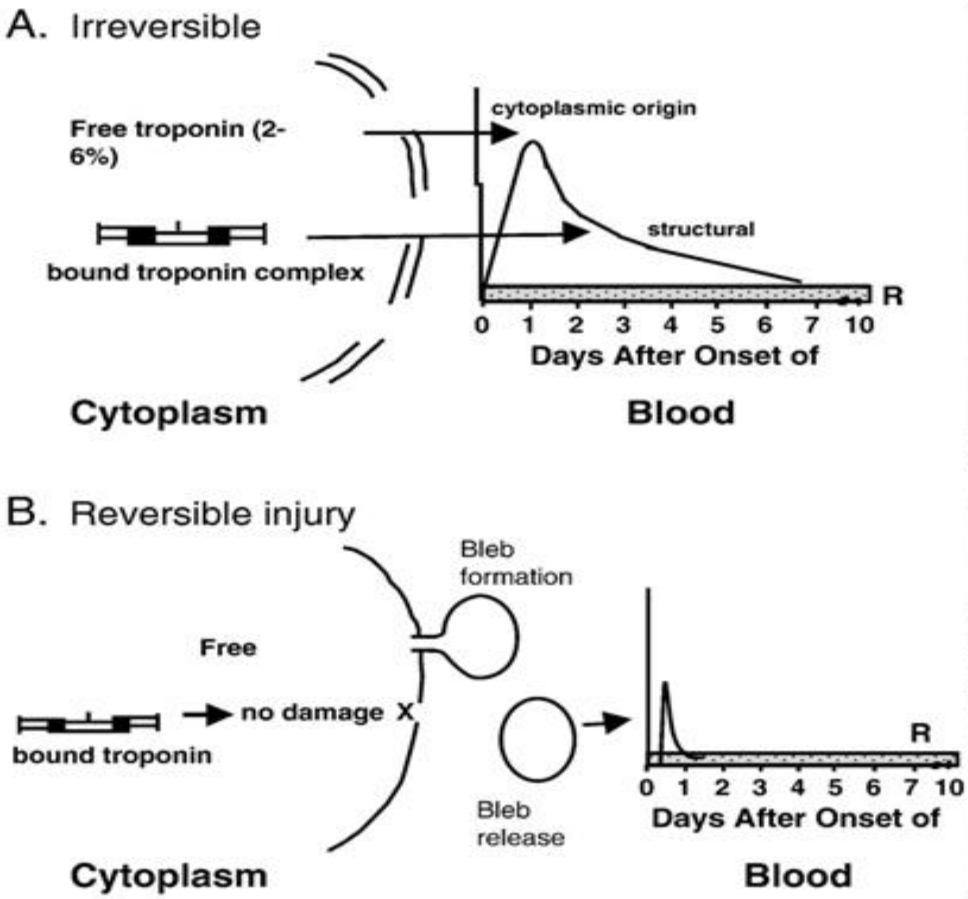
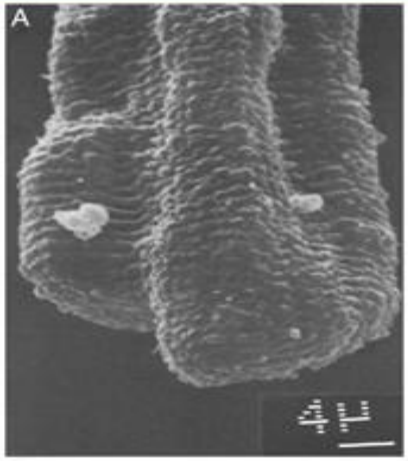
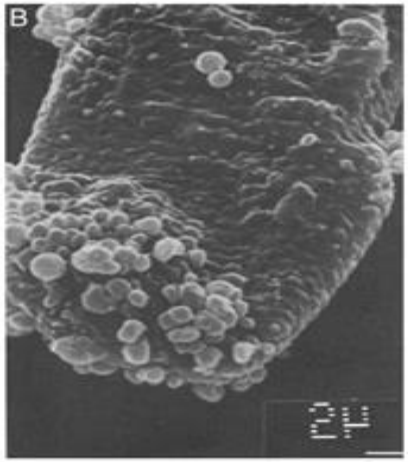
# Troponine : marqueur d'ischémie et de nécrose




Hackmann1 et al. Clin Chimica Acta (2010)

Agewall et al. European Heart Journal (2011)

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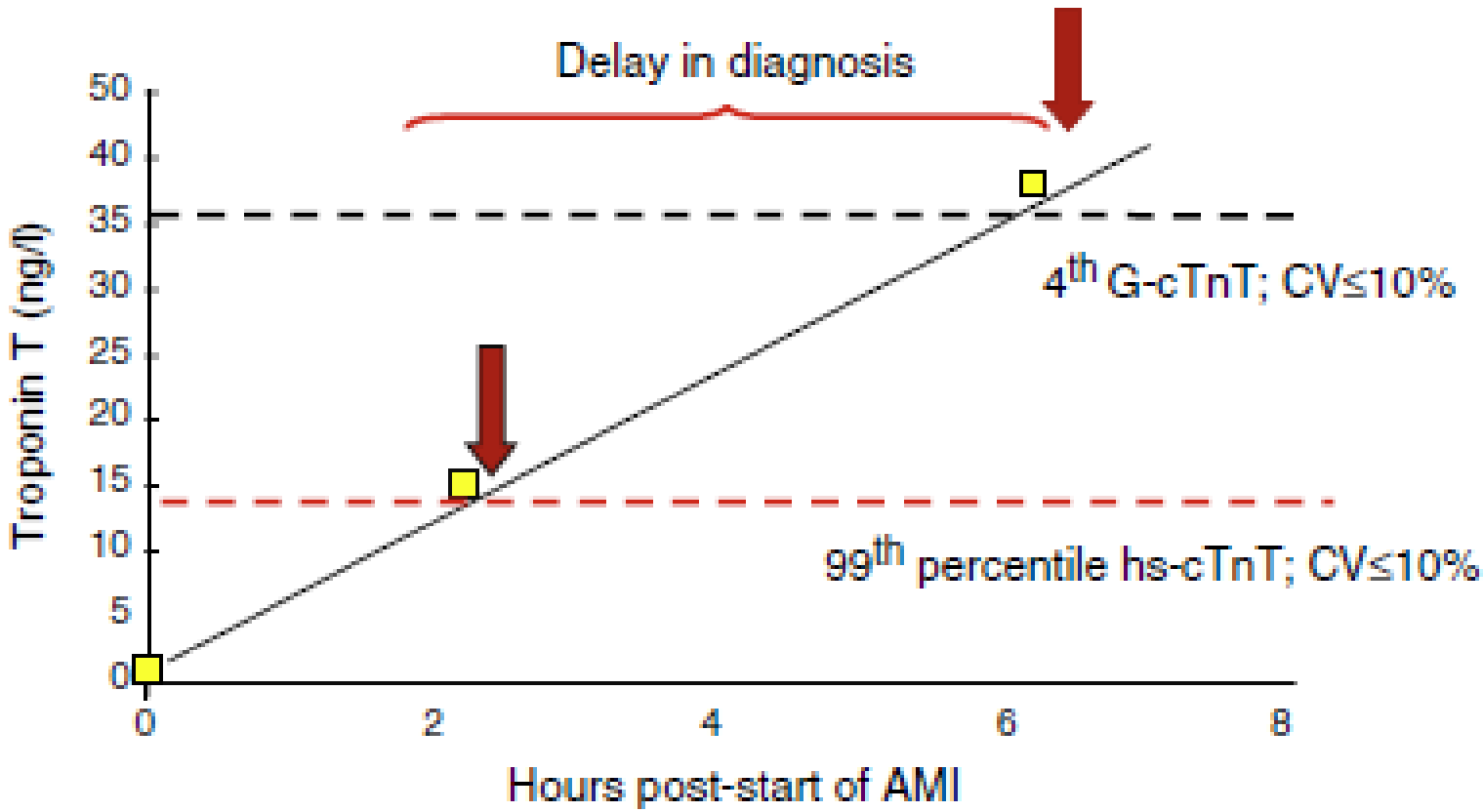
# Amélioration de la Sensibilité et détection plus précoce



# Algorithme de triage du SCA

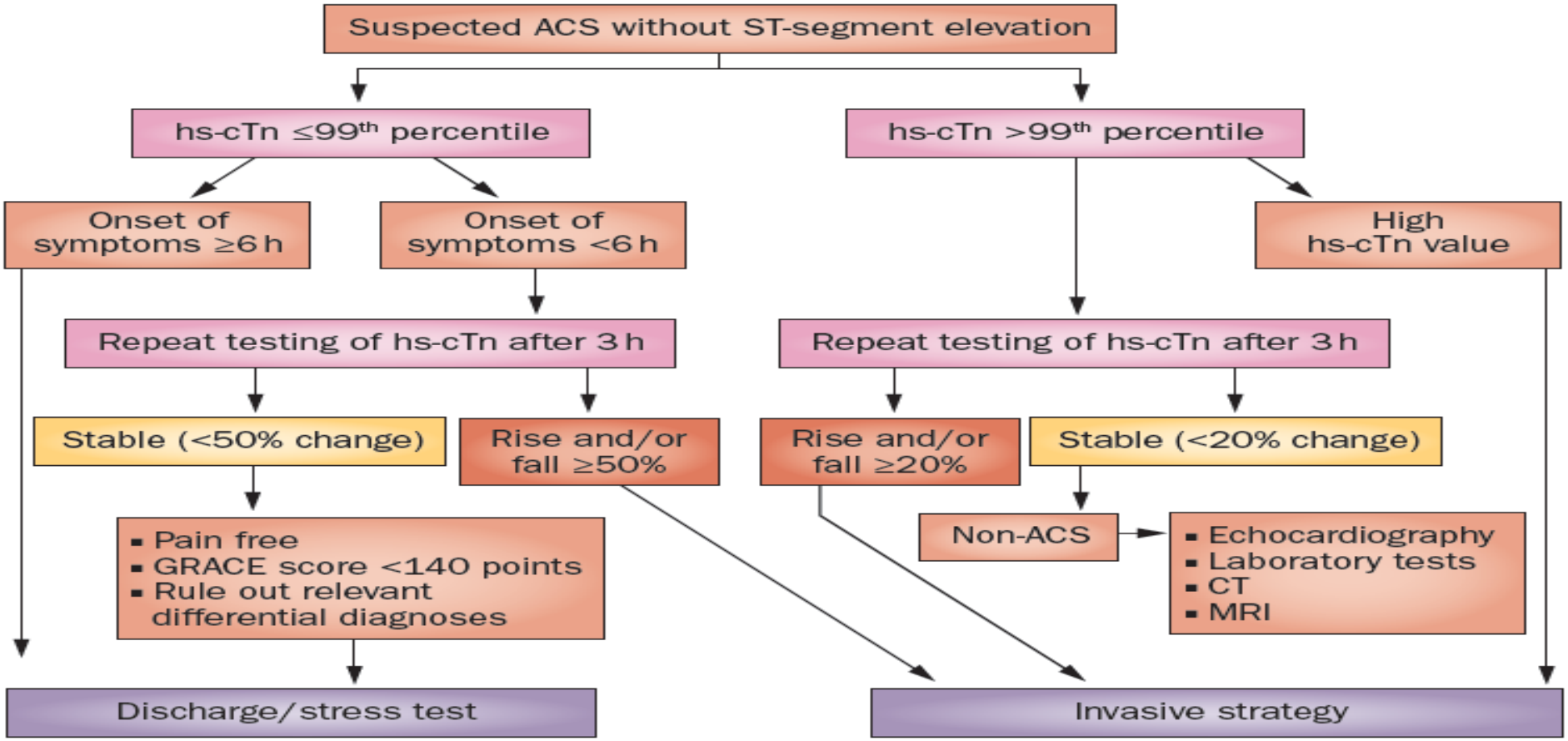



**Figure 1** | Algorithm for accelerated rule-out and rule-in of NSTEMI based on ESC recommendations.[5,9] Abbreviations: ACS, acute coronary syndrome; hs-cTn, cardiac troponin level as measured using a high-sensitivity assay; GRACE, Global Registry of Acute Coronary Events; NSTEMI, non-ST-segment elevation myocardial infarction.

# Troponine T-hs pour triage du SCA: admission et 1 hr

**TRAPID-AMI**

Mortalité à 30 jours:
0; 1,6 et 1,9% respectivement

17,3% Infarctus

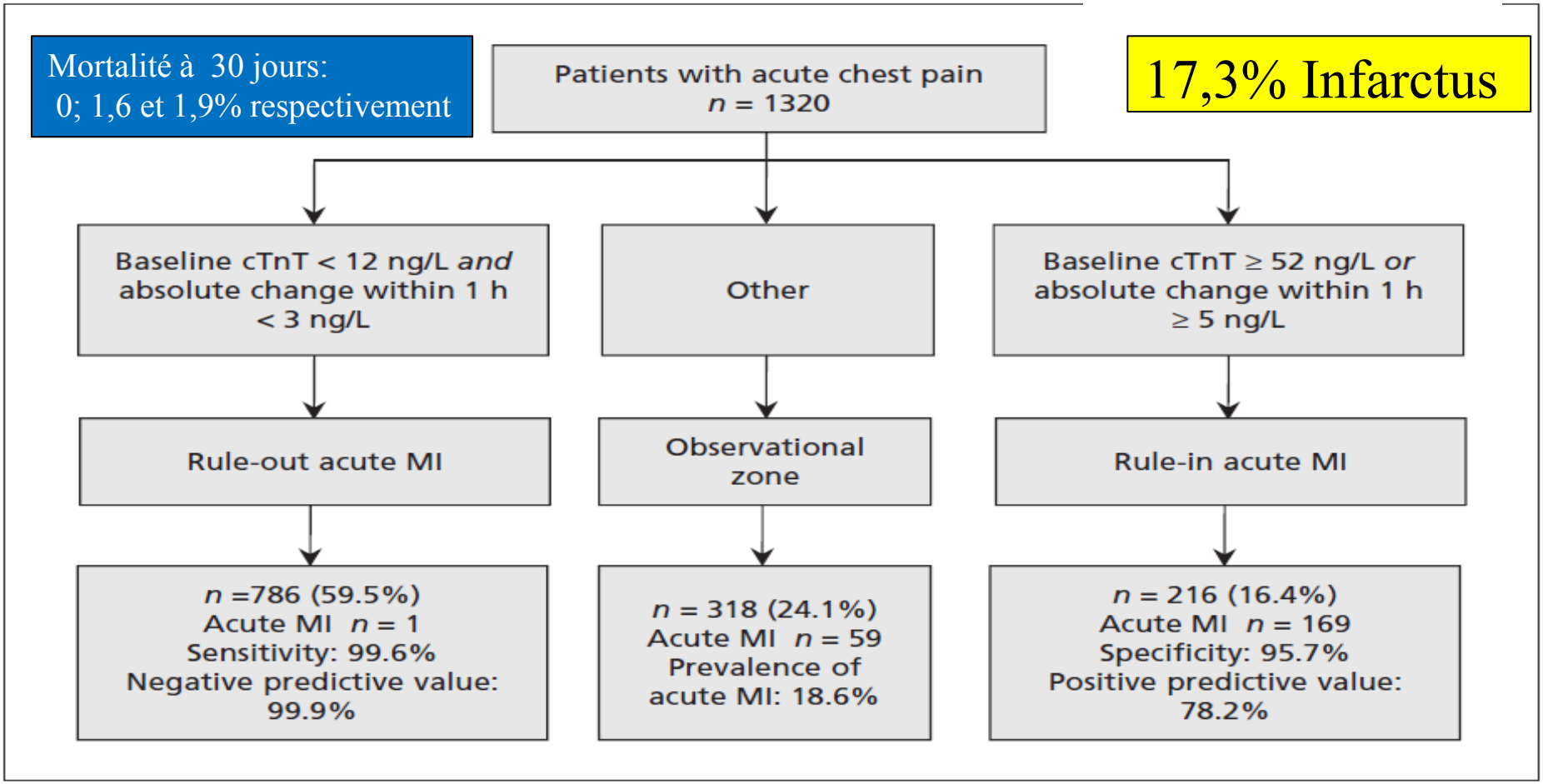



**Figure 1: Performance of the high-sensitivity cardiac troponin T (cTnT) 1-hour algorithm for rapid diagnosis of acute myocardial infarction (MI).**

Mueller C, et al. *Ann Emerg Med*. 2016;68:76-87.

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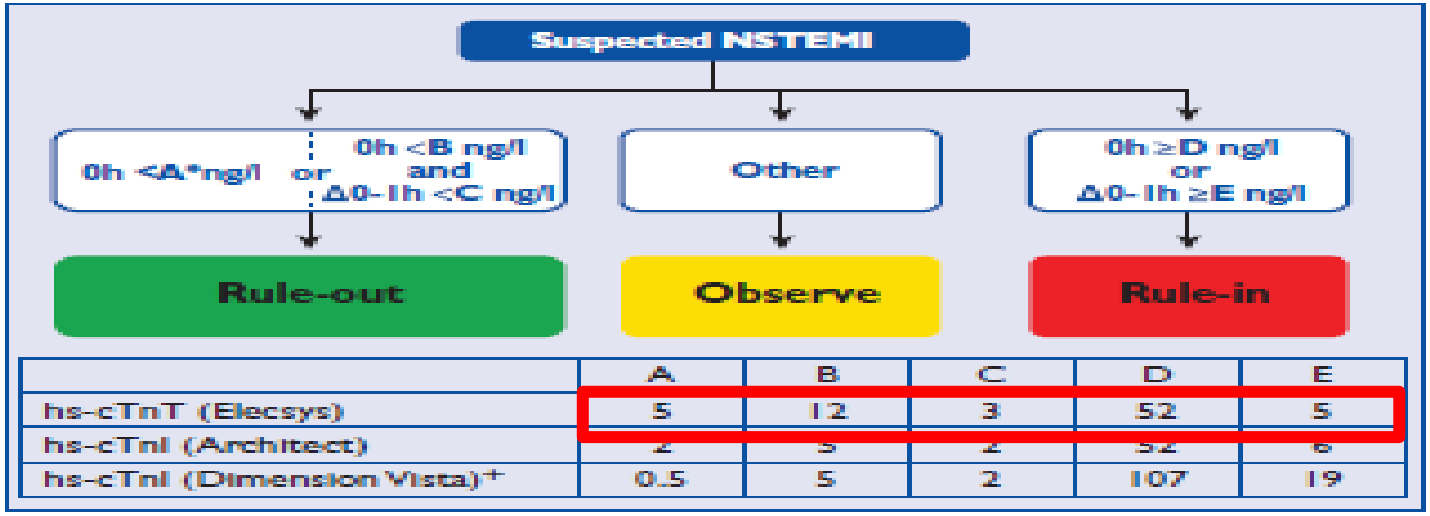
# More ED Discharges With Increasing Cardiac Troponin Sensitivity




| | A | B | C | D | E |
|---|---|---|---|---|---|
| hs-cTnT (Elecsys) | 5 | 12 | 3 | 52 | 5 |
| hs-cTnI (Architect) | 2 | 5 | 2 | 52 | 6 |
| hs-cTnI (Dimension Vista)+ | 0.5 | 5 | 2 | 107 | 19 |

**Figure 3** 0 h/1 h rule-in and rule-out algorithms using high-sensitivity cardiac troponins (hs-cTn) assays in patients presenting with suspected non-ST-elevation myocardial infarction (NSTEMI) to the emergency department. 0 h and 1 h refer to the time from first blood test. NSTEMI can be ruled-out already at presentation, if the hs-cTn concentration is very low. NSTEMI can also be ruled-out by the combination of low baseline levels and the lack of a relevant increase within 1 h. Patients have a high likelihood for NSTEMI if the hs-cTn concentration at presentation is at least moderately elevated or hs-cTn concentrations show a clear rise within the first hour. Cut-off levels are assay-specific. Cut-off levels for other hs-cTn assays are in development. *Only applicable if chest pain onset >3h, +At the time of the publication of the guideline not yet commercially available.

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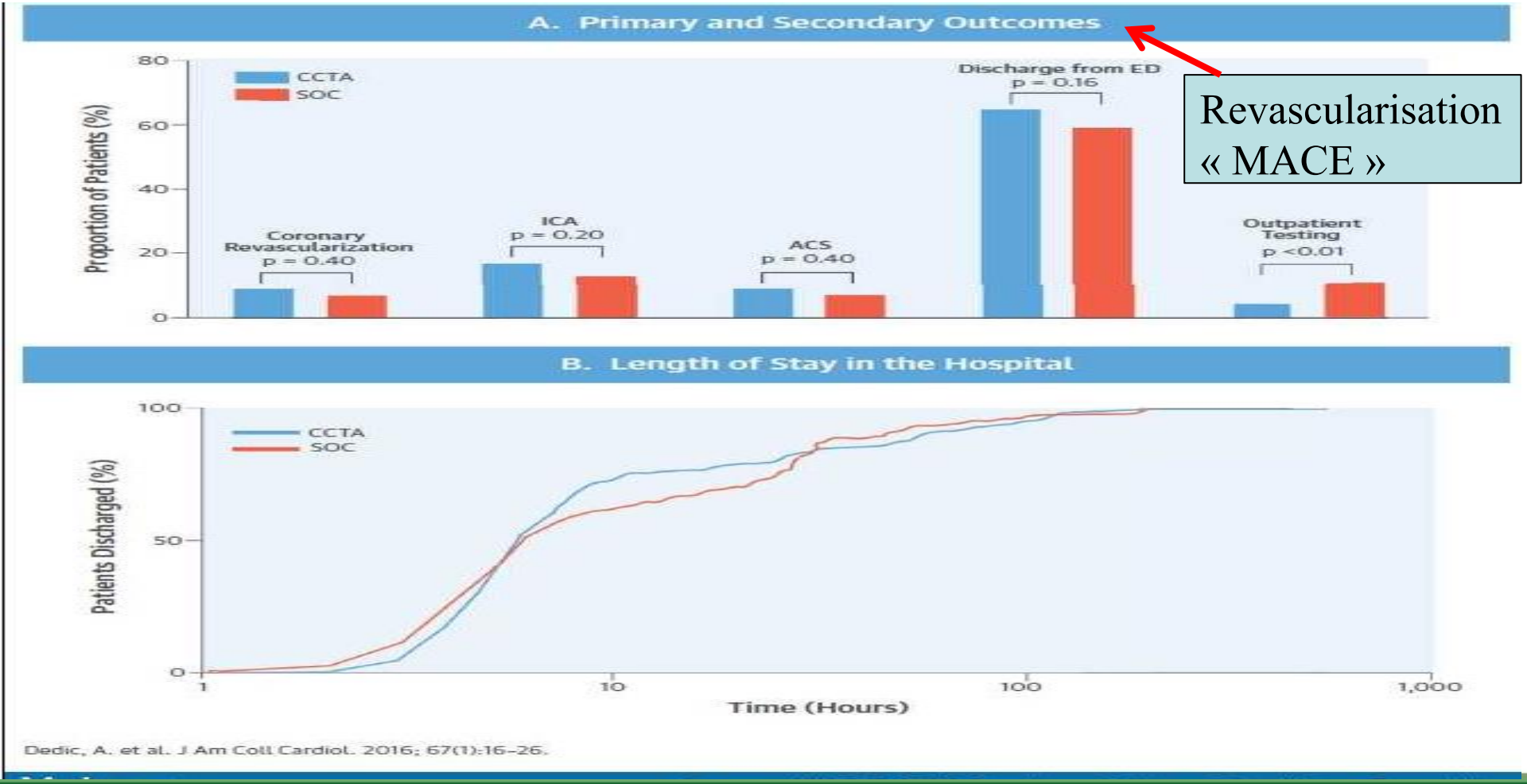
la santé

# Angio-CT vs examens Dx conventionnel pour triage du SCA avec Troponines-hs N = 500




Dedic, A. et al. J Am Coll Cardiol. 2016; 67(1):16–26.

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# La face obscure des troponines

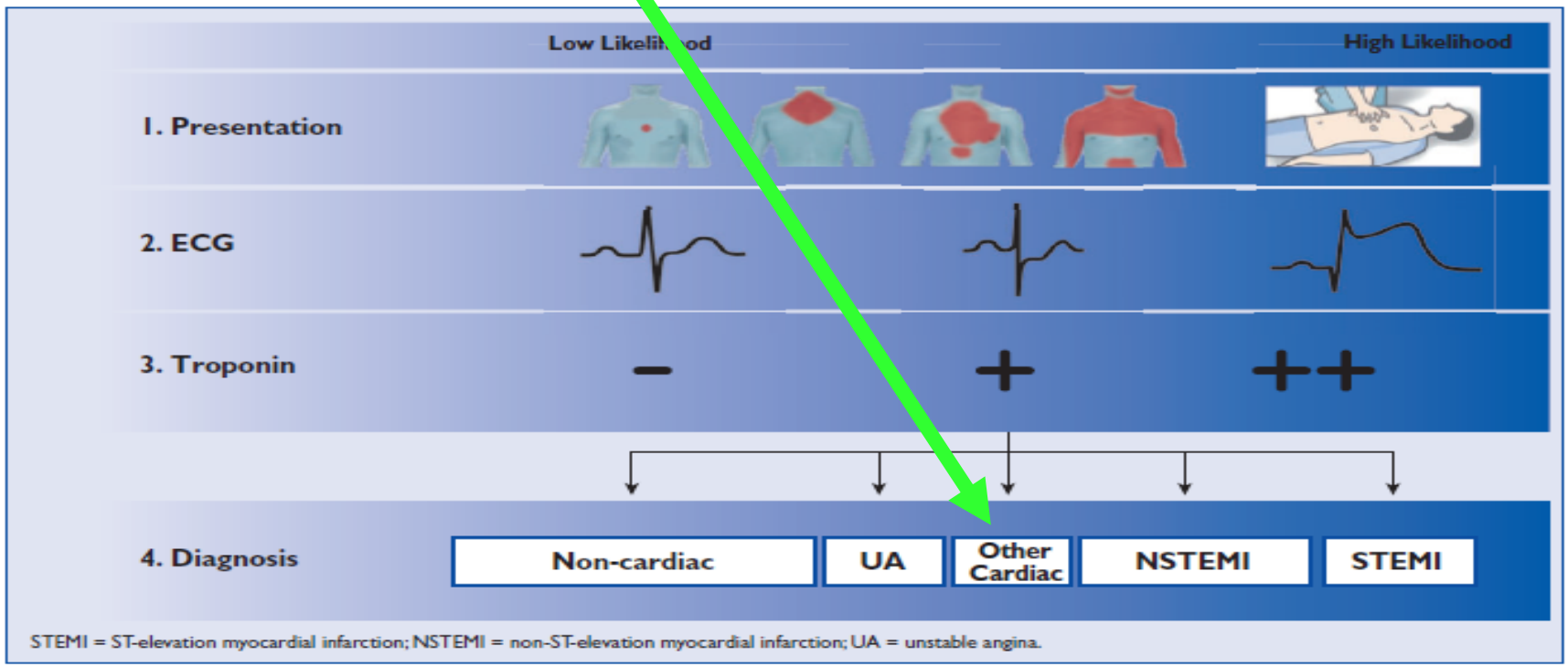
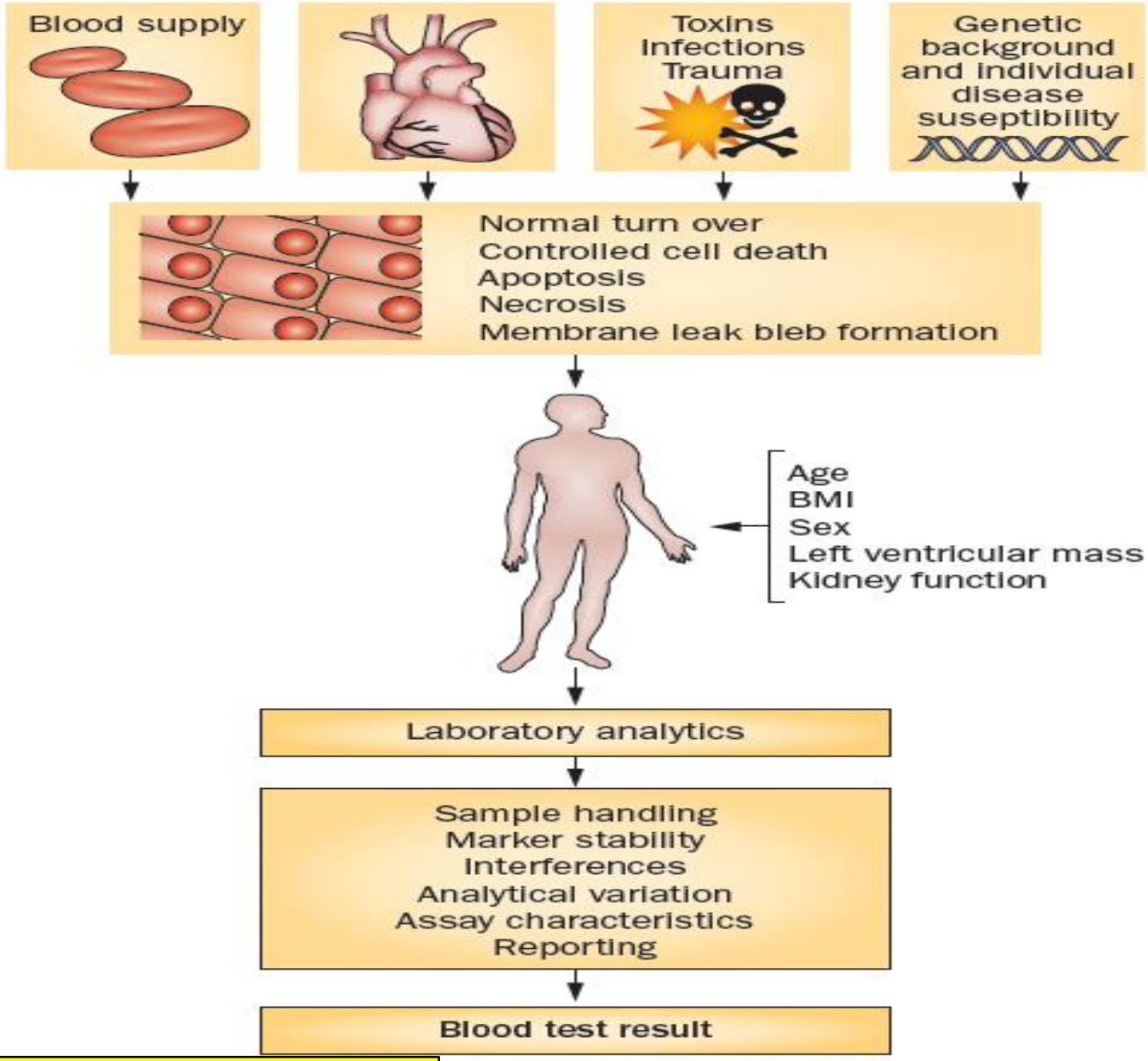



**Figure 1** Initial assessment of patients with suspected acute coronary syndromes. The initial assessment is based on the integration of low-likelihood and/or high-likelihood features derived from clinical presentation (i.e., symptoms, vital signs), 12-lead ECG, and cardiac troponin. The proportion of the final diagnoses derived from the integration of these parameters is visualized by the size of the respective boxes. "Other cardiac" includes, among other, myocarditis, Tako-Tsubo cardiomyopathy, or tachyarrhythmias. "Non-cardiac" refers to thoracic diseases such as pneumonia or pneumothorax. Cardiac troponin should be interpreted as a quantitative marker: the higher the level, the higher the likelihood for the presence of myocardial infarction. In patients presenting with cardiac arrest or haemodynamic instability of presumed cardiovascular origin, echocardiography should be performed/interpreted by trained physicians immediately following a 12-lead ECG. If the initial evaluation suggests aortic dissection or pulmonary embolism, D-dimers and multi-detector computed tomography angiography are recommended according to dedicated algorithms.[42,43]






**E. Giannitsis et HA Katus**
**Nature Reviews Cardiology Volume 10 Nov 2013**

# *TROPONINE ET SCA SOUPÇONNÉ*

**Taux élevé de troponine**

## SCA

## PAS de SCA

Contusion myocardique
Péri. / Myocardite
Embolie pulmonaire
Hypertension pulmonaire
MCAS
**<u>Ins Cardiaque (aigue/chronique)</u>**
Rejet d'une greffe cardiaque
Tachy/Brady-arrythmies
Maladie valvulaire
Cardiomyopathies
« Takotstubo »
Vasospasme coronarien
Crise HTA
Dissection Aortique

AVC / HSA
Hémor. Céré
Choc septique
Soins critiques
Grands Brûlés
IRC / IRA
Amyloidose
Sarcoidose
Sclérodermie
Mal. Inflammatoire
Venin de scorpion
Course de marathon
Hypothyroïdie
Rhabdomyolyse

## Iatrogène

Angioplastie coronarienne
Chirurgie cardiaque
Cardioversion
Ablation de l'arythmie???
Chimiothérapie cardiotoxique

## Analytique

Anticorps hétérophiles
Facteur rhumatoïde
Filaments de fibrine

# Méta-analyse: Mortalité de toutes causes vs Niveau de Troponines (toutes confondues) en Insuffisance cardiaque

| Study or Subgroup | log[Hazard Ratio] | SE | Weight | Hazard Ratio IV, Random, 95% CI |
|---|---|---|---|---|
| Alehagen 2010 | 0.806 | 0.217 | 9.7% | 2.24 [1.46, 3.43] |
| Horwich 2003 | 0.741 | 0.261 | 9.1% | 2.10 [1.26, 3.50] |
| Hudson 2004 | 1.457 | 0.535 | 5.5% | 4.29 [1.50, 12.25] |
| Jungbuer 2011 | 1.991 | 0.44 | 6.6% | 7.32 [3.09, 17.35] |
| Kawahara 2011 | 1.74 | 0.527 | 5.6% | 5.70 [2.03, 16.00] |
| Latini High 2007 | 0.174 | 0.045 | 11.3% | 1.19 [1.09, 1.30] |
| Latini Low 2007 | 0.732 | 0.098 | 11.0% | 2.08 [1.72, 2.52] |
| Macin 2006 | 1.358 | 0.774 | 3.5% | 3.89 [0.85, 17.73] |
| Orea Tejeda 2010 | 1.626 | 0.334 | 8.0% | 5.08 [2.64, 9.78] |
| Ralli 2005 | 0.992 | 0.295 | 8.6% | 2.70 [1.51, 4.81] |
| Stanton 2005 | 0.415 | 0.48 | 6.1% | 1.51 [0.59, 3.88] |
| Tentzeris 2011 | 1.355 | 0.308 | 8.4% | 3.88 [2.12, 7.09] |
| Tsutamoto 2010 | 1.364 | 0.451 | 6.5% | 3.91 [1.62, 9.47] |
| **Total (95% CI)** | | | **100.0%** | **2.85 [2.02, 4.03]** |

Heterogeneity: Tau² = 0.27; Chi² = 98.34, df = 12 (P < 0.00001); I² = 88%
Test for overall effect: Z = 5.96 (P < 0.00001)

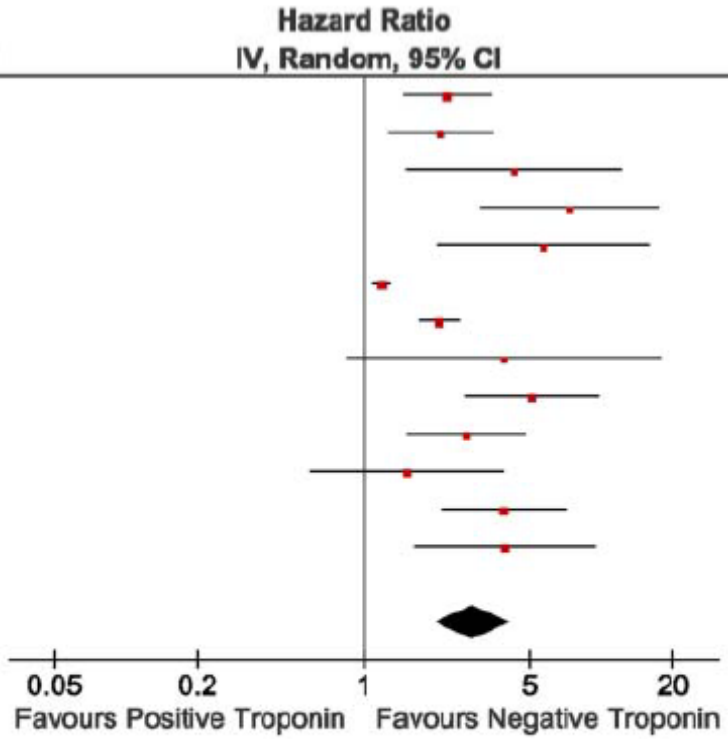
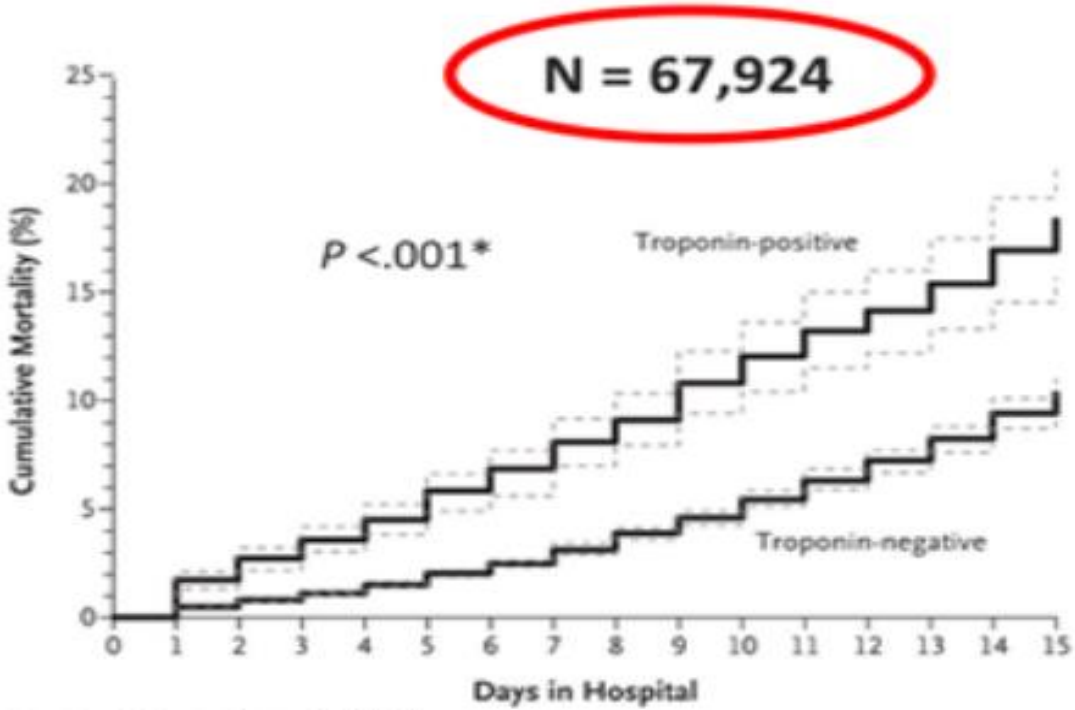



**Figure 2** Forest plot for primary outcome (either all-cause or cardiovascular mortality).

*Heart* 2012;**98**:1778–1786. doi:10.1136/heartjnl-2012-301779 Vijaiganesh Nagarajan,[1]

# Acute Heart Failure

## *Mortality According to Time in Hospital and Troponin Status at Presentation*




*Dashed lines show 95% CI.

From N Engl J Med, Peacock WF 4th, et al., Cardiac Troponin and Outcome in Acute Heart Failure, 358., 2117-2126.
Copyright © 2008 Massachusetts Medical Society. Reprinted with permission from Massachusetts Medical Society.

# Troponine : marqueur pronostique

The NEW ENGLAND JOURNAL of MEDICINE

A Sensitive Cardiac Troponin T Assay in Stable Coronary Artery Disease

(PEACE) Trial Investigators

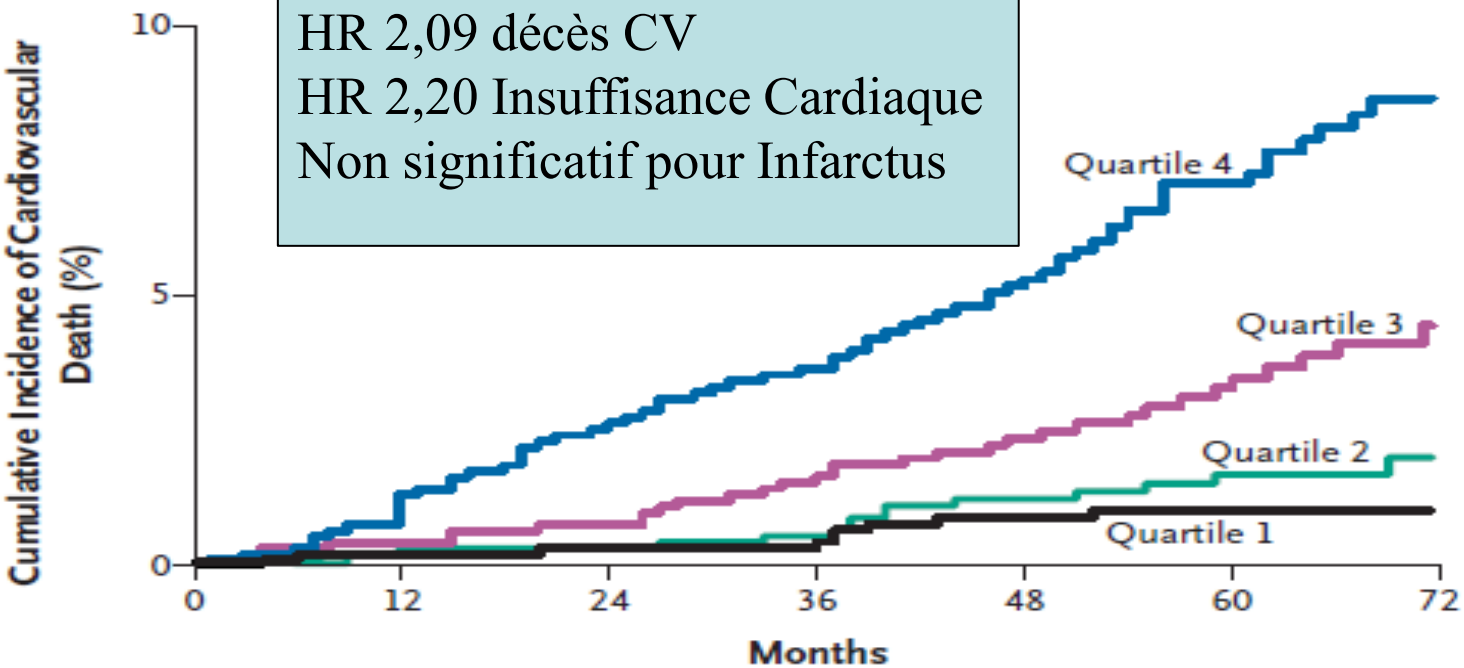
- 3679 pts avec MCAS stable et FeVG préservée (18% F)
- 11,1% ont Troponines > 14 ng / L
- Suivi 5,2 ans
- Mesure troponine T HS
- Comparaison avec une population référence
- Évaluation de l'impact pronostic

Omland et al. NEJM 2009

# Troponine : marqueur pronostique

HR 2,09 décès CV
HR 2,20 Insuffisance Cardiaque
Non significatif pour Infarctus

**97,7% des pts avec MCAS cliniquement stable ont une T HS détectable et 11,1% ont une valeur > 99e centile**




| High-sensitivity cardiac troponin T levels (μg/liter) | Q1 | Q2 | Q3 | Q4 |
|---|---|---|---|---|
| Men | ≤0.0042 | 0.0043–0.0062 | 0.0063–0.0095 | ≥0.0096 |
| Women | ≤0.0027 | 0.0028–0.0045 | 0.0046–0.0073 | ≥0.0074 |

**Figure 2.** Incidence of Cardiovascular Death According to Quartile of High-Sensitivity Cardiac Troponin T Level.

Omland et al. NEJM 2009

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# Association between high-sensitivity cardiac troponin T levels and the predicted cardiovascular risk in middle-aged men without overt cardiovascular disease

Toshiaki Otsuka, MD,[a] Tomoyuki Kawada, MD,[a] Chikao Ibuki, MD,[b] and Yoshihiko Seino, MD[b] *Tokyo, and Chiba, Japan*

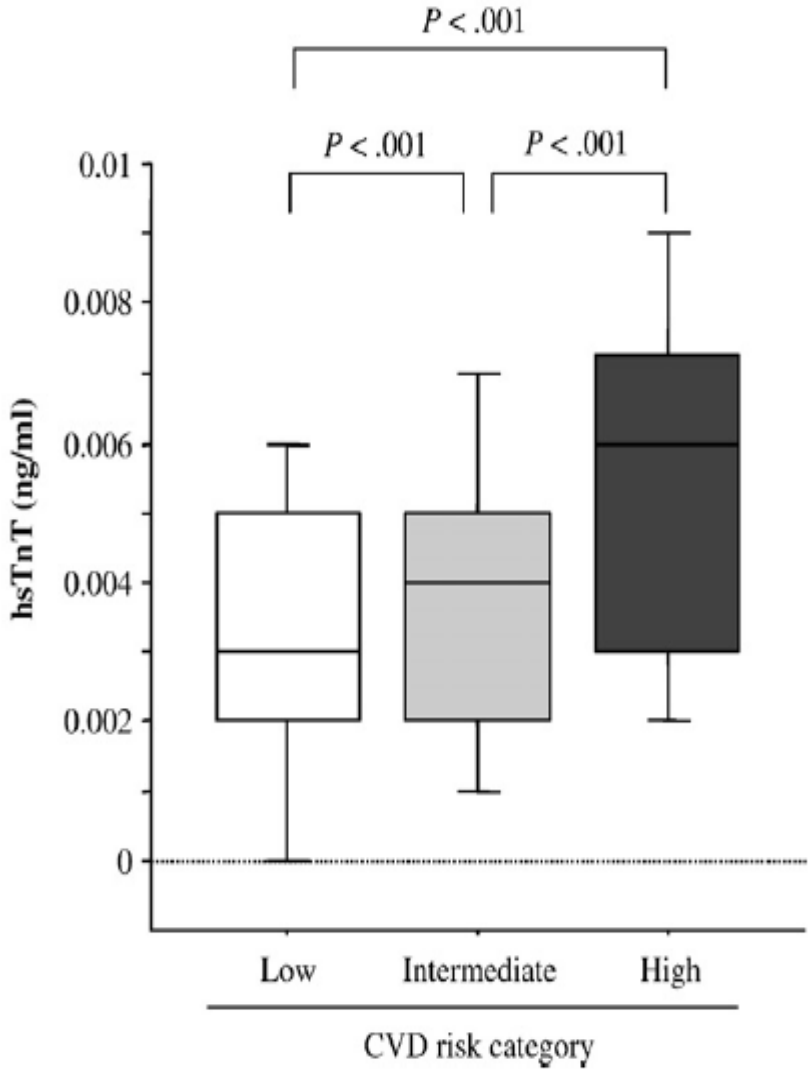
- N = 1072 sujets sans Hx de MCAS
- Age Moyen: 44 ans
- Age, HTA, Tabagisme, GFR, HVG sont des déterminants indépendants du niveau de Troponines hs
- OR: 3,98 entre 1er et 3e Tertile;

Comparateur = Framingham > 20% événement CV à 10 ans

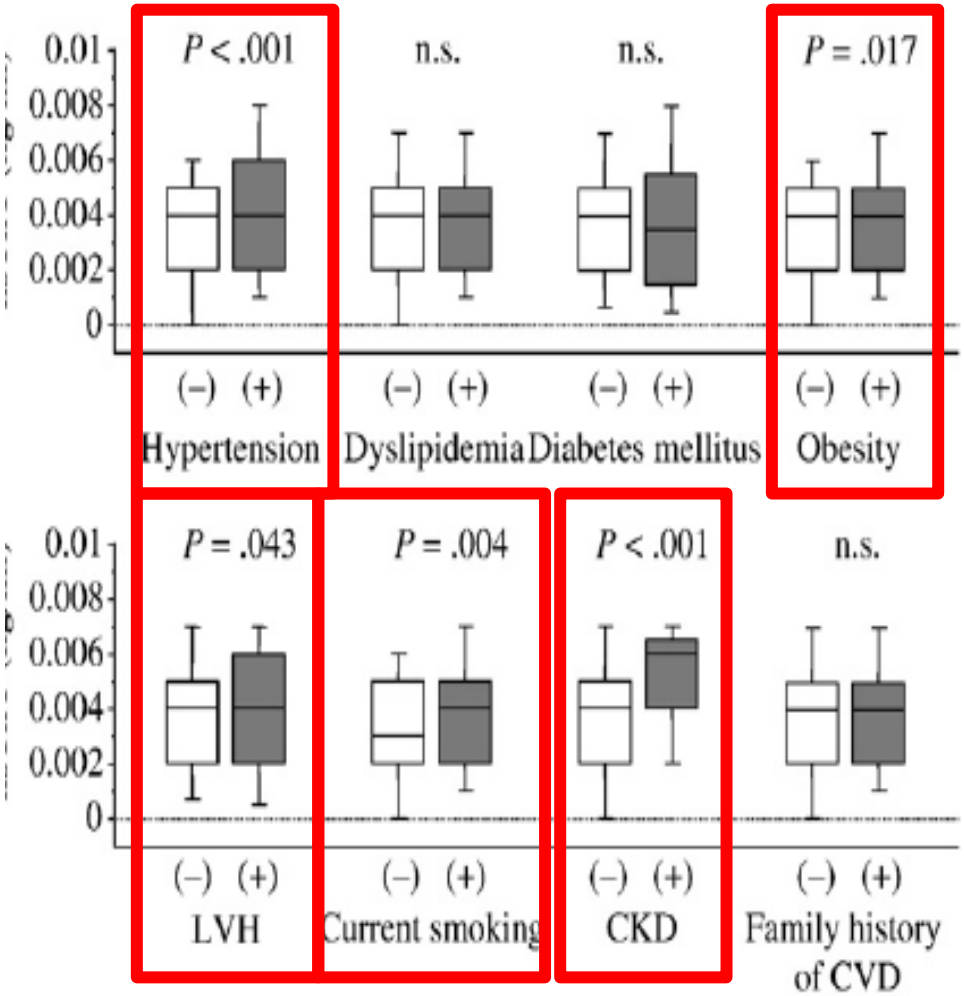


(Am Heart J 2010;159:972-8.)

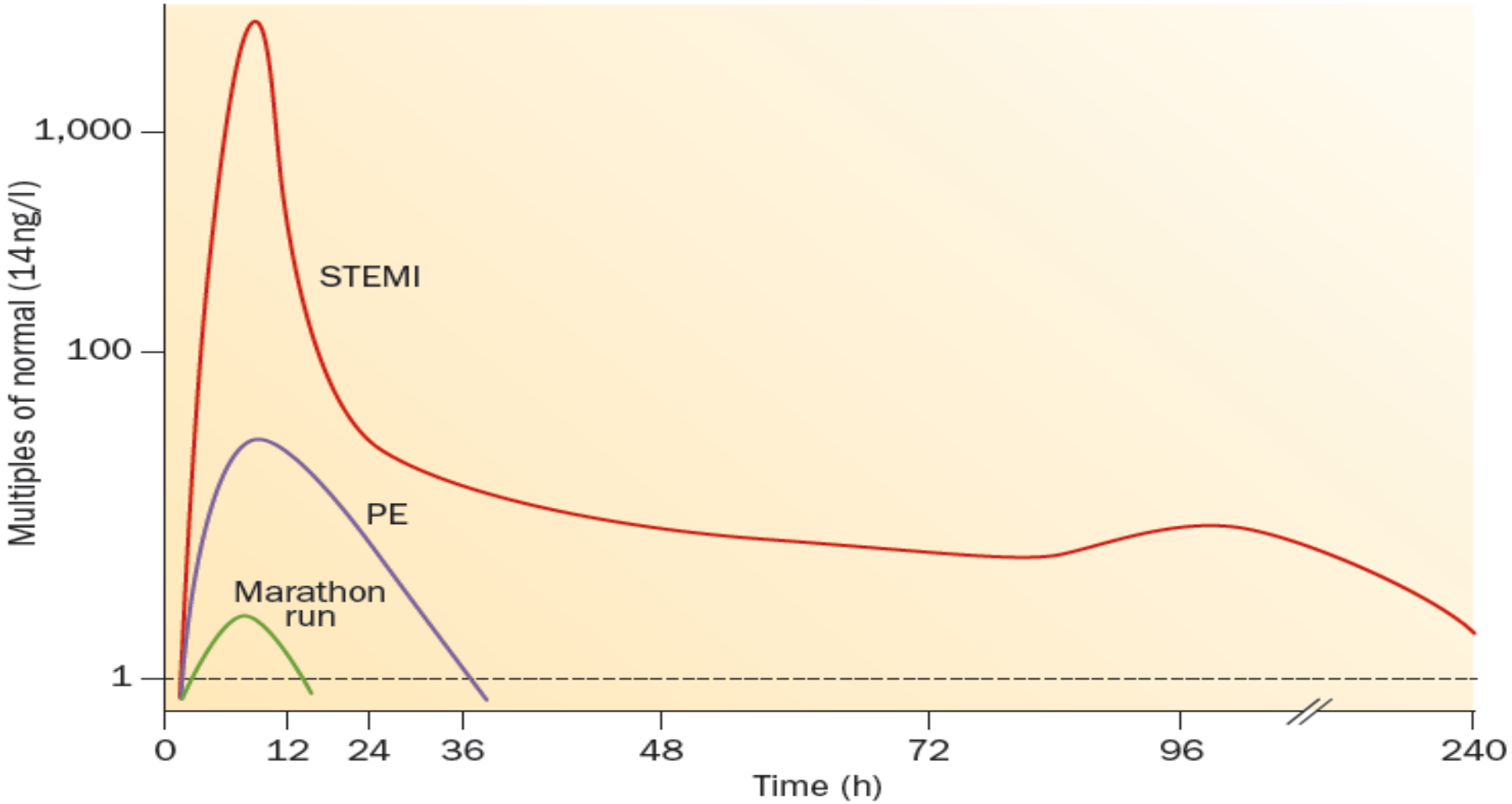
## Figure 3




## Figure 2



# Cinétique des Troponines due à un « stress » aigu mais non coronarien



## Table 1. Differential diagnosis of increased cTn in patients without ACS or heart failure.

- Acute disease
  - Cardiac and vascular
    - Acute aortic dissection
    - Cerebrovascular accident
      - Ischemic stroke
      - Intracerebral hemorrhage
      - Subarachnoid hemorrhage
    - Medical ICU patients
    - Gastrointestinal bleeding
  - Respiratory
    - Acute PE
    - ARDS
  - Cardiac inflammation
    - Endocarditis
    - Myocarditis
    - Pericarditis
  - Muscular damage
  - Infectious
    - Sepsis
    - Viral illness
  - Other acute causes of cTn increase
    - Kawasaki disease
    - Apical ballooning syndrome
    - Thrombotic thrombocytopenic purpura
    - Rhabdomyolysis
    - Birth complications in infants
      - Extreme low birth weight
      - Preterm delivery
    - Acute complications of inherited disorders
      - Neurofibromatosis
      - Duchenne muscular dystrophy
      - Klippel-Feil syndrome
    - Environmental exposure
      - Carbon monoxide
      - Hydrogen sulfide
      - Colchicine

Tachy-arrythmies
Cardiomyopathies
Valvulopathies

E. Giannitsis et HA Katus
Nature Reviews Cardiology Volume 10 Nov 2013

Table 1. Differential diagnosis of increased cTn in patients without ACS or heart failure.

- Myocardial injury
  - Blunt chest injury
  - Endurance athletes
  - Envenomation
    - Snake
    - Jellyfish
    - Spider
    - Centipede
    - Scorpion
- Chronic disease
  - ESRD
  - Cardiac infiltrative disorders
    - Amyloidosis
    - Sarcoidosis
    - Hemochromatosis
    - Scleroderma
  - Hypertension
  - Diabetes
  - Hypothyroidism
- Iatrogenic disease
  - Invasive procedures
    - Htx
    - Congenital defect repair
    - RFCA
    - Lung resection
    - ERCP
  - Noninvasive procedures
    - Cardioversion
    - Lithotripsy
  - Pharmacologic sources
    - Chemotherapy
    - Other medications

Non prédicteur de pronostic à court terme mais **prédicteur à moyen et long terme**

**E. Giannitsis et HA Katus**
**Nature Reviews Cardiology Volume 10 Nov 2013**

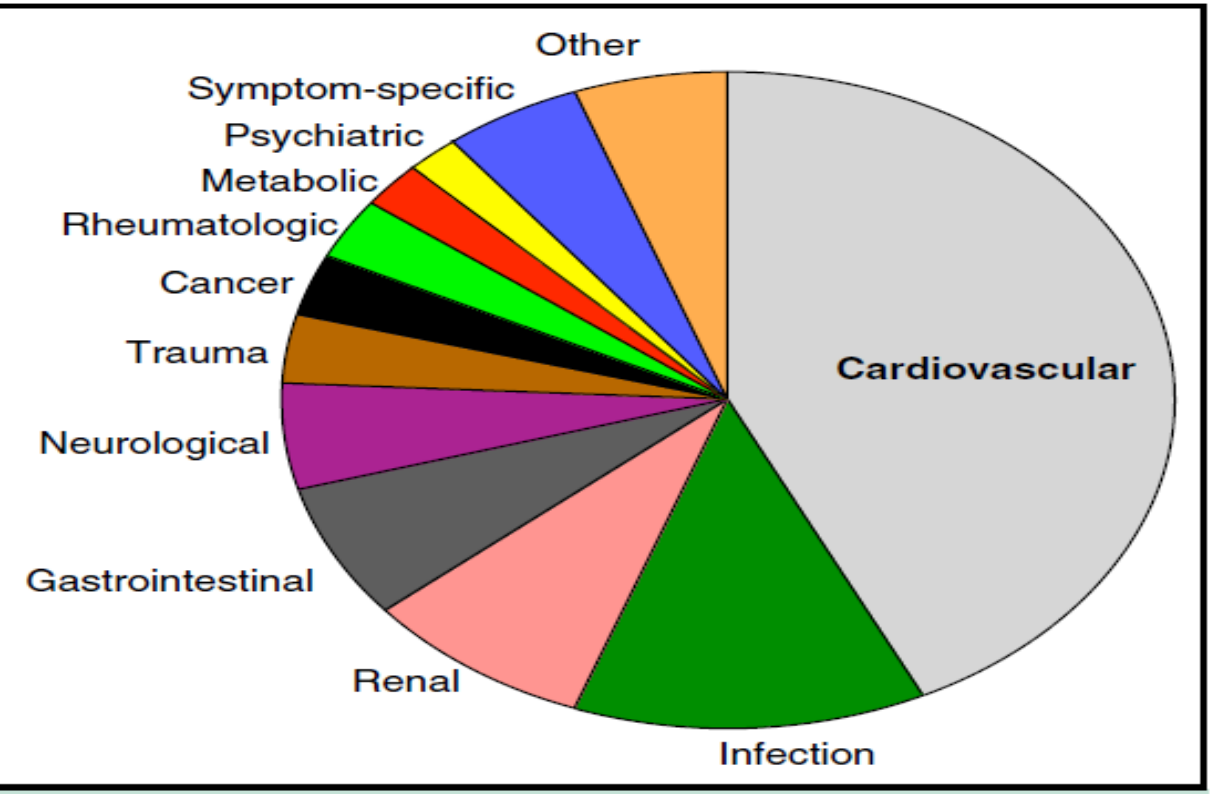
## Une Observation sur l'utilisation de troponines à l'urgence

# SURVIE à 12 MOIS

# SCA 85% vs non-SCA 59%

- Des 252 sans évidence de SCA:
  - Une étiologie a été trouvée chez 171 (68% principalement ins. cardiaque, embolie pulmonaire, sepsis ou ins. rénale)
  - 95% pas de DRS et 93% ont ECG Normal
- Non-SCA ont Troponines < que SCA

# Outcomes of Hospitalized Patients with Non-Acute Coronary Syndrome and Elevated Cardiac Troponin Level



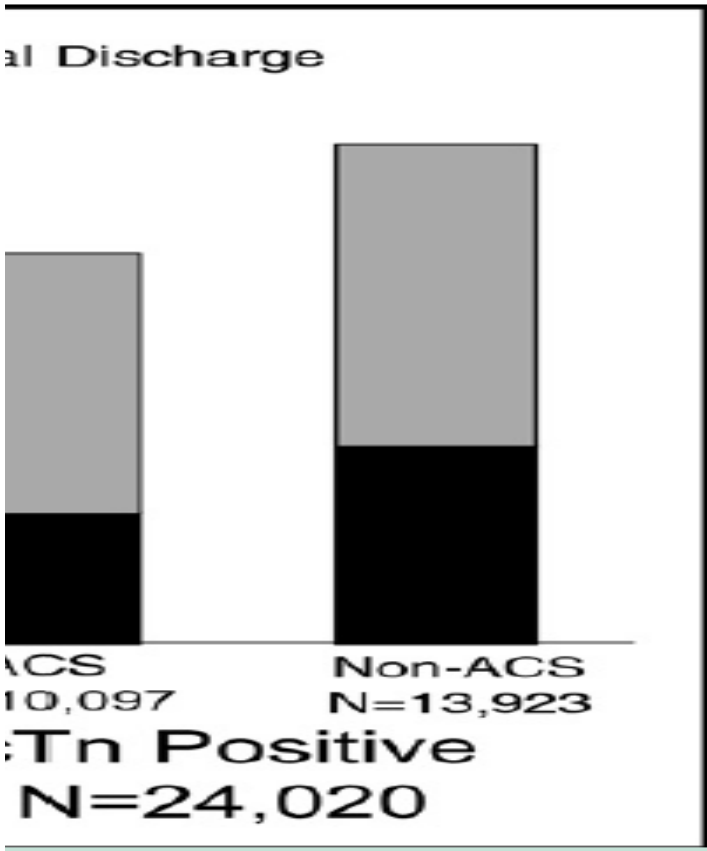




**Figure 3** The primary diagnoses based on the ICD-9 codes are shown for all 13,923 hospitalized patients with an elevated troponin level and a non-acute coronary syndrome condition. The most common discharge diagnosis involved the cardiovascular system.

post-hospital discharge
e 100,433 hospitalized
during hospitalization
ing to the ICD-9 diag-

*The American Journal of Medicine (2011) 124, 630-635*

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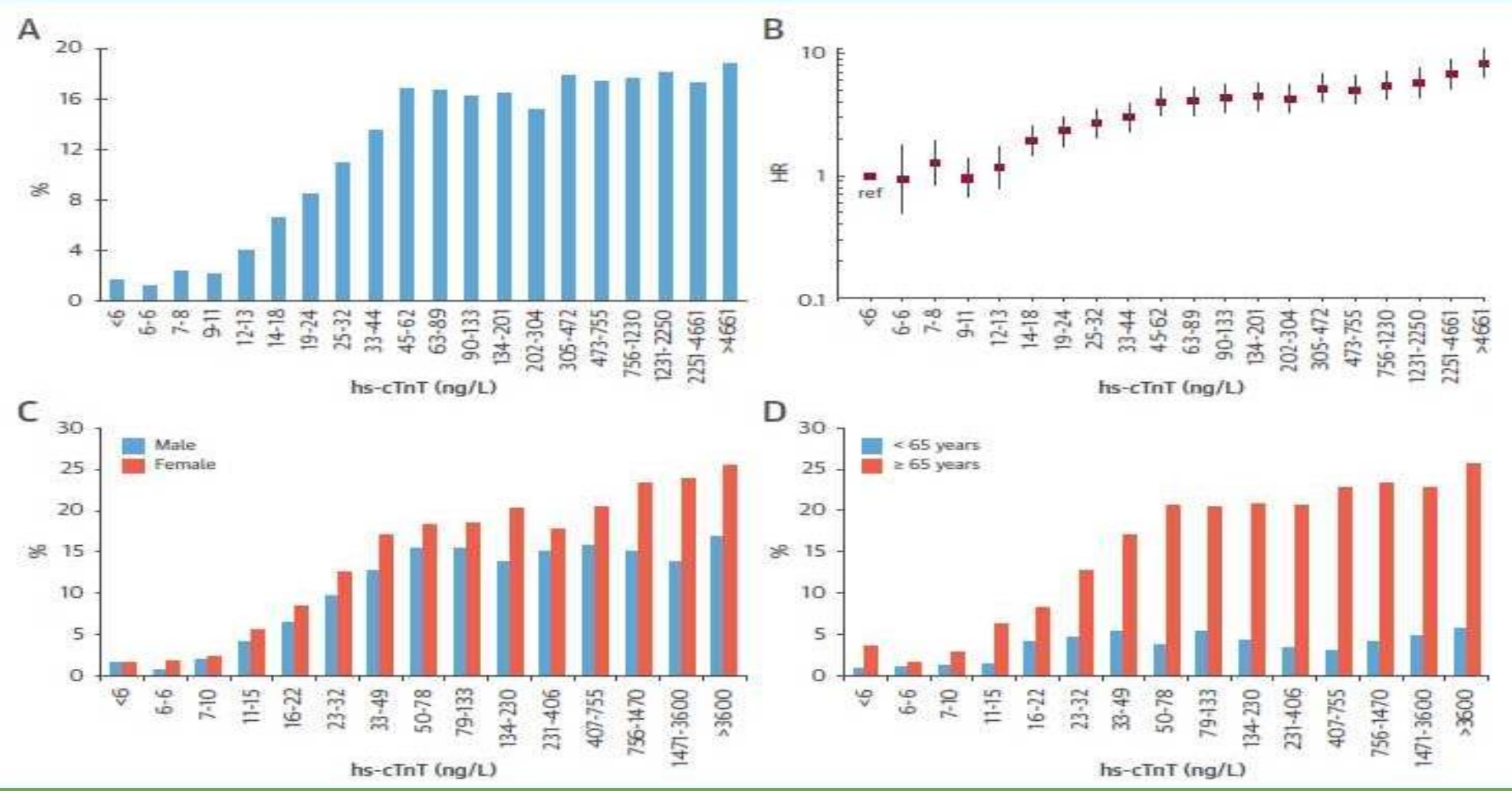
# Registre Suédois hospitalisations: N = 48,594

## % décès à un an



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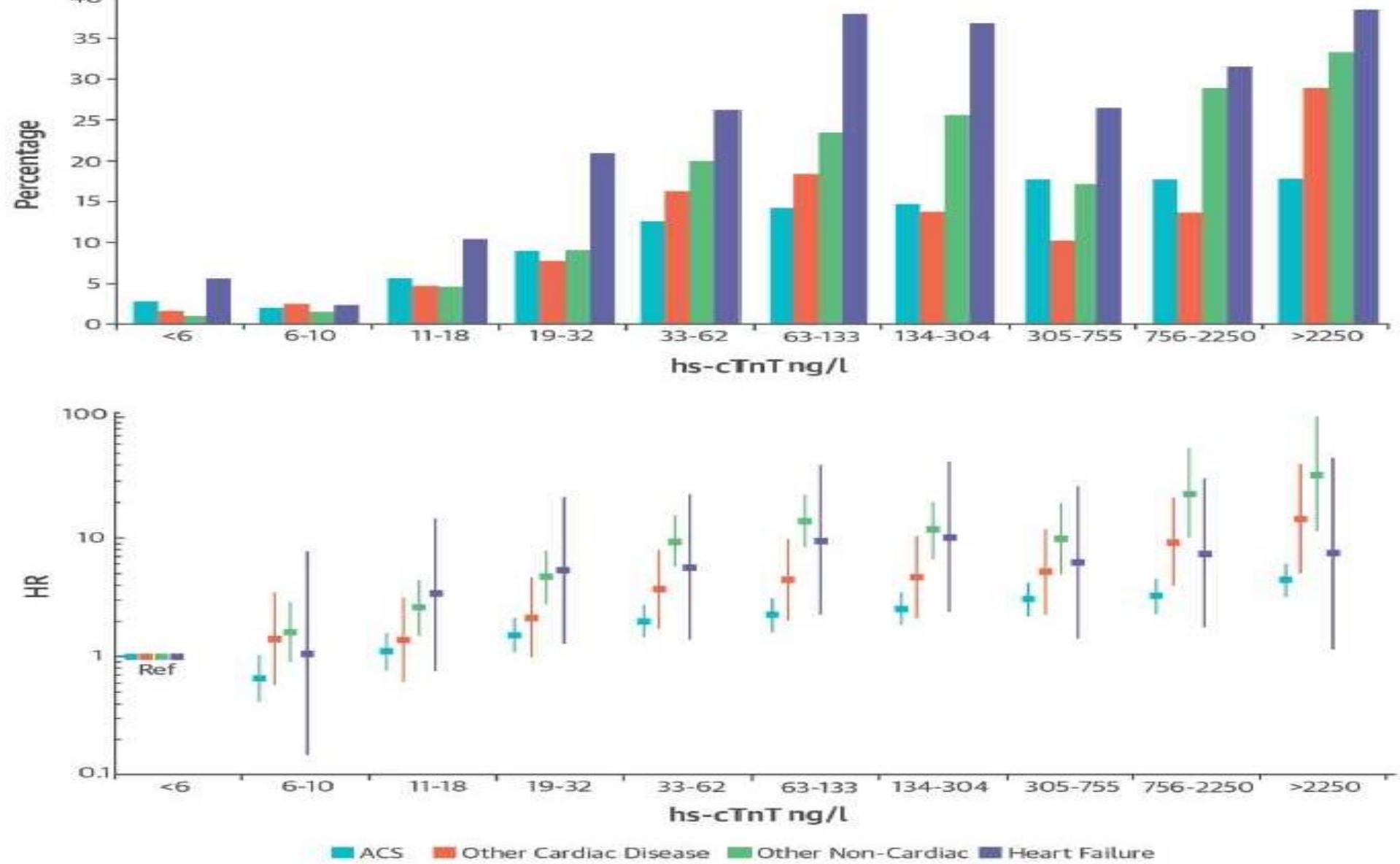


Melki, D. et al. J Am Coll Cardiol. 2015; 65(16):1655-64.

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# Association Between Postoperative Troponin Levels and 30-Day Mortality Among Patients Undergoing Noncardiac Surgery

VISION

## Peak postoperative hsTnT thresholds associated with 30-day mortality

| hsTnT thresholds | # of patients (%) | # of deaths (%) | aHR (95% CI) | p-value |
|---|---|---|---|---|
| <5 ng/L | 5318 (24.4) | 6 (0.1) | 1.00 | - |
| 5 to <14 ng/L | 8750 (40.1) | 40 (0.5) | 3.73 (1.58-8.82) | 0.003 |
| 14 to <20 ng/L | 2530 (11.6) | 29 (1.1) | 9.11 (3.76-22.09) | <0.001 |
| 20 to <65 ng/L | 4049 (18.6) | 123 (3.0) | 23.63 (10.32-54.09) | <0.001 |
| 65 to <1000 ng/L | 1118 (5.1) | 102 (9.1) | 70.34 (30.60-161.71) | <0.001 |
| ≥1000 ng/L | 54 (0.2) | 16 (29.6) | 227.01 (87.35-589.92) | <0.001 |

- No interaction b/w postop hsTnT threshold ≥20 ng/L and eGFR or sex (interaction p=0.83 and 0.20)

Devereaux PJ JAMA Juin 2012

# Étude rétrospective au CHUS grâce au dossier informatisé ARIANE et banque de données CIRESSS sur la conduite clinique à l'urgence suite à l'introduction de la Troponine T-hs

- Troponines T-hs introduits en 2011
- 2009-2010: **30,482 visites** à l'urgence avec prélèvements de Troponines T 4e génération
- 2012-2013: **33,917 visites** à l'urgence avec prélèvements de Troponines T-hs

- 83,9% des **positifs** sont hospitalisés (p= NS);

  29.5% ont SCA (p=NS)
- **Négatifs**: proportion moindre sont hospitalisés avec T-hs (24.3% vs. 37.7%, P<0.0001)
- 31% « **zone grise** » avec T-hs. Patients plus vieux et probabilité d'hospitalisation plus élevée vs négatifs: 56.8% vs. 24.3%, P<0.0001

  **mais** pas plus de SCA: 4.9% vs. 4.3%, P=0.14



**T 4eG: négatif<0.03µg/L; positif≥0.03µg/L**

**T-hs: négatif≤14ng/L; « zone grise » 15-49ng/L; positif≥50ng/L**

# Causes d'élévation des Troponines suite à un dommage Myocardique

**Injury related to primary myocardial ischemia**

- Plaque rupture
- Intraluminal coronary artery thrombus formation

**Injury related to supply/demand imbalance of myocardial ischemia**

- Tachy-/bradyarrhythmias
- Aortic dissection or severe aortic valve disease
- Hypertrophic cardiomyopathy
- Cardiogenic, hypovolemic, or septic shock
- Severe respiratory failure
- Severe anemia
- Hypertension with or without LVH
- Coronary spasm
- Coronary embolism or vasculitis
- Coronary endothelial dysfunction without significant CAD

**Injury not related to myocardial ischemia**

- Cardiac contusion, surgery, ablation, pacing, or defibrillator shocks
- Rhabdomyolysis with cardiac involvement
- Myocarditis
- Cardiotoxic agents (eg, anthracyclines, trastuzumab)

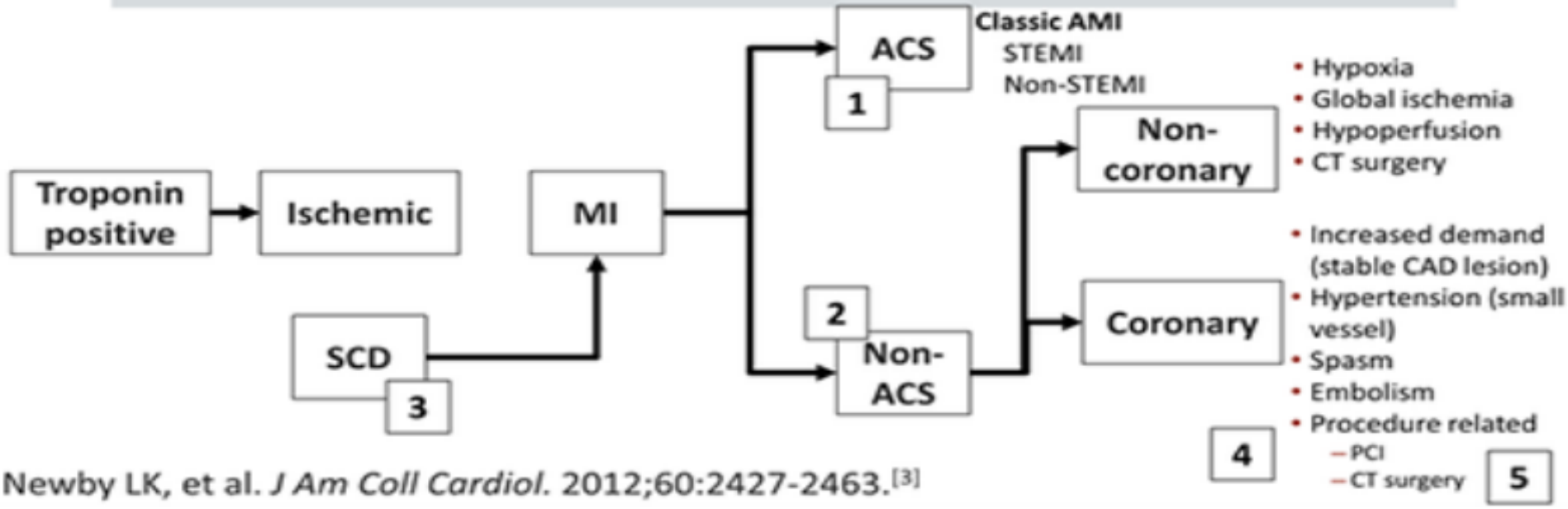
**Multifactorial or indeterminate myocardial injury**

- Heart failure
- Stress (Takotsubo) cardiomyopathy
- Severe pulmonary embolism or pulmonary hypertension
- Sepsis and critically ill patients
- Renal failure
- Severe acute neurological diseases (eg, stroke, subarachnoid hemorrhage)
- Infiltrative diseases (eg, amyloidosis, sarcoidosis)
- Strenuous exercise

Thygesen K, et al. *Eur Heart J.* 2012;33:2551-2567.[11]

# Troisième définition Universelle de l'Infarctus du Myocarde

| Type | Description |
|---|---|
| 1 | Ischemic myocardial necrosis secondary to plaque rupture (ACS) |
| 2 | Ischemic myocardial necrosis not due to ACS (eg, supply/demand mismatch, coronary spasm, embolism, ↑ or ↓BP, anemia, arrhythmia) |
| 3 | Sudden cardiac death |
| 4 | Procedure-related<br>• Secondary to PCI<br>• From stent thrombosis |
| 5 | CABG-related |




Newby LK, et al. *J Am Coll Cardiol*. 2012;60:2427-2463.[3]

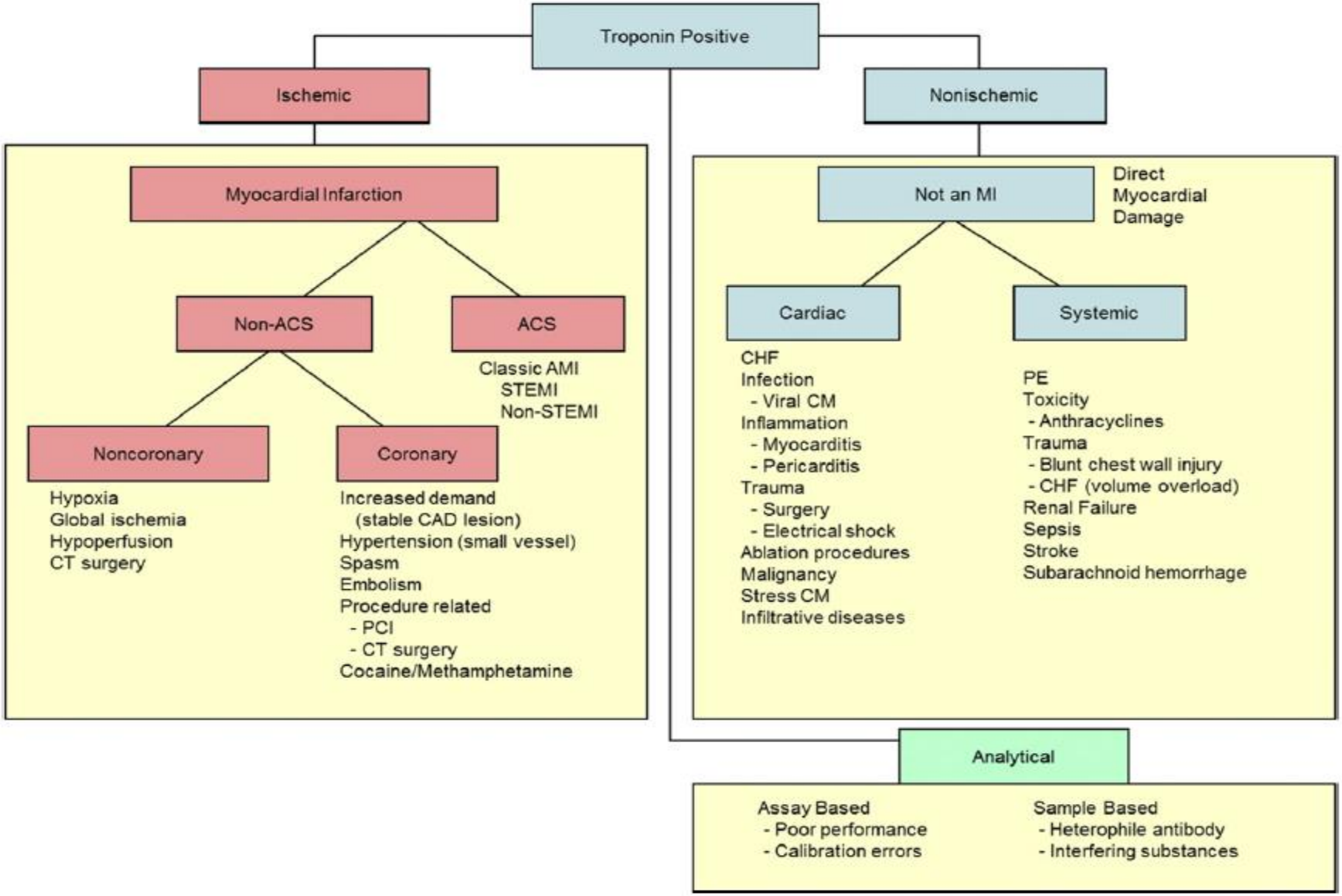



**Figure 1. Conceptual Model for Clinical Distribution of Elevated Troponin**

# Concept Global

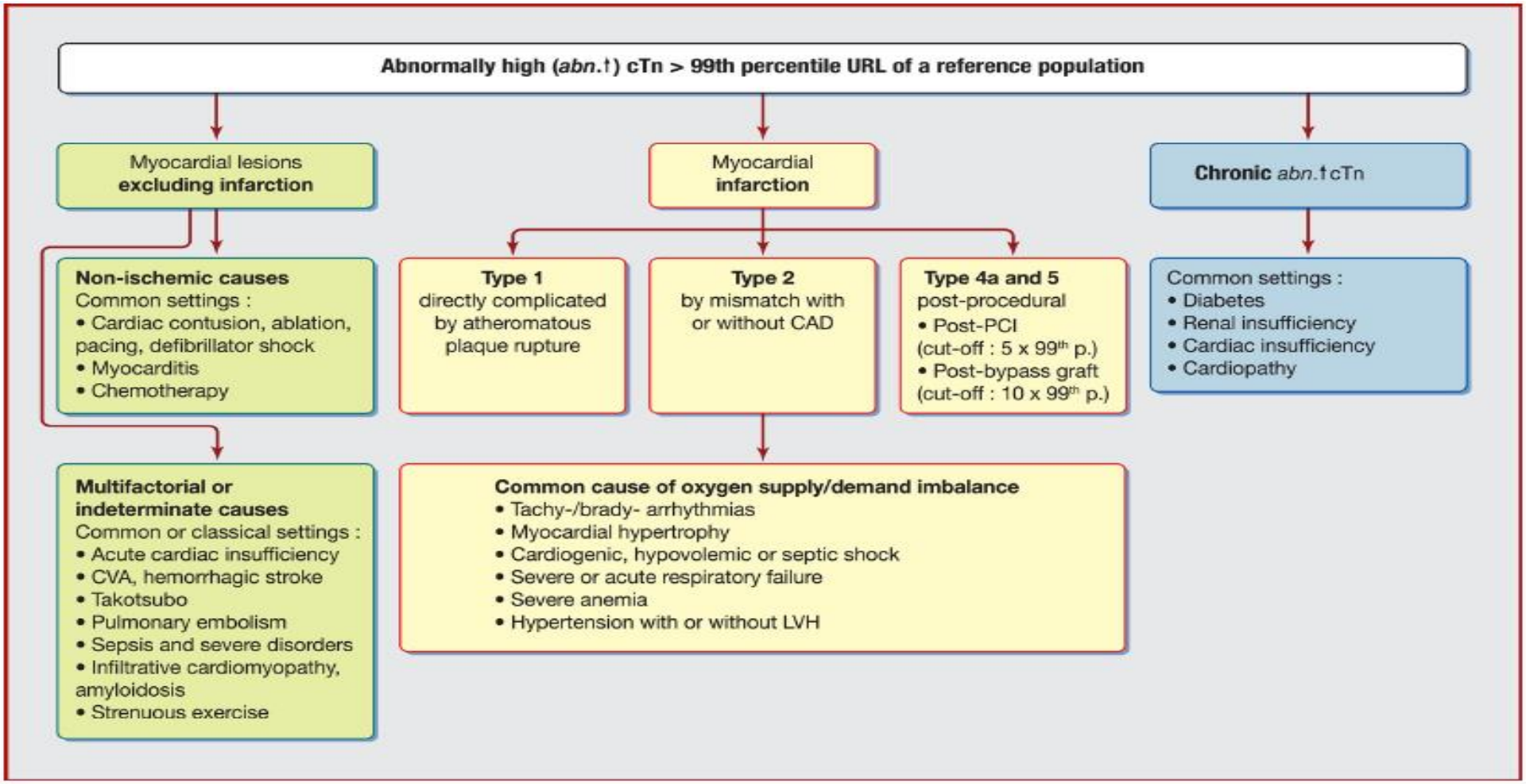



**Figure 4.** Classification of abnormally high cardiac troponin (cTn) concentrations. CAD: coronary artery disease; CVA: cerebrovascular accident; LVH: left ventricular hypertrophy; p.: percentile; PCI: percutaneous coronary intervention; URL: upper reference limit.

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# Probabilité de SCA pré  post/test - Troponines

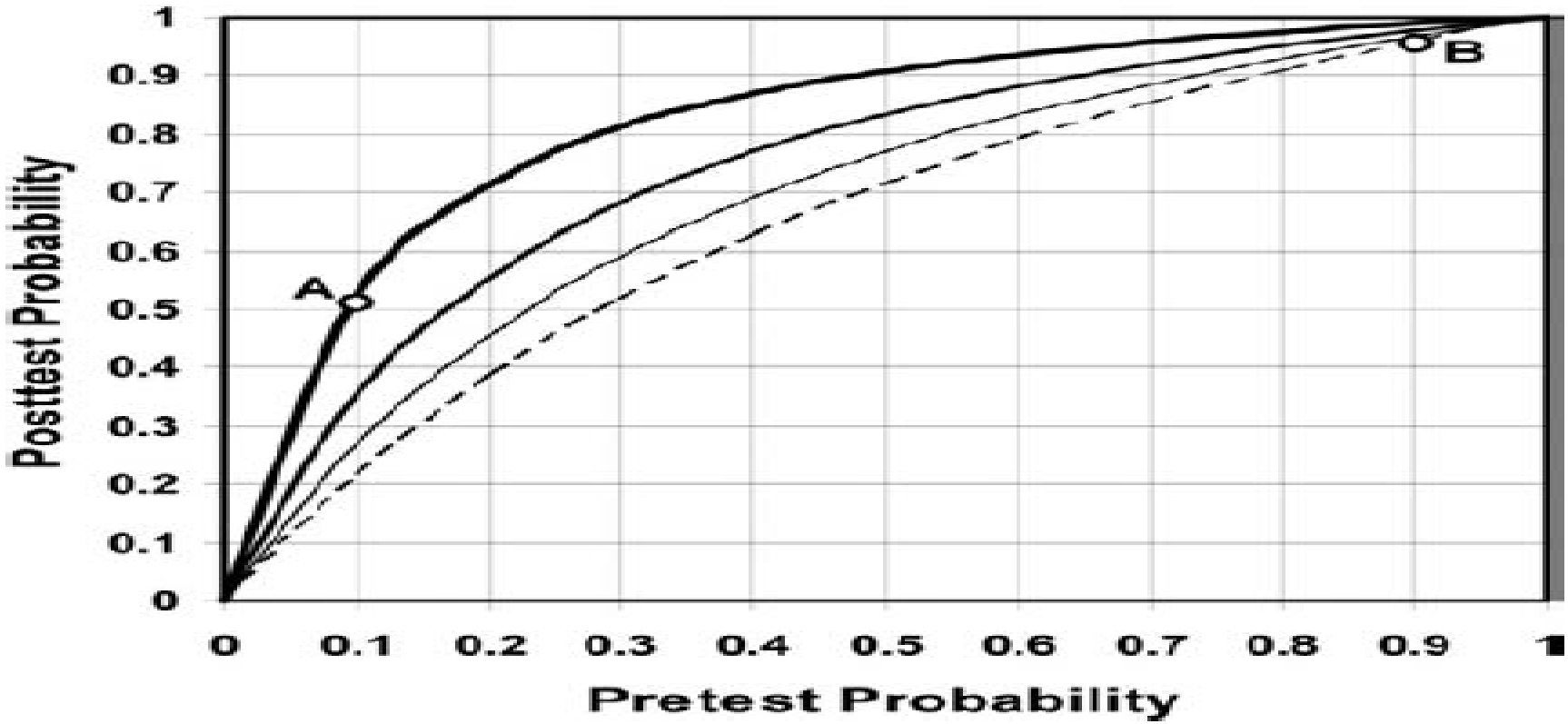



**Figure 3. Relation Between Pre-Test And Post-Test Probability According to Bayes' Theorem for Troponin Test With 100% Sensitivity**

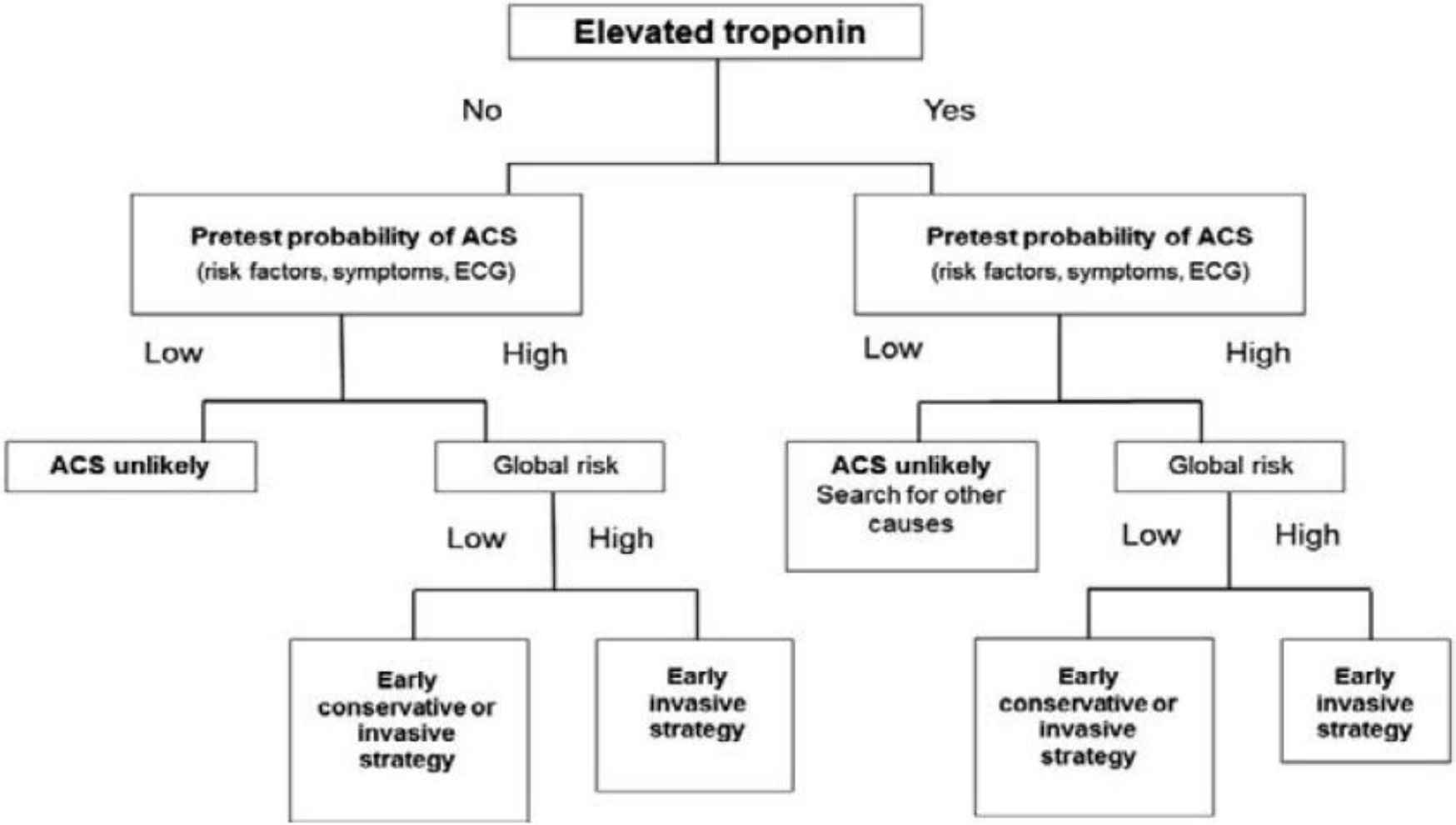
The curves are shown for a specificity of 60% (lowermost) to 90% (uppermost). See text for further discussion. Modified with permission from Diamond and Kaul (19).

# Probabilité pré-test – évaluation sommaire

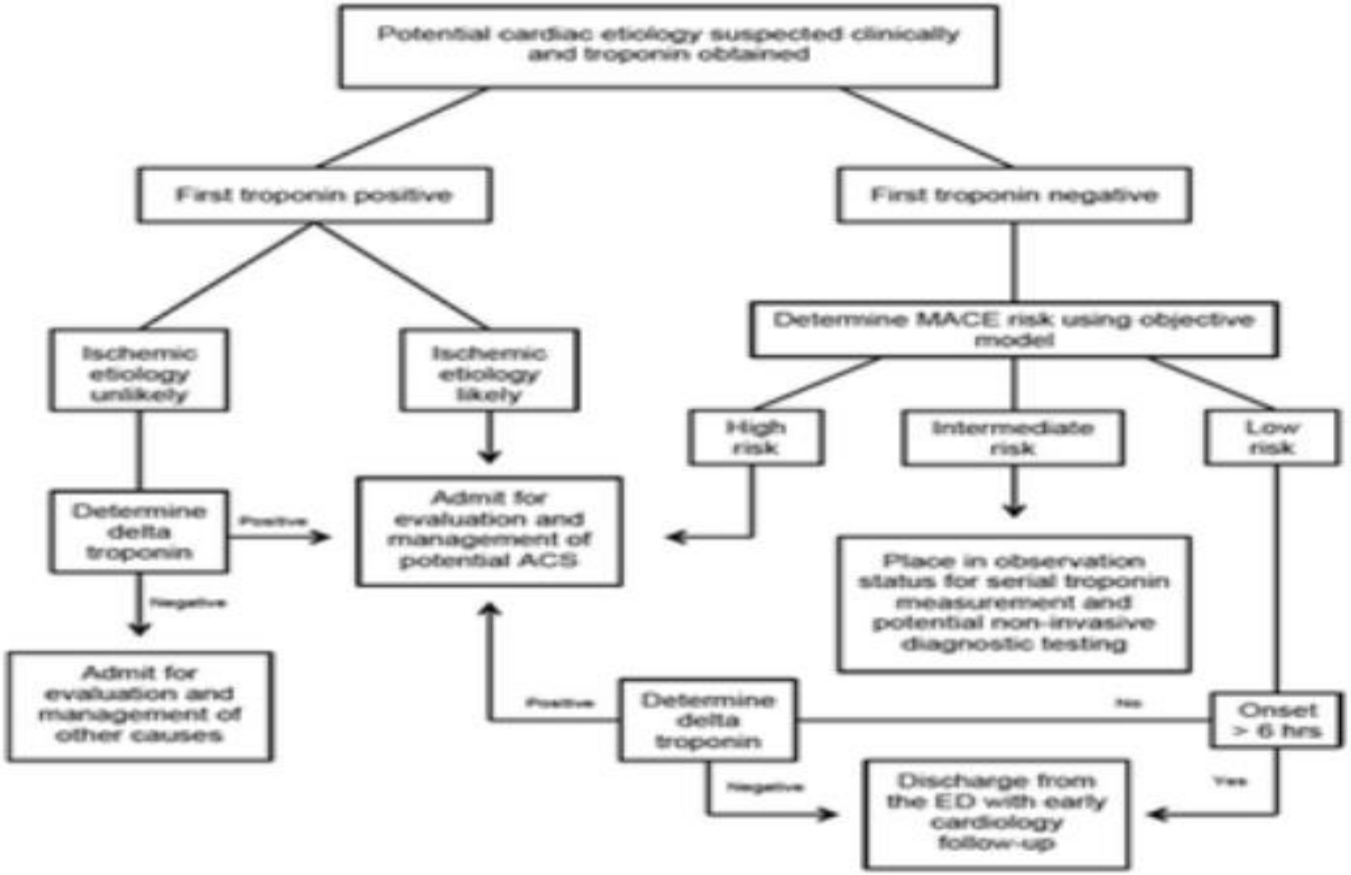
Table 1. Semiquantitative Summary of Positive and Negative Predictive Accuracies of Troponin Testing in Various Scenarios

| Typical Anginal Symptoms | Ischemic ECG or Echocardiogram Findings | History of Risk Factors for Coronary Artery Disease | Pre-Test Likelihood of Acute Myocardial Ischemia | Cardiac Troponin | Predictive Value for Acute Myocardial Infarction | Diagnostic Evaluation for Nonthrombotic Etiology | Prognostic Information |
|---|---|---|---|---|---|---|---|
| Yes | Yes | Yes | High (>80%) | Positive | High PPV | No | Yes |
| | | | | Negative | High NPV | No | Yes |
| No | No | No | Low (<10%) | Positive | Low PPV | Yes | Yes |
| | | | | Negative | High NPV | No | Yes |

# Algorithme d'approche globale



# Algorithm -- Admit or Discharge




Note: Each institution adopting hs-cTn will develop its own algorithm of care.
From Levy PD. Republished with permission.
Levy PD. *Coagulation Catastrophes: Taking Care of the Most Difficult Cases in Emergency Medicine*. 2015:1-7.

# CONCLUSION

- Très sensible, détecte des nécrose inférieures à 1 g de tissus ainsi que les « stress » hémodynamiques et /ou métaboliques
- Spécifique au Myocyte, signale un dommage, « leak » ou « turn-over » augmenté.
- Ne donne pas l'étiologie de l'insulte: Interpréter selon la probabilité de SCA (Clinique et ECG)
- Dans le SCA, améliore la Valeur Prédictive Négative et la Sensibilité **mais pas la Spécificité**

# Conclusion (suite)

- Jusqu'à 20% des consultations à l'urgence ont des Troponines-hs anormales ( > 99$^{e}$ percentile) mais la majorité (50-80%) n'ont pas de SCA
- Le Dx d'Infarctus implique une étiologie ischémique à la nécrose
- La définition Universelle de l'Infarctus de 2012 clarifie les types d'infarctus selon l'étiologie et inclut le rôle central des troponines, incluant les Hautes sensibilité
- La nécrose cellulaire, l'ischémie et le stress hémodynamique au sens large du terme (aigu et chronique) peuvent induire une élévation des Troponines, qui **peu importe la cause, est pronostique**
- **Des prélèvement sériés sont nécessaires pour établir la cinétique**

# Question: Lequel de ces patients avec Troponines T-hs à 250 ng/ml a un infarctus de Type 2

- A) F 83 ans avec DRS, pneumonie et FA rapide
- B) H 35 ans avec Myocardite prouvé à l'IRM
- C) F 52 ans avec ablation des veines pulmonaire pour FA il y a 24 hrs
- D) H 45 ans avec contusion myocardique suite à un accident d'auto
- E) F 50 ans avec ChimioRx par Anthracyclines depuis deux mois et Sx d'insuffisance cardiaque



Thygesen et al ESC/ACCF/AHA/WHF Third Universal Definition of MI
*Circulation* October 16, 2012