CRIB Cardiovascular Research Institute Basel

University Hospital Basel

Early diagnosis of acute MI: novel strategies

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Disclosures

- **Swiss National Science Foundation**
- Schweizerische Herzstiftung
  Fondation Suisse de Cardiologie
  Fondazione Svizzera di Cardiologia
- University Hospital Basel

UNI BASEL

- Abbott
- Alere
- Beckman Coulter
- BG Medicine
- Bühlmann
- B·R·A·H·M·S
- Critical Diagnostics
- Roche
- Schiller — The Art of Diagnostics
- Siemens
- Novartis
- CardioRentis
- Basens biognostic

Early diagnosis of AMI: novel strategies

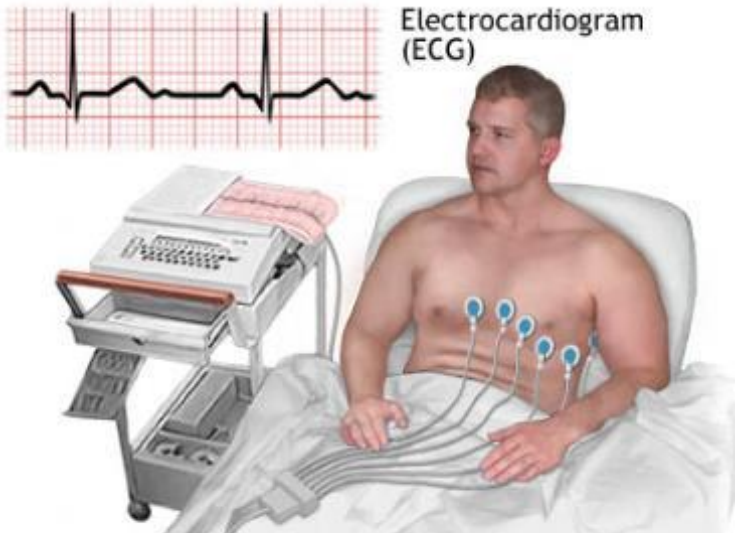
- **Background & Case**
- **Novel strategies**
- **Medical value for Patients**

  Physicians

  Health Care System

Early diagnosis of AMI is critical

- But still an **unmet need** in many patients
- Delayed “rule-in” ➔ morbidity + mortality ⇧
- Delayed “rule-out” ➔ time in ED + costs ⇧
  patient anxiety ⇧
- 3 key tools: History incl. chest pain characteristics
  ECG
  cTn



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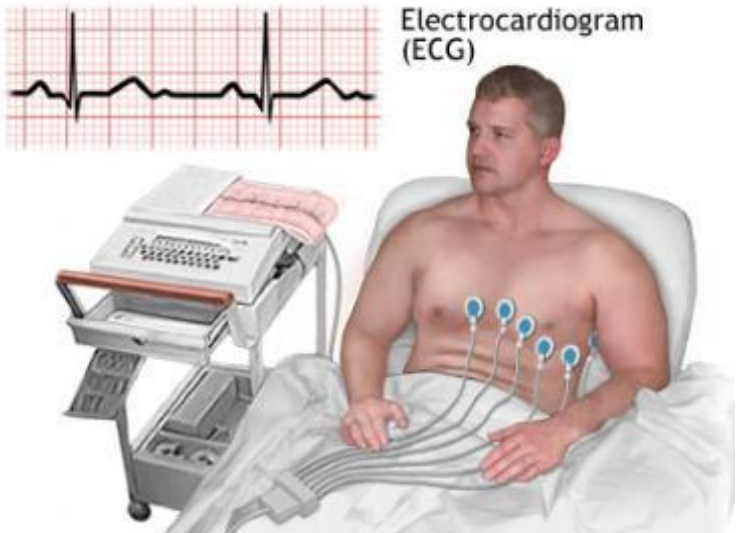


Case Mr. 45y

Presentation: In the morning (>6h ago) dyspnea+ chest pain, 30min, no radiation, no sweating

Never angina during exercise

Asymptomatic at presentation to ED

History: stopped antiyhpertensive therapy years ago, no other medical history

cvRF: hypertension, former smoking (20 py)

Vitals: BP 190/95mmHg, Puls 80/min, Oxy 98%

Geb:	16.08.1962
Alter:	45 Jahre
Geschl:	M
Grösse:	-.- cm
Gewicht:	-.- kg
BD:	- / - mmHg

Med:
Bem:

HF 82 /min

Achsen

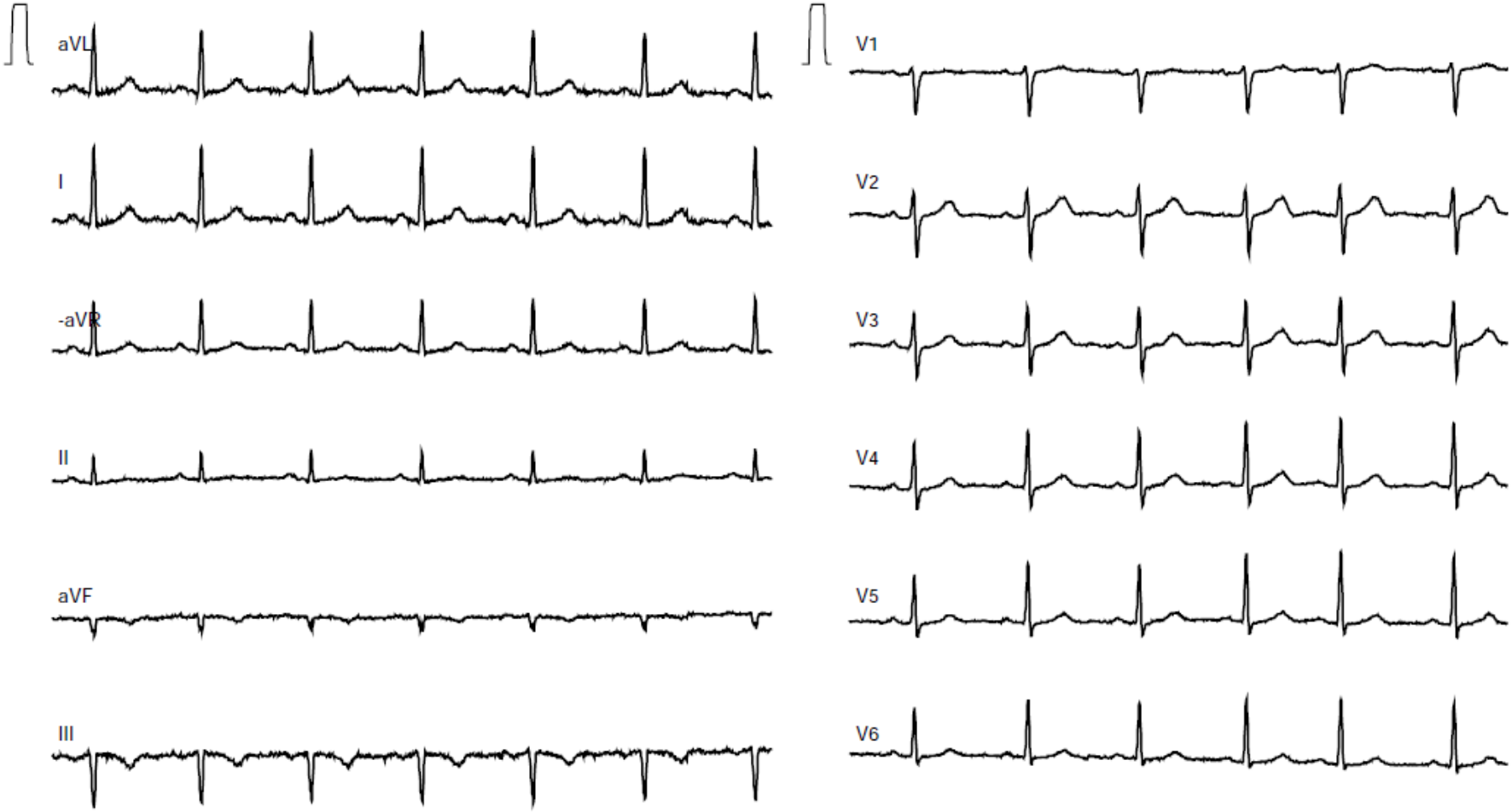
P	17 °
QRS	-12 °
T	-16 °

Intervalle

RR	730 ms
P	106 ms
PQ	156 ms
QRS	78 ms
QT	356 ms
QTc	416 ms

Interpretation

Validiert von



25 mm/s 10.0 mm/mV 0.05-35 Hz

28.04.2008 14:19:03

- Lab results:

	0 h		6 h
TnT4 [<0.01ug/L)	<0.01		<0.01
CK	136 U/L		107 U/L
CK-MB	4.4		4.2

Completely asymptomatic during 7h in the ED

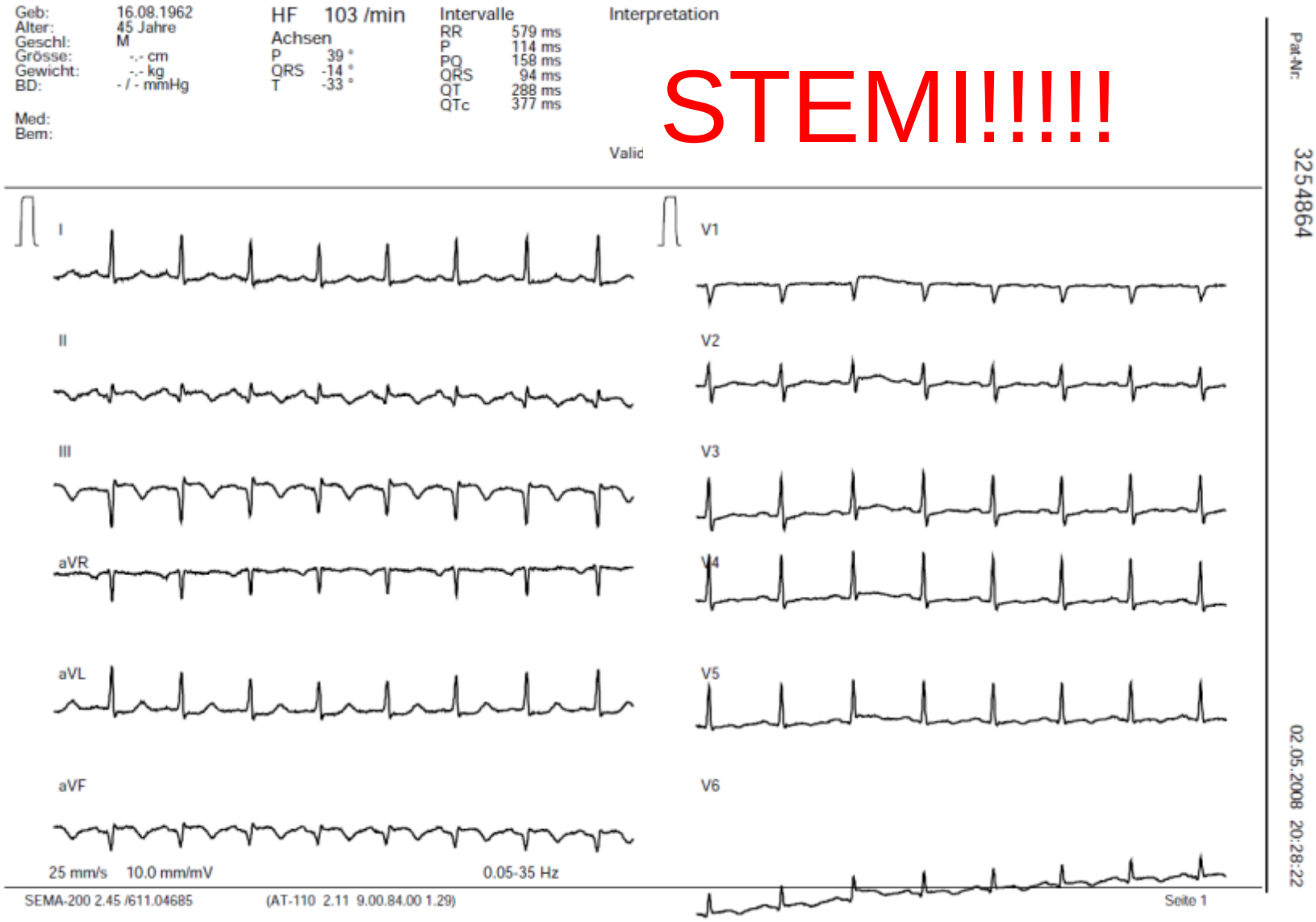
Normal 2nd ECG

D-dimers negative

Chest x-ray normal

Same Patient presenting 4 (!) days later

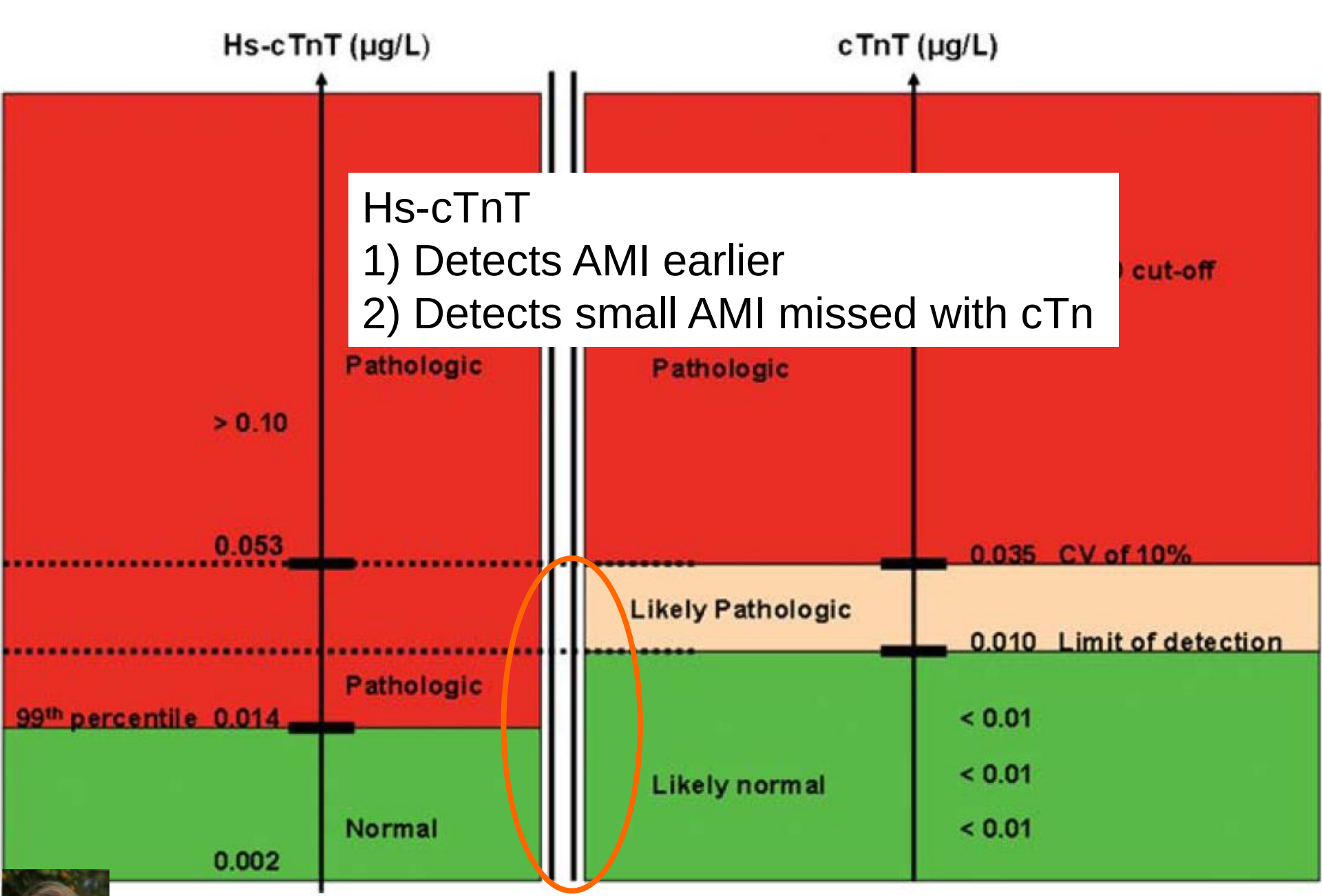
Acute chest pain radiating in his left arm and back



How about hs-cTn at initial presentation 4 days ago??

		Study blood examination			
	0 h	1 h	2 h	3 h	6 h
TnT4 [<0.01 ug/L)	<0.01	<0.01	<0.01	<0.01	<0.01
CK	136 U/L			120 U/L	107 U/L
CK-MB	4.4			4.4	4.2
s-cTnI [Ref. 0.040 ug/L]	0.016 ug/L	0.039 ug/L	0.088 ug/L	0.102 ug/L	
hs-cTnI [Ref. 9 ng/L]	18 ng/L	45 ng/L	67 ng/L	100 ng/L	
hs-cTnT [Ref. 14 ng/L]	11 ng/L	22 ng/L	31 ng/L	32 ng/L	

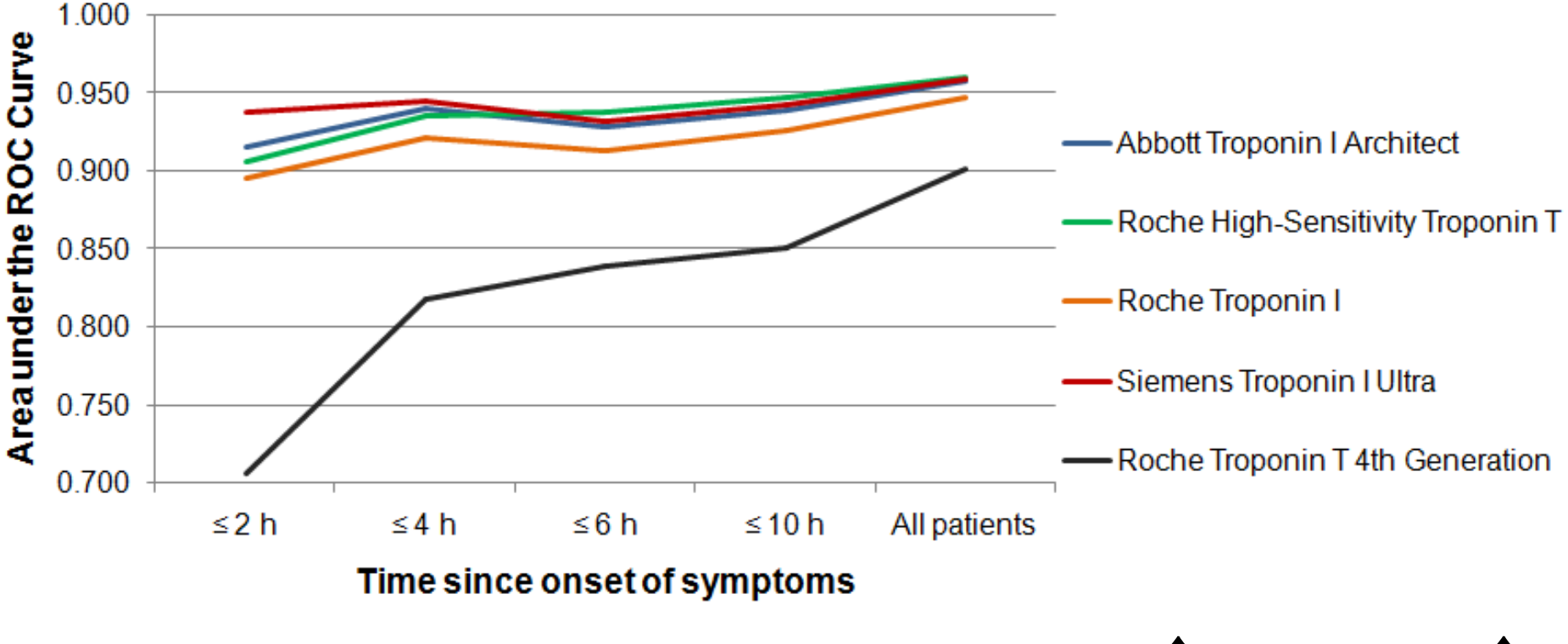
(H)s-cTn improve the early rule-**in** of AMI



Twerenbold R, Jaffe A, et al. Eur Heart J 2012

Hs-cTn improve the early diagnosis of AMI

at presentation



Hs-Tn + ECG + History → Rule out ↑ + Rule in ↑

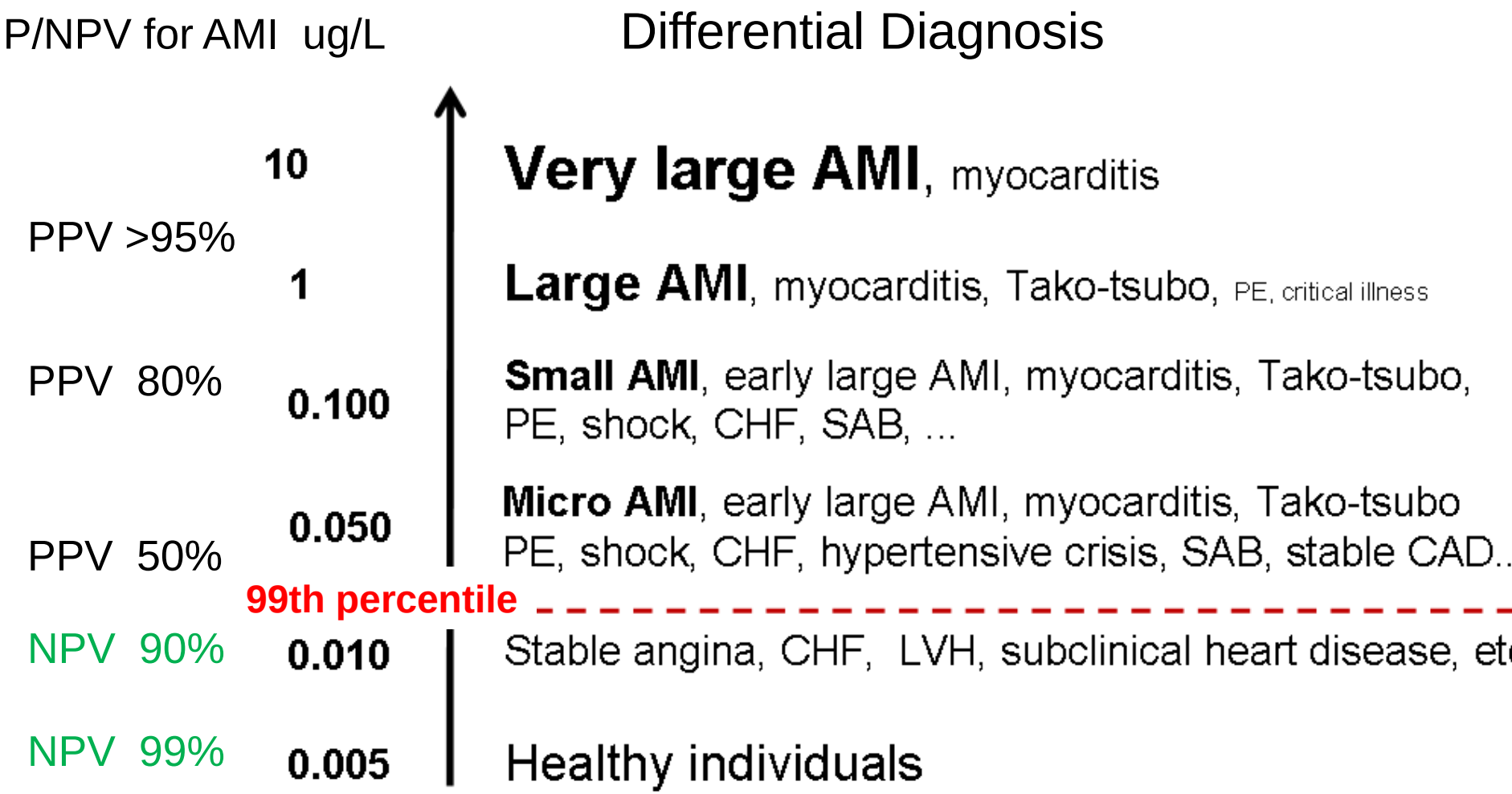
Reichlin T et al. N Engl J Med 2009;361:858-67

1) Hs-cTn ≠ Pregnancy Test

~~„Troponin-positive~~“

2) $cTn_A \neq cTn_B$

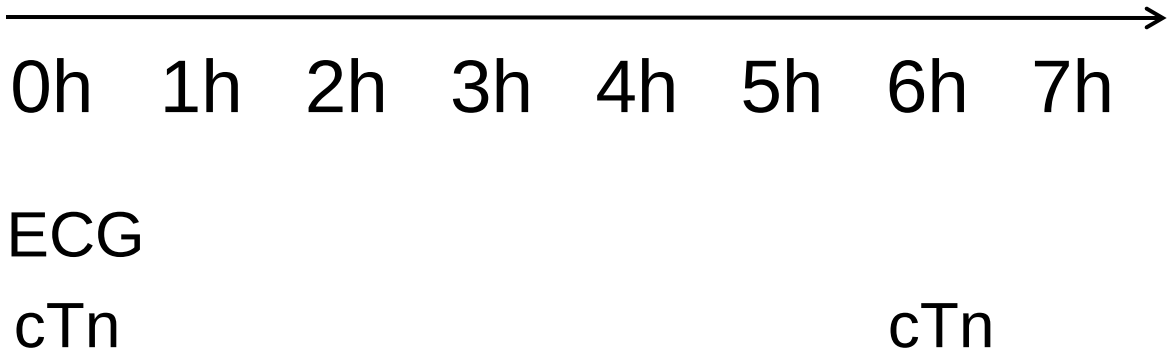
Hs-cTn: Quantitative marker of cardiomyocyte injury



Mueller C. Eur Heart J 2014

1.Rule-in

2.Rule-out



ESC 2011: **hs-cTn** **hs-cTn**

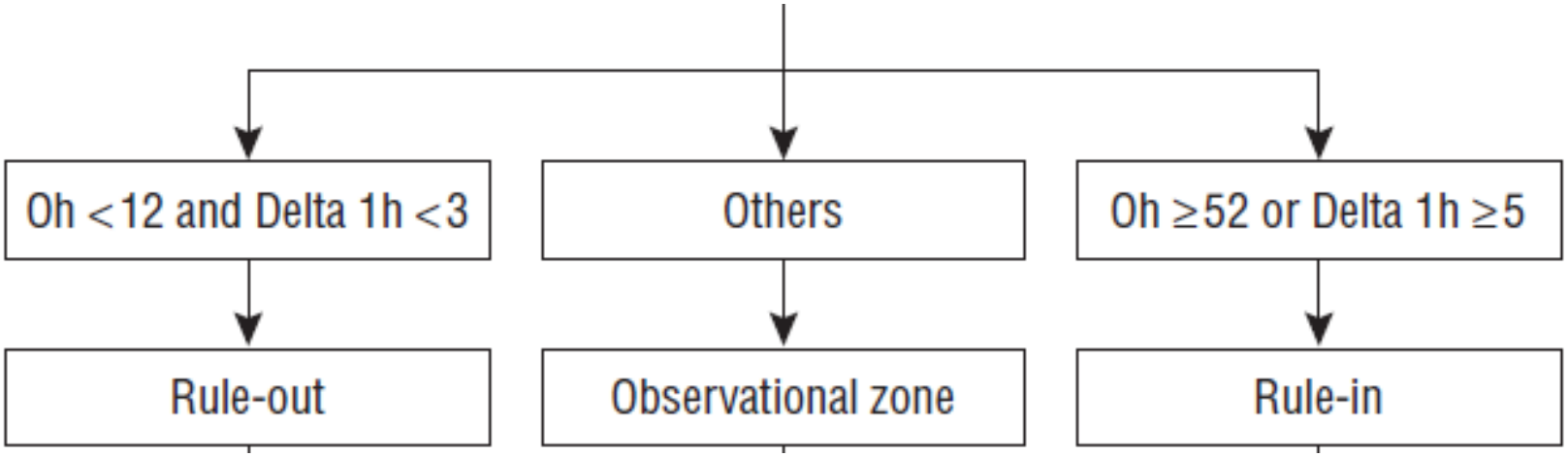
1h-Algo: **hs-cTn**
hs-cTn

Diagnostics ≠ Therapeutics

Education:	**+**	**+++**
Best method:	**Diagnostic** (blinded) **RCT** (open)	**RCT** (blinded)

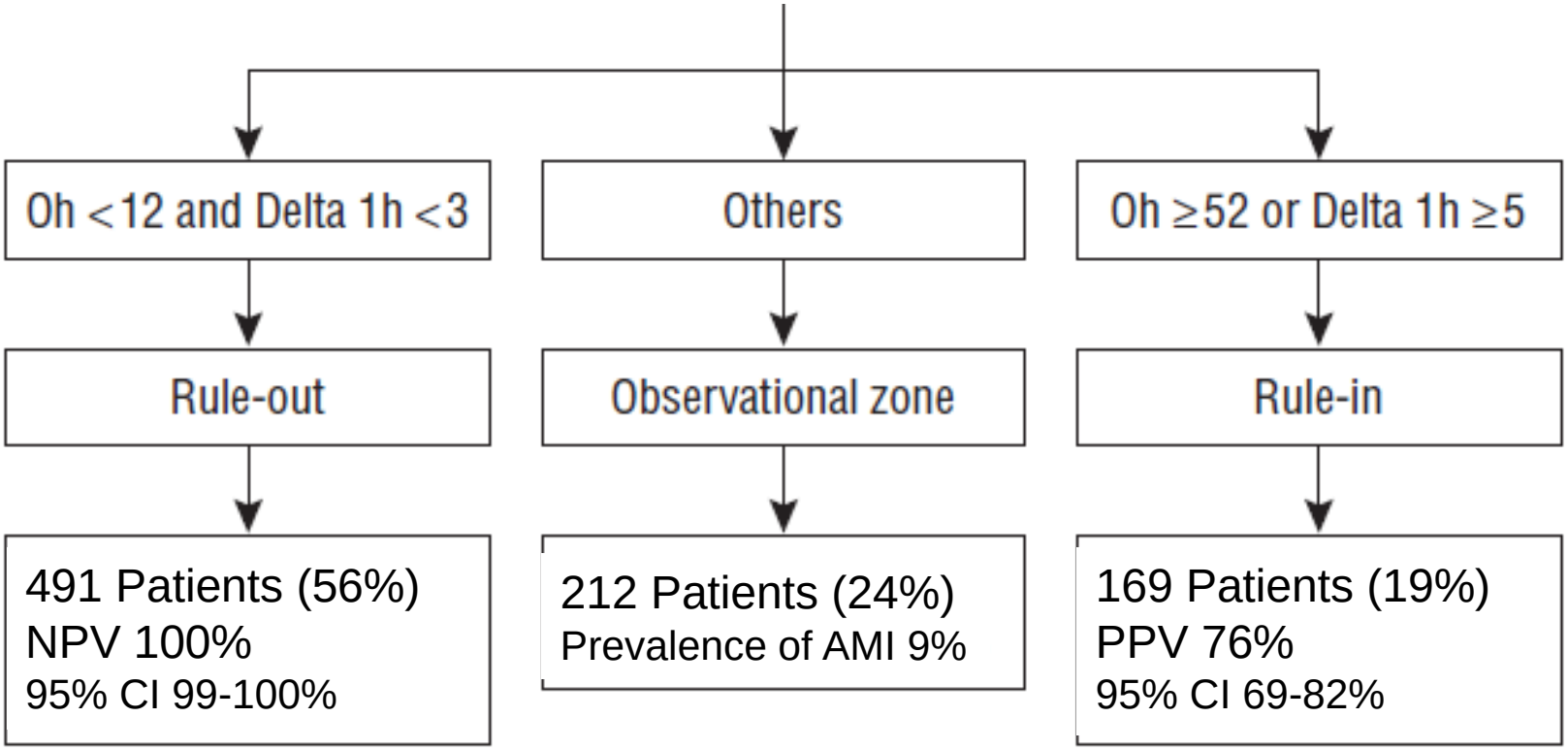
	LOD	+ copeptin	1h-algorithm	2h-algorithm	2h ADP	3h ESC
NPV for AMI	98-100%	98-99%	99.1-100%	99.5-99.9%	99.1-100%*	99.6-100%
Effectiveness	+	++	+++	+++	++	++
Details: If using hs-cTnT	Hs-cTnT<5	Hs-cTnT<14 & Copeptin<10 pmol/L	Hs-cTnT<12 & 1h delta<3	Hs-cTnT<14 at 0h and 2h & 2h delta<4	Hs-cTnT<14 & ECG o.k. at 0h and 2h & TIMI≤1	Hs-cTnT<14 0h+3 & GRACE<140 & pain-free
If using hs-cTnI	Hs-cTnI<2	Hs-cTnI<26 & Copeptin<10 pmol/L	Hs-cTnI<5 & 1h delta<2		Hs-cTnI<26 & ECG o.k. at 0h and 2h & TIMI≤1	Hs-cTnI<26 0h+3 & GRACE<140 & pain-free
Feasibility	+++	+	+++	+++	++	++
Also for Rule-in	-	-	+	+	-	+/-

hs-cTnT 1h-algorithm



Reichlin T, et al. Arch Intern Med 2012

hs-cTnT 1h-algorithm



However:

1) Would represent a major change in clinical practice

2) Experts ambivalent

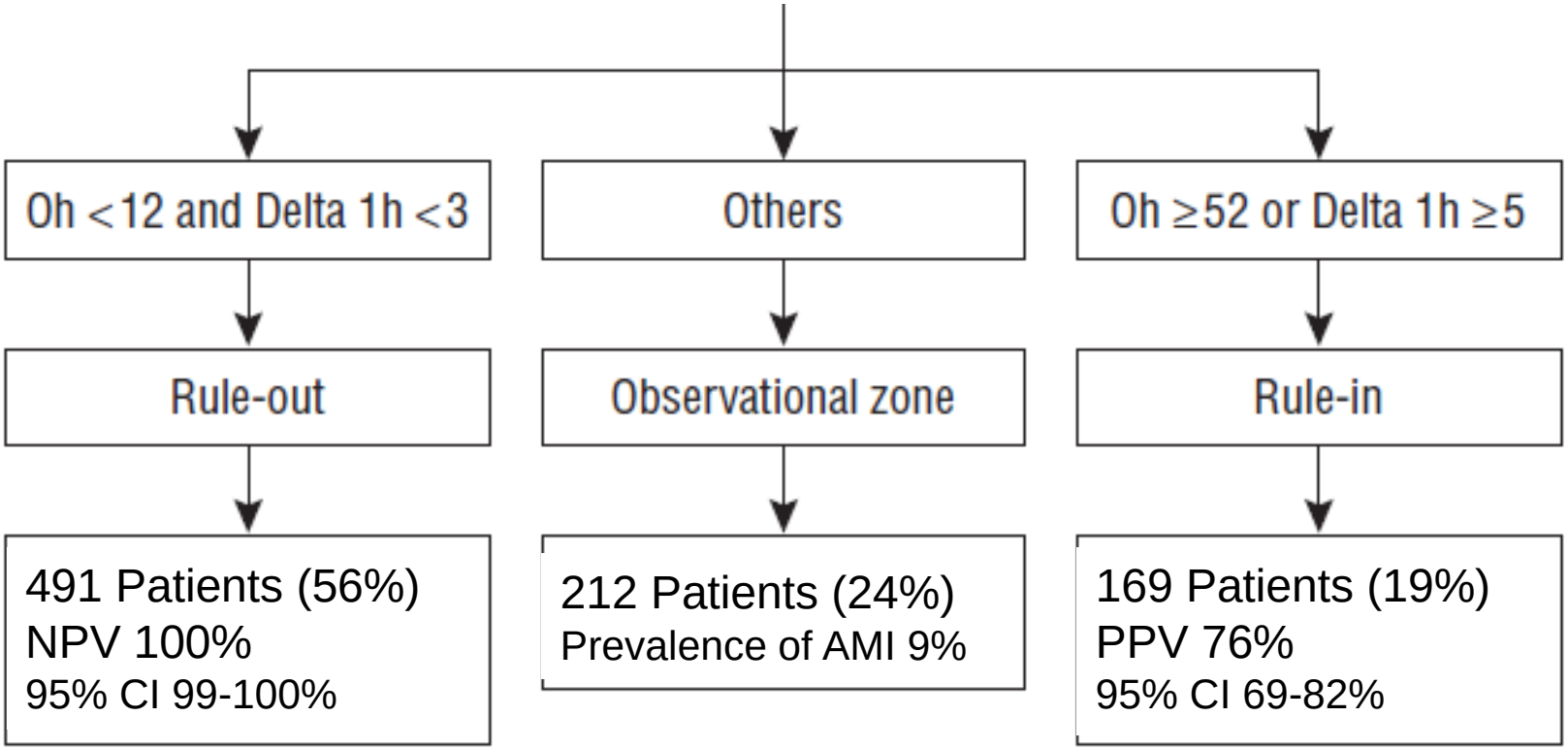
3) NOT used clinically until now

Reichlin T, et al. Arch Intern Med 2012

TRAPID-AMI: Methods

12 sites on 3 continents

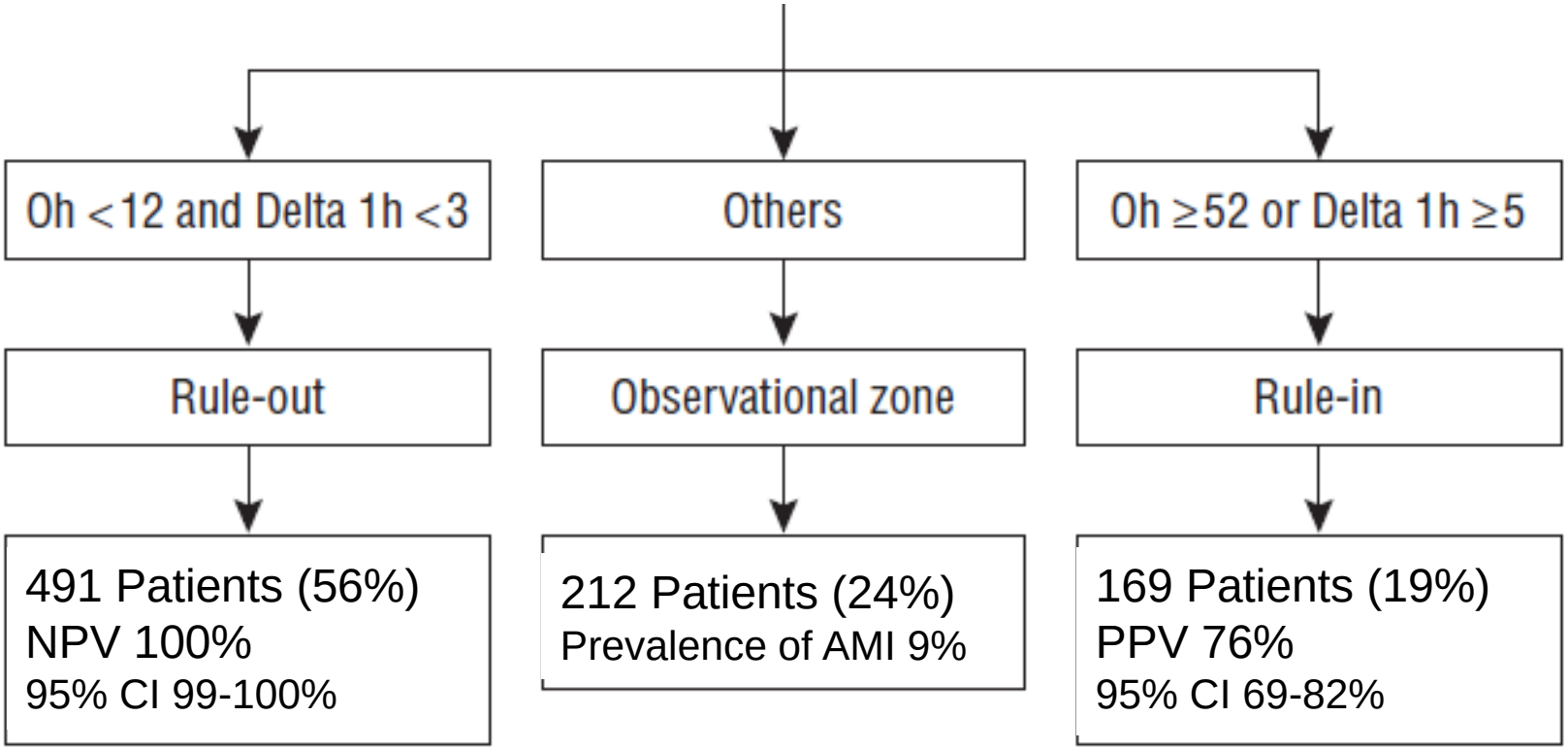
hs-cTnT 1h-algorithm



NPV 99.1%, (63%) TRAPID-AMI n=1282 PPV 77% (14%)

Mueller C et al. Eur Heart J 2015 in revision

hs-cTnT 1h-algorithm



NPV 99.1% (63%) **TRAPID-AMI n=1282** **PPV 77% (14%)**

NPV 99.9% (60%) **APACE-Val n=1320** **PPV 78% (16%)**

Mueller C et al. Eur Heart J 2015 in revision; Reichlin T, et al. CMAJ 2015 in review

Medical value for patients

0h 1h 2h 3h 4h 5h 6h 7h

ECG

cTn cTn

ESC 2011: **hs-cTn** **hs-cTn**

1h-Algo: **hs-cTn**

hs-cTn

Medical value for physicians

0h 1h 2h 3h 4h 5h 6h 7h

ECG

cTn cTn

ESC 2011: **hs-cTn** **hs-cTn**

1h-Algo: **hs-cTn**

hs-cTn

Medical value for health care system

0h 1h 2h 3h 4h 5h 6h 7h

ECG

cTn cTn

ESC 2011: **hs-cTn** **hs-cTn**

1h-Algo: **hs-cTn**

hs-cTn

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