



# **ROLE OF C-REACTIVE PROTEIN IN PATIENTS WITH SUSPECTED PULMONARY EMBOLISM AND A POSITIVE D-DIMER TEST**

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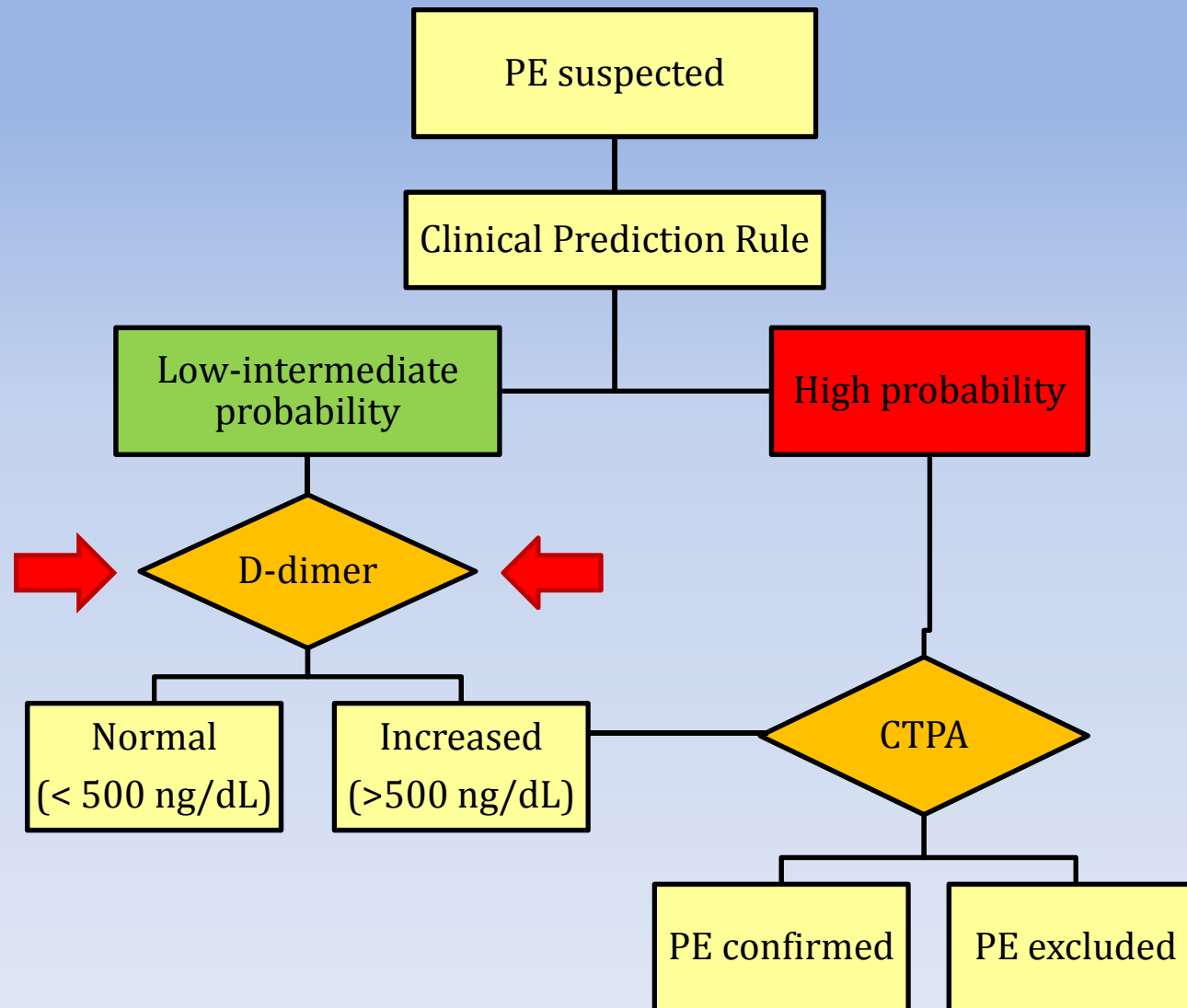
*Milan, Italy*

# PULMONARY EMBOLISM

Diagnosis challenging for the ED physician  
- *variable and often subtle presentation.*

D-dimer: first test in patients with low or  
intermediate pre-test probability of PE  
(*International ESC Guidelines 2008*)

# PULMONARY EMBOLISM – diagnostic algorithm



# D-dimer: open problems

Low Specificity (Sp 50%\*)

\* With ELISA and quantitative latex methods



High number of false positives



High number of negative CT scans

# C-Reactive Protein

Cheap!

Synthesis increased during thromboembolic event

*(Roumen-Klappe et al. Journal Vasc Surg 2002;35:701-706)*

Previous studies reported low yield in the diagnosis of PE in  
alternative to D-dimer

*(Steeghs et al, BJH 2005;130:614-619)*

# AIM of THE STUDY

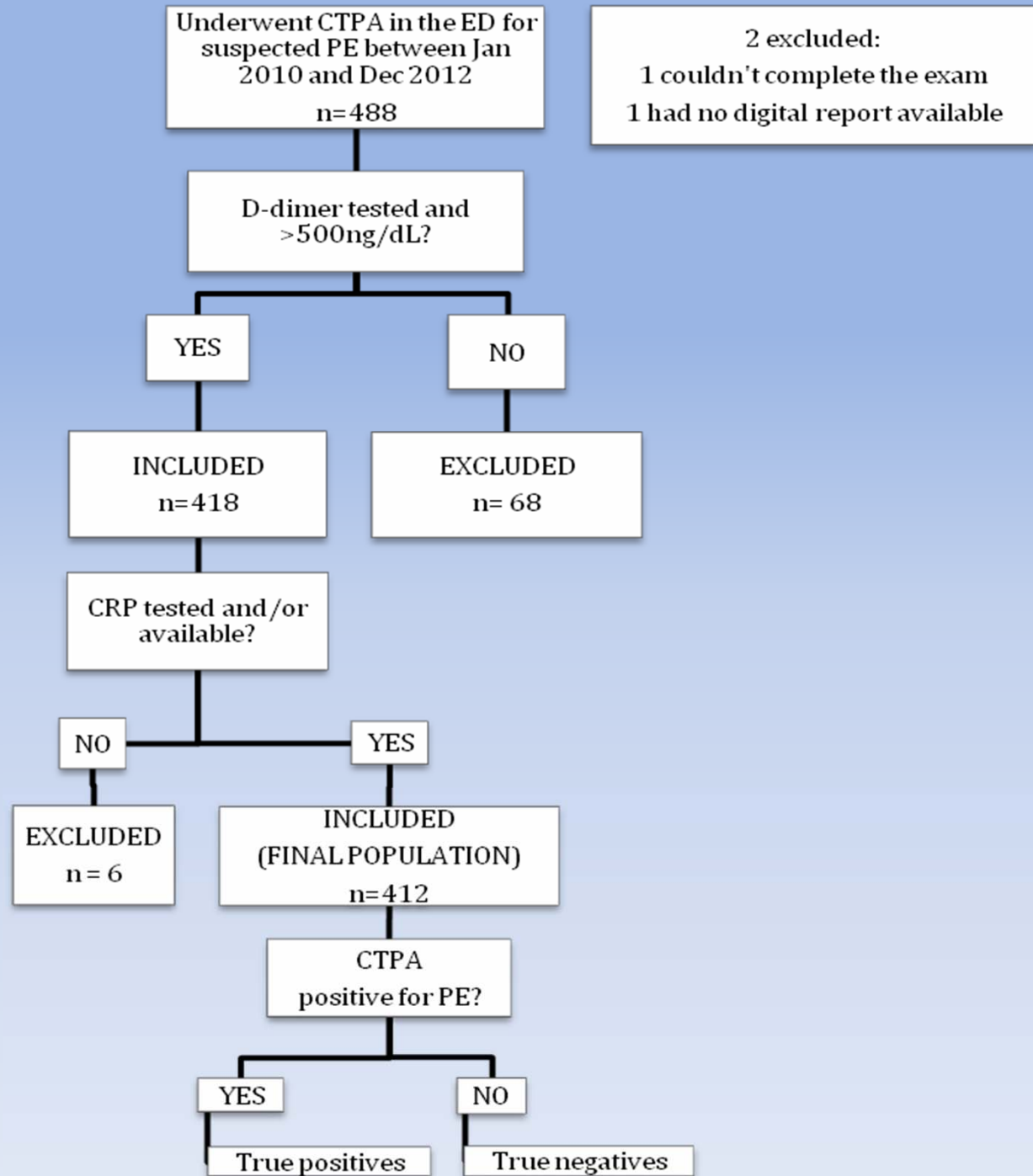
Evaluate the diagnostic accuracy of CRP in a population of patients with suspected PE  
and an elevated D-dimer

*Can we further screen the patients who will eventually undergo a CT scan in order to rule out a PE?*

# STUDY DESIGN

## Retrospective cross sectional study

Emergency Department  
- Luigi Sacco Hospital  
Jan 2010 - Dec 2012



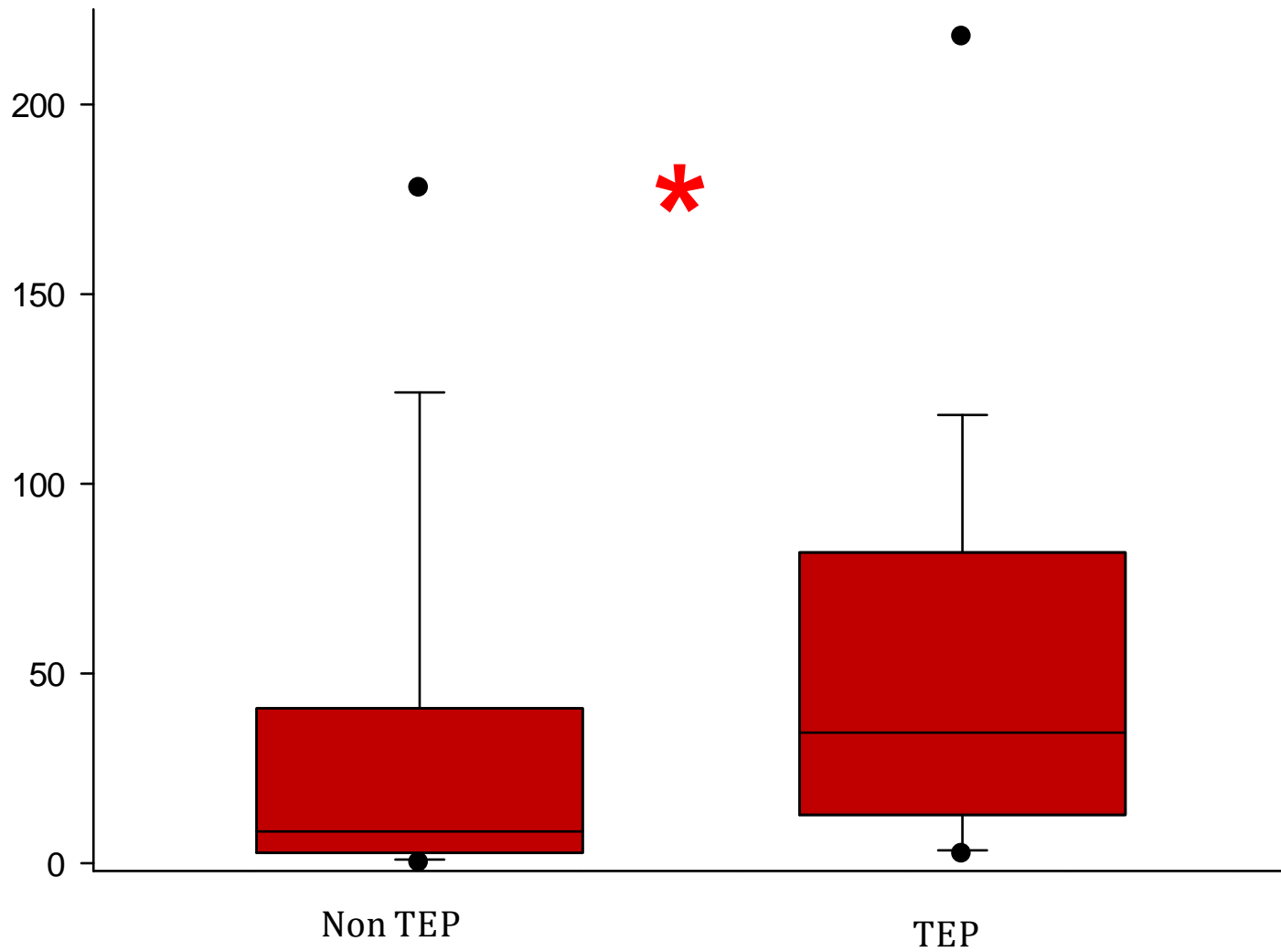
# POPULATION CHARACTERISTICS

	<b>PE +</b> n= 92	<b>PE -</b> n= 320	<b>TOT</b> n= 412	<b>p</b>
<b>Age</b>	73 ±13	77 ±13	76 ±13	n.s.
<b>Women (%)</b>	53 (58%)	214 (67%)	267 (65%)	n.s.
<b>D-dimer</b> [ng/dL] median (Q1-Q3)	2486 (1631–5114)	2180 (1182–4324)	2240 (1201–4717)	n.s.
<b>CRP</b> [mg/L] median (Q1-Q3)	34,5 (12,9–80)	8,4 (2,8–40,8)	13,2 (3,3–52,4)	p<0,001



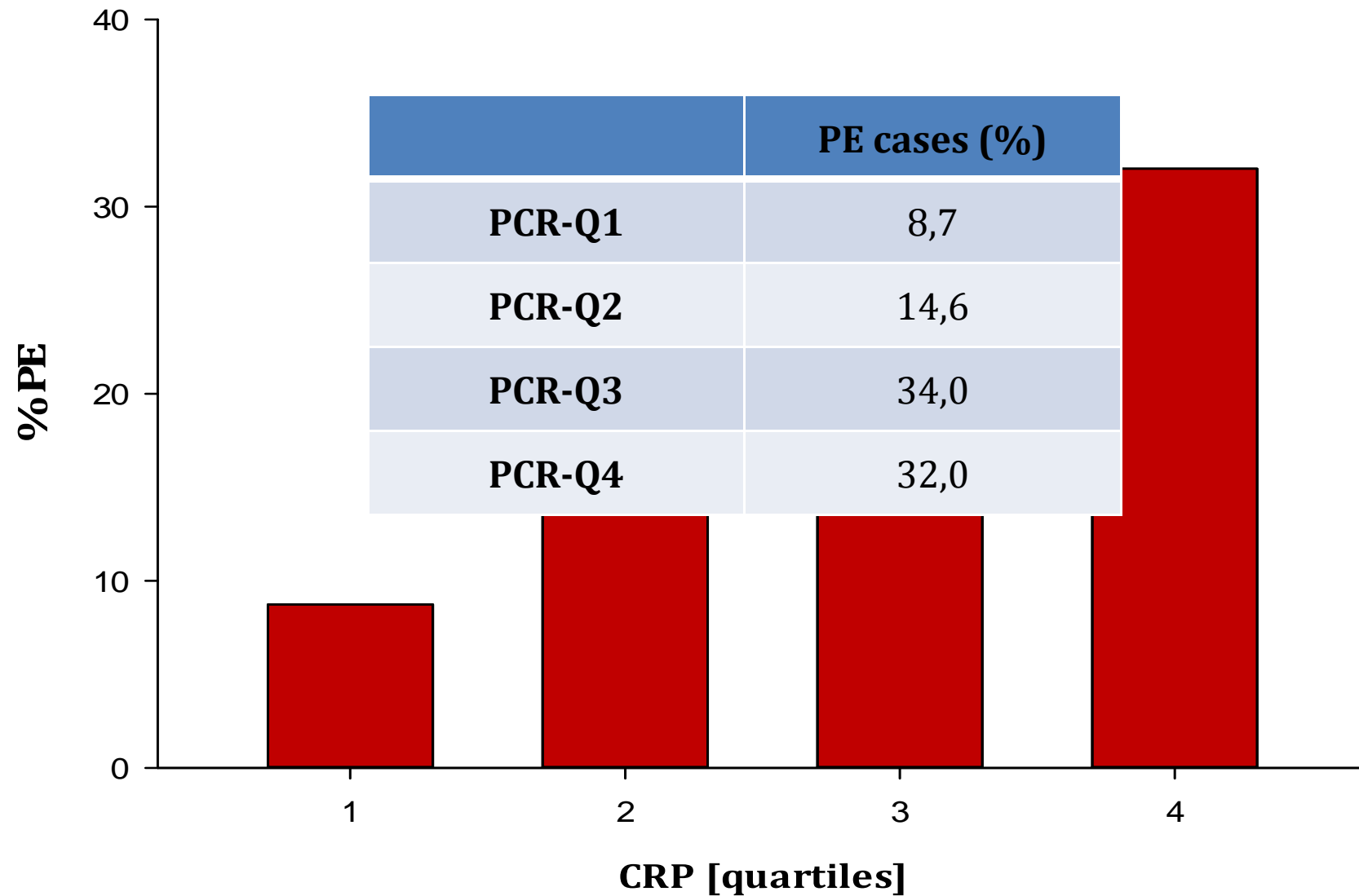
### PCR values TEP vs. nonTEP

PCR [mg/L]

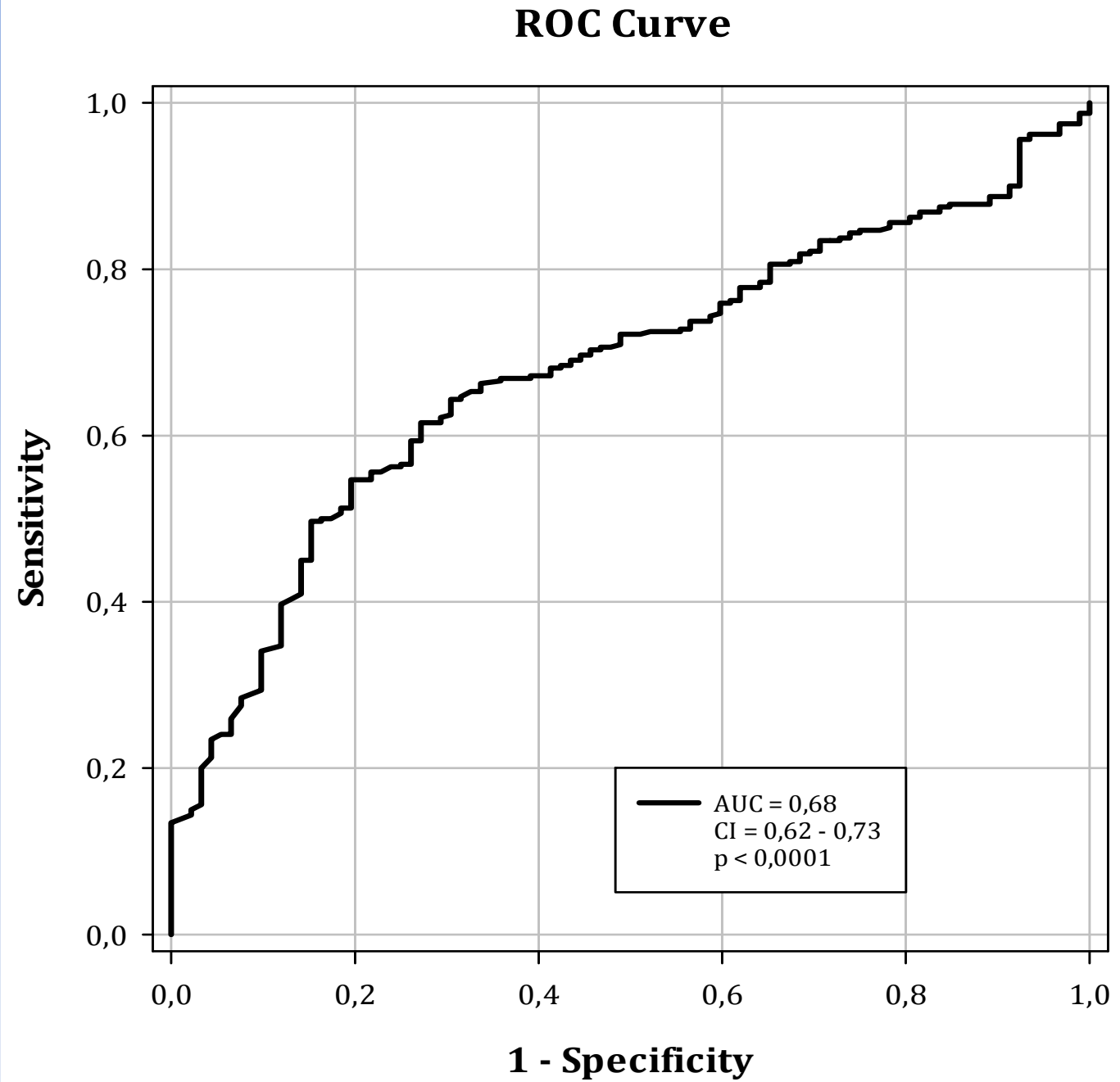


\*p<0,001

## Probability of PE in the population as divided by CRP quartiles



# CRP ROC curve



	<b>Sn</b>	<b>Sp</b>	<b>LR-</b>	<b>NPV</b>
<b>PCR &gt;1</b>	1,00	0,12	0,00	1,00
<b>PCR &gt;1,3</b>	0,98	0,15	0,14	0,96
<b>PCR &gt;1,6</b>	0,97	0,17	0,19	0,95
<b>PCR &gt;2,0</b>	0,96	0,21	0,20	0,94
<b>PCR &gt;2,6</b>	0,93	0,24	0,27	0,93
<b>PCR &gt;2,9</b>	0,92	0,28	0,28	0,93
<b>PCR &gt;3,0</b>	0,92	0,28	0,27	0,93
<b>PCR &gt;3,1</b>	0,90	0,29	0,33	0,91
<b>PCR &gt;4,5</b>	0,88	0,36	0,33	0,91
<b>PCR &gt;6,0</b>	0,86	0,41	0,34	0,91
<b>PCR &gt;8,0</b>	0,85	0,50	0,31	0,92
<b>PCR &gt;9,9</b>	0,80	0,53	0,37	0,90
<b>PCR &gt;13</b>	0,74	0,57	0,46	0,88
<b>PCR &gt;15,9</b>	0,71	0,62	0,48	0,88
<b>PCR &gt;19,9</b>	0,68	0,65	0,49	0,88
<b>PCR &gt;22,5</b>	0,64	0,67	0,54	0,87
<b>PCR &gt;26,1</b>	0,57	0,68	0,64	0,85
<b>PCR &gt;29,9</b>	0,53	0,71	0,66	0,84
<b>PCR &gt;40</b>	0,41	0,74	0,80	0,81
<b>PCR &gt;60,2</b>	0,33	0,81	0,84	0,81
<b>PCR &gt;80,2</b>	0,25	0,84	0,89	0,80
<b>PCR &gt;100</b>	0,15	0,88	0,97	0,78
<b>PCR &gt; 130,6</b>	0,08	0,91	0,87	0,78
<b>PCR &gt;220</b>	0,03	0,96	0,87	0,78
<b>PCR &gt;329</b>	0,00	0,99	1,01	0,78
<b>PCR &gt;379,5</b>	0,00	1,00	1,00	0,78

**A CRP cutoff of 2,9 mg/L provided a Sn of 92%  
and a Sp of 27%**

*7 PE lost → 4 “segmental”  
→ 2 likely high risk*

*95 spared CTPAs (23%)*

**38 patients without PE had a CRP of  $\leq 1$ mg/L**

*Even applying our findings in the safest way (i.e. considering a CRP cutoff that yields a sensitivity of 100%), we would have spared 38 CTPAs (9.2%).*

# LIMITATIONS

Retrospective study - no follow-up data available

No stratification based on the pre-test probability  
(lack of data)

# CONCLUSIONS

CRP values are significantly higher in patients with PE compared to patients without PE ( $p < 0,001$ ).

The probability of PE shows a linear increase with CRP plasmatic levels

Future: more ample, prospective studies?