Value-added reporting

X. Bossuyt

COMMUNICATING DIAGNOSTIC ACCURACY

Communicating diagnostic accuracy

Question 1

- Sensitivity: 95%
- Specificity: 90%

- Pre-test probability: 2.5%

- Post-test probability ???

- 10%
- 20%
- 50%
- 80%
- 90%

Communicating diagnostic accuracy

Question 1

- Sensitivity: 95%
- Specificity: 90%

- Pre-test probability: 2.5%

- Post-test probability ???

- 10%
- 20%
- 50%
- 80%
- 90%

Communicating diagnostic accuracy

Question 1

- Sensitivity: 95%
- Specificity: 90%

- Pre-test probability: 2.5%

- Post-test probability ???

- 10%
- **20% (9% of respondents)**
- 50%
- 80%
- 90%

Communicating diagnostic accuracy

Question 2

- LR 10

  A pos test result occurs 10 times more frequently in patients with the disease compared to patients without the disease

- Pre-test probability: 2.5%

- 10%
- 20%
- 50%
- 80%
- 90%

Communicating diagnostic accuracy

Question 2

- LR 10

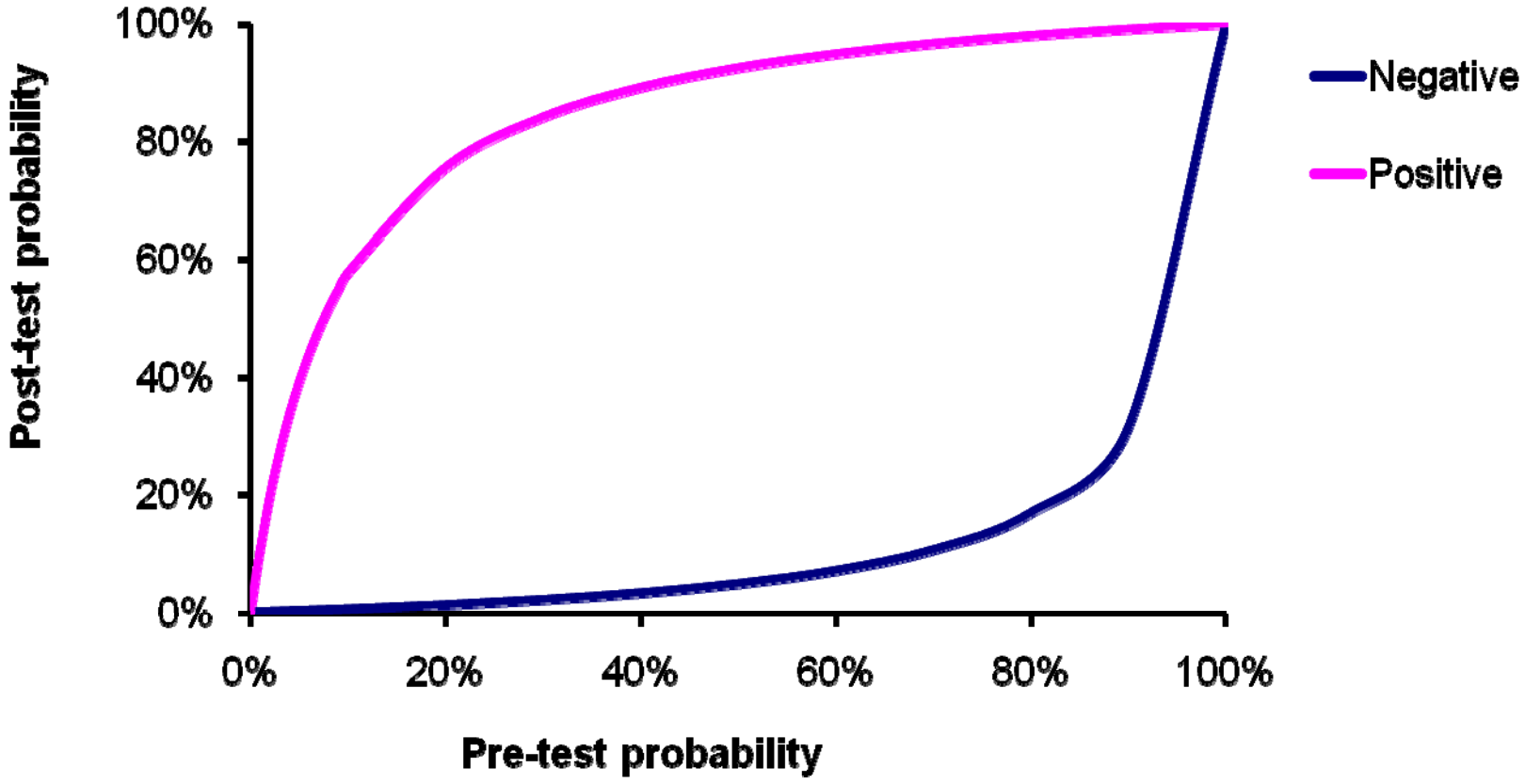
  A pos test result occurs 10 times more frequently in patients with the disease compared to patients without the disease

- Pre-test probability: 2.5%

- 10%
- **20% (35% of respondents)**
- 50%
- 80%
- 90%

Communicating diagnostic accuracy

- **Question 3**



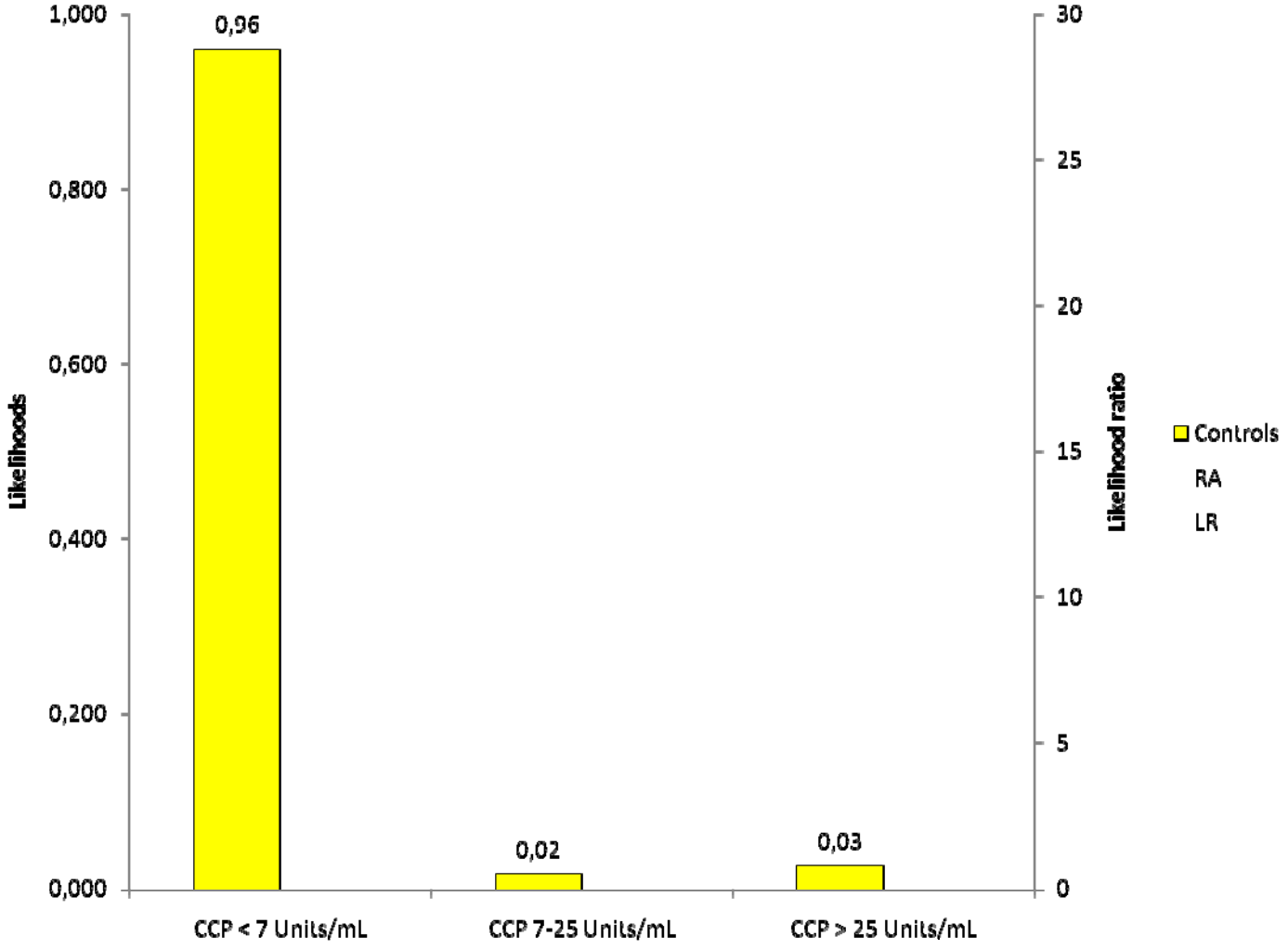
RHEUMATOID ARTHRITIS

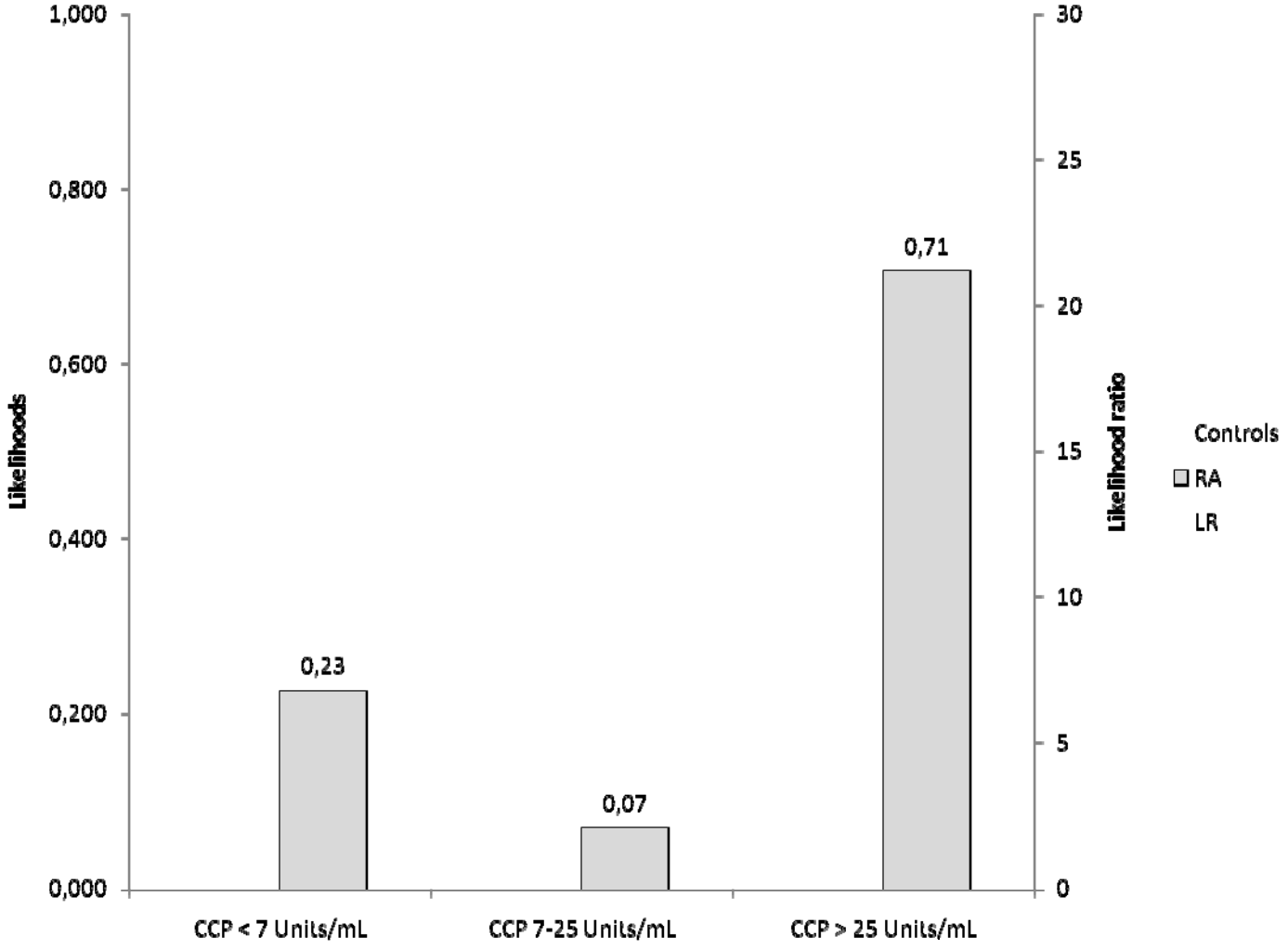
Anti-CCP

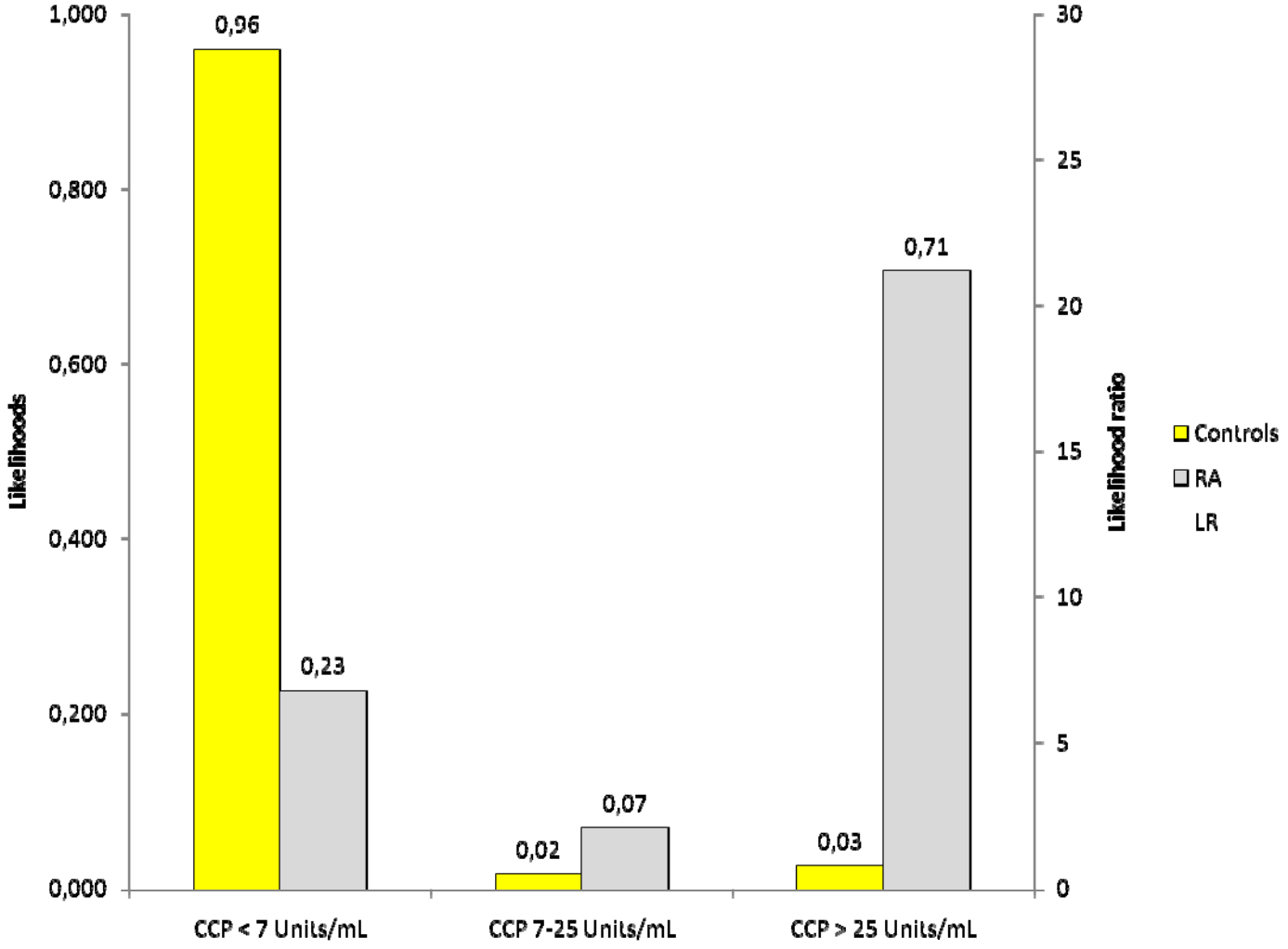
298 patients

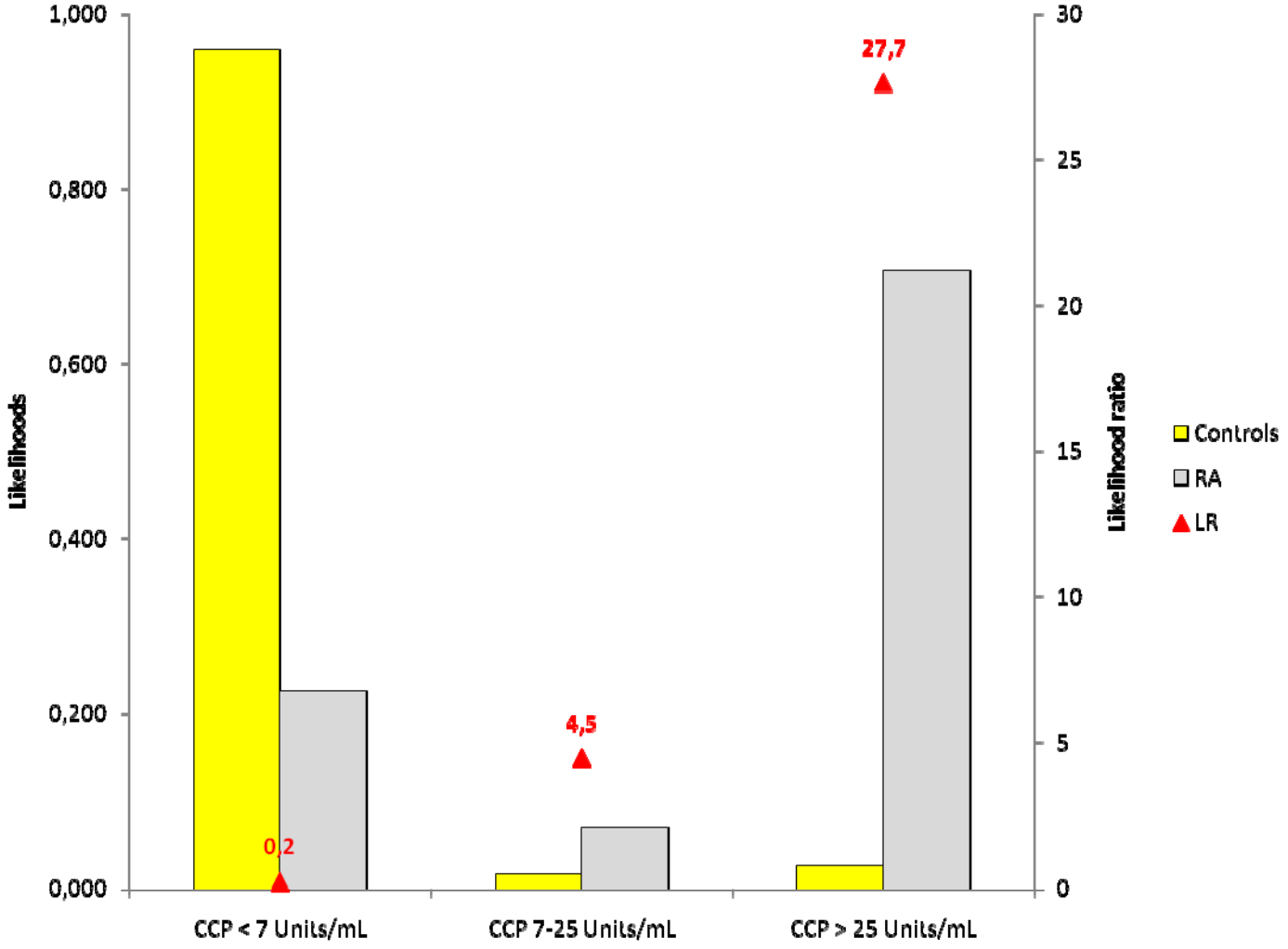
- RA patients (n=85)
  - 45 early RA
  - 40 established RA
- Diseased controls (n=165), including:
  - Psoriatic arthritis
  - Connective tissue disease
  - Organ-specific autoimmune disease
- Consecutive patients (n=48)
  - 16 RA

- Anti-CCP: Phadia (7Units/mL)
- RF: nephelometry, Immage, Beckman-Coulter (20 IU/mL)

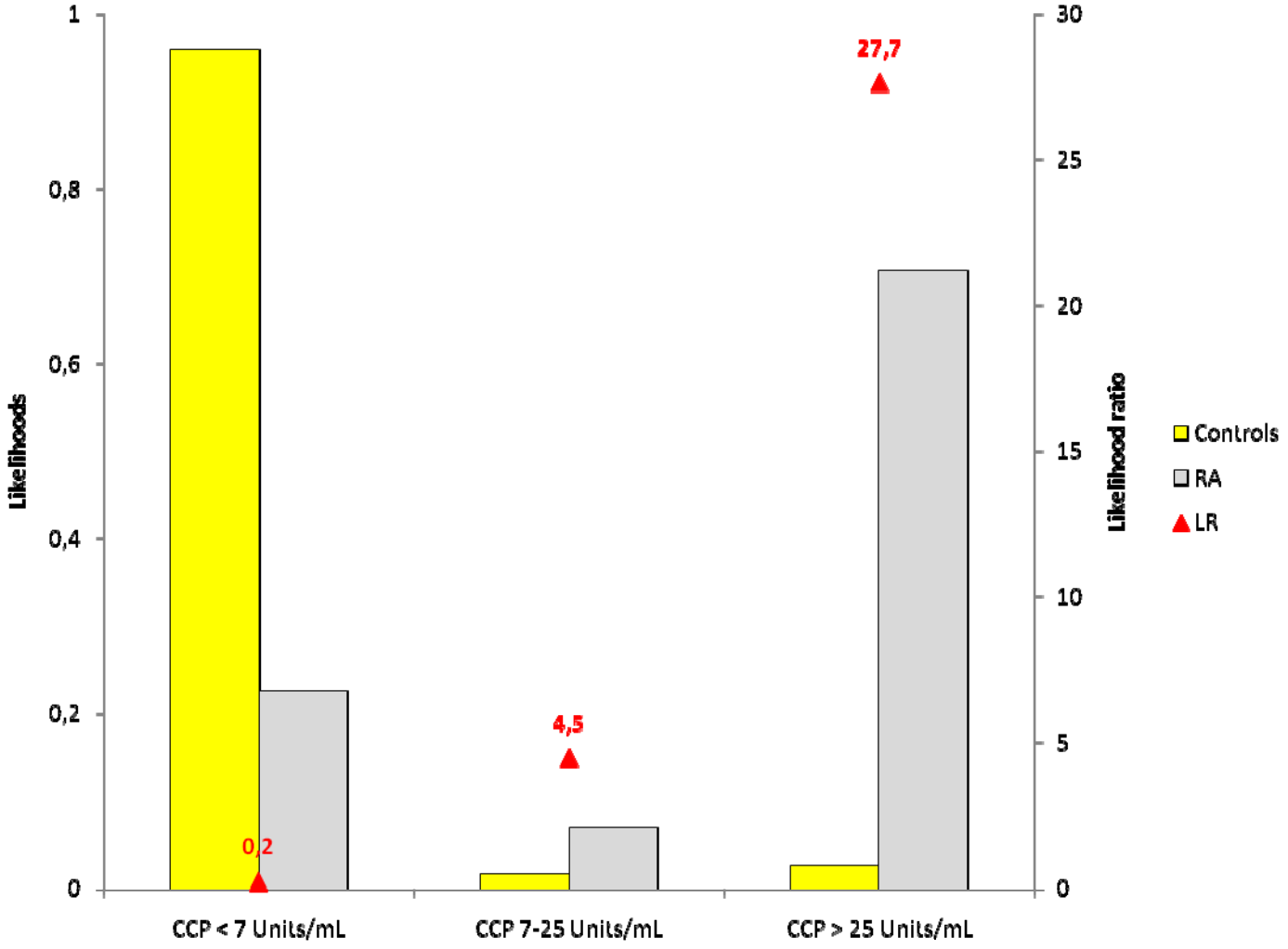

1,000
0,800
0,600
0,400
0,200
0,000
Likelihoods
0,96
0,02
0,03
CCP < 7 Units/mL
CCP 7-25 Units/mL
CCP > 25 Units/mL
30
25
20
15
10
5
0
Likelihood ratio
Controls
RA
LR

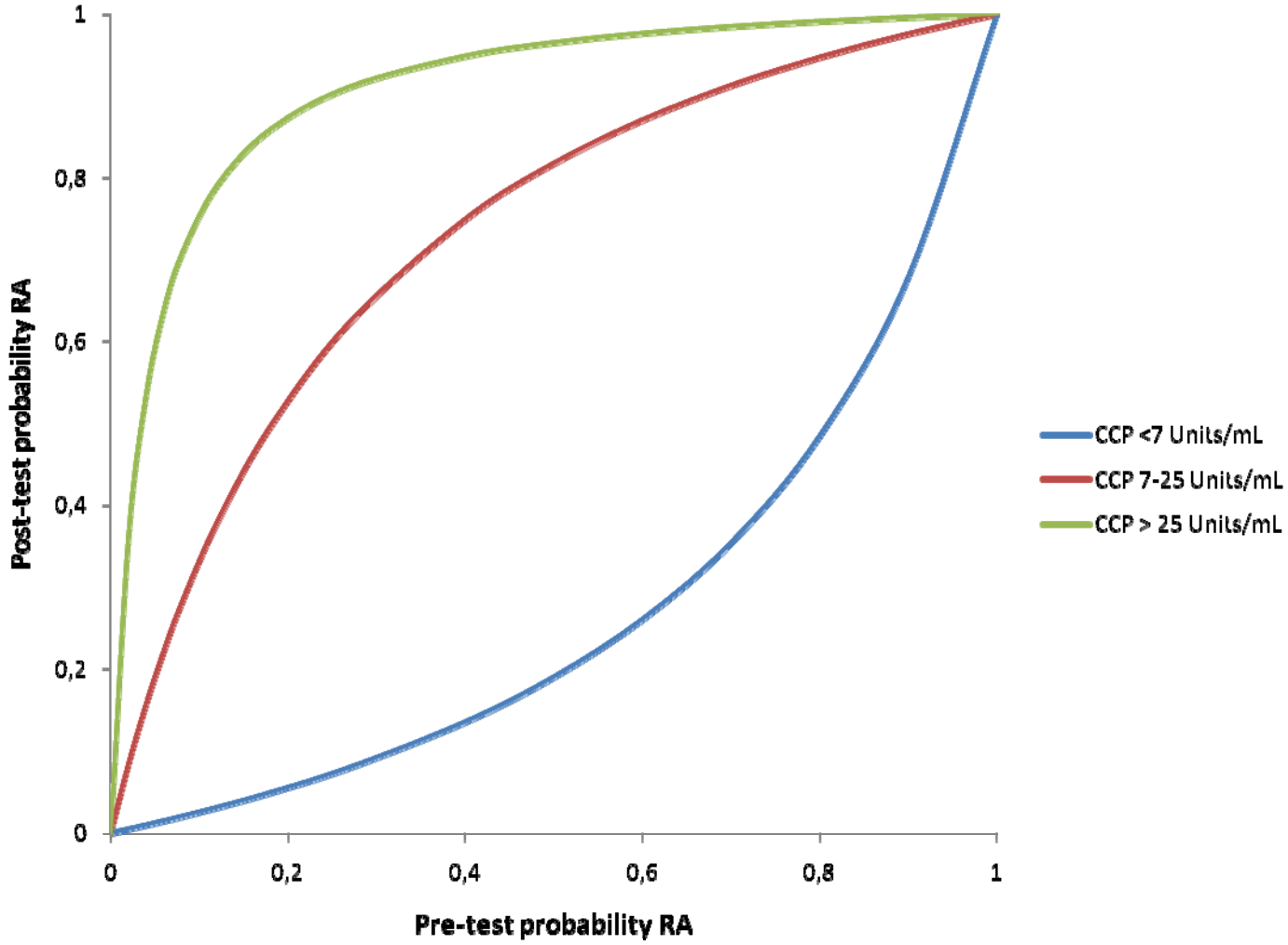

1,000
0,800
0,600
0,400
0,200
0,000
Likelihoods
30
25
20
15
10
5
0
Likelihood ratio
0,23
0,07
0,71
CCP < 7 Units/mL
CCP 7-25 Units/mL
CCP > 25 Units/mL
Controls
RA
LR

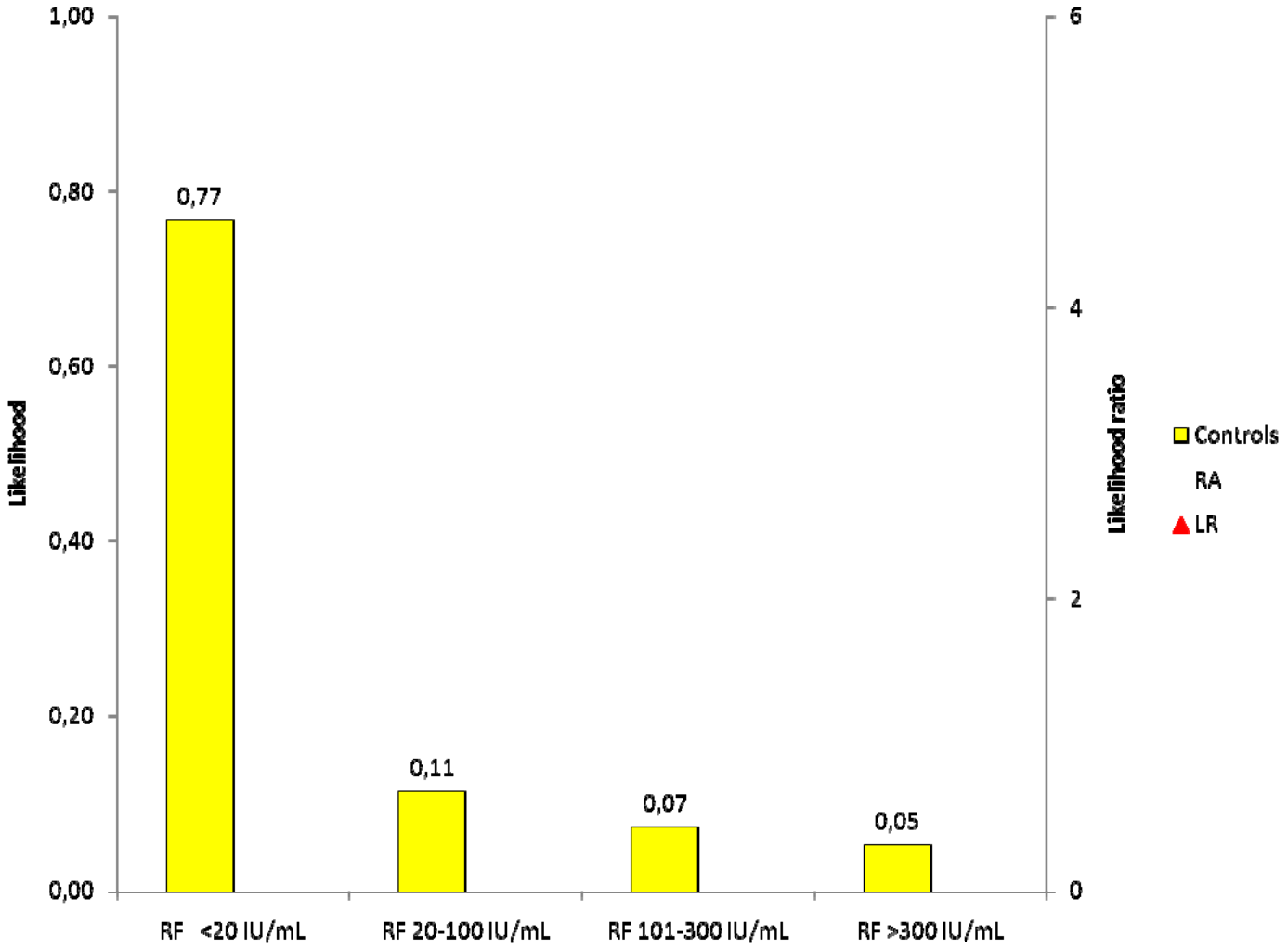

1,000
0,800
0,600
0,400
0,200
0,000
Likelihoods
30
25
20
15
10
5
0
Likelihood ratio
0,96
0,23
0,02
0,07
0,03
0,71
CCP < 7 Units/mL
CCP 7-25 Units/mL
CCP > 25 Units/mL
Controls
RA
LR

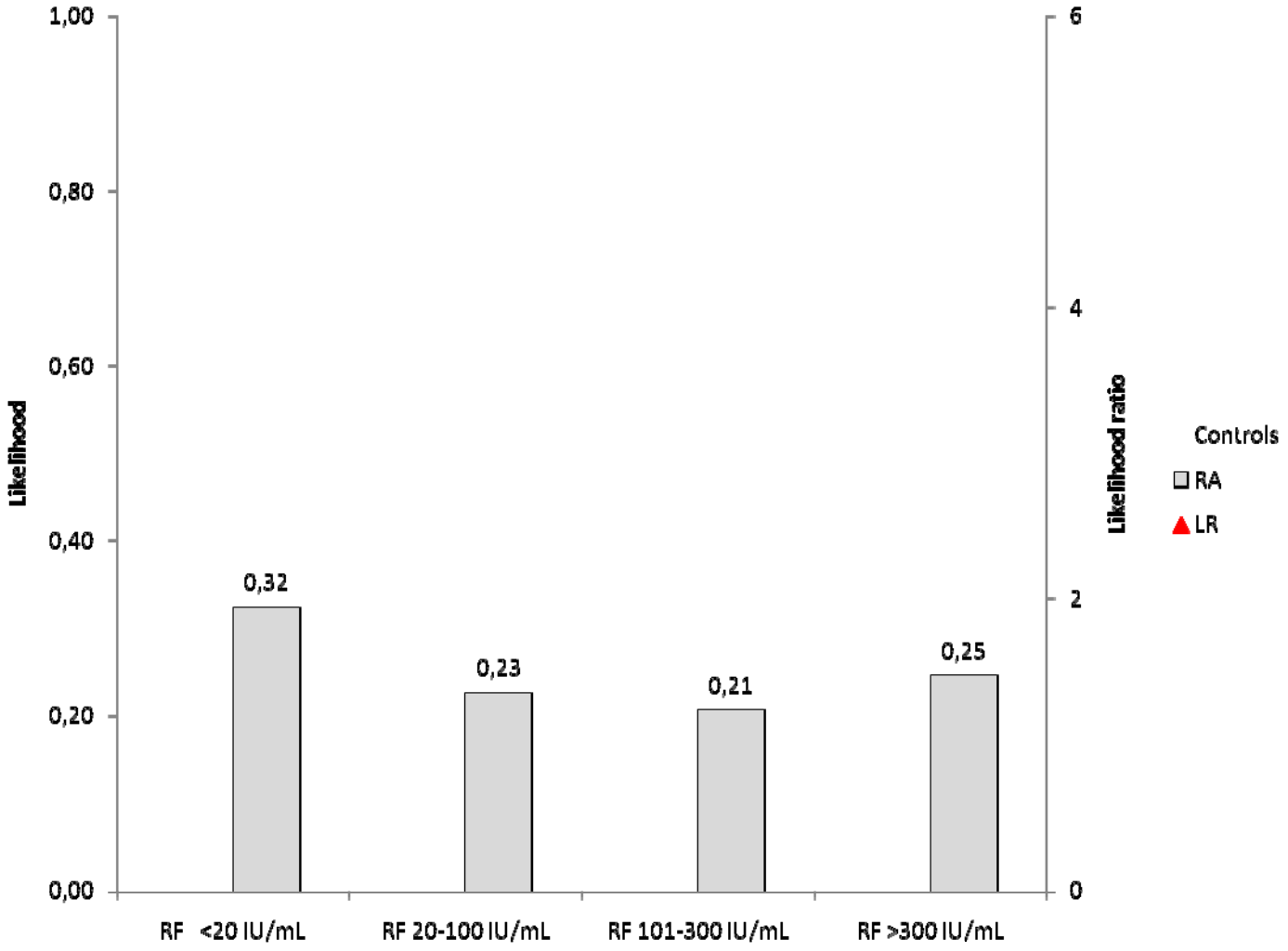

1,000
0,800
0,600
0,400
0,200
0,000
Likelihoods
30
25
20
15
10
5
0
Likelihood ratio
27,7
4,5
0,2
CCP < 7 Units/mL
CCP 7-25 Units/mL
CCP > 25 Units/mL
Controls
RA
LR

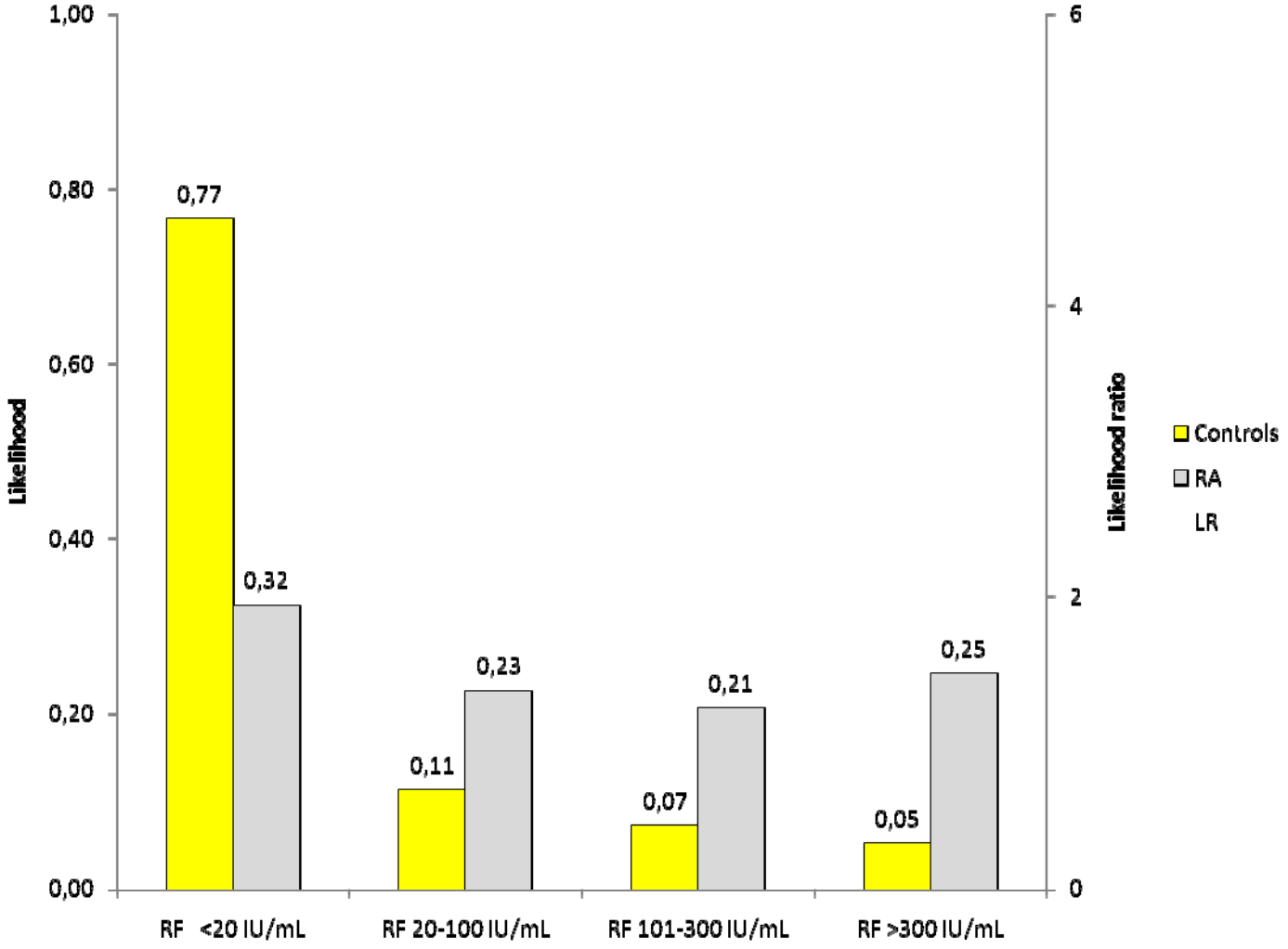
LR		
1		no clinical value
>10	<0.1	clinically important difference
5 – 10	0.1 – 0.2	modest, but substantial difference
2 – 5	0.2 – 0.5	small difference that may be relevant

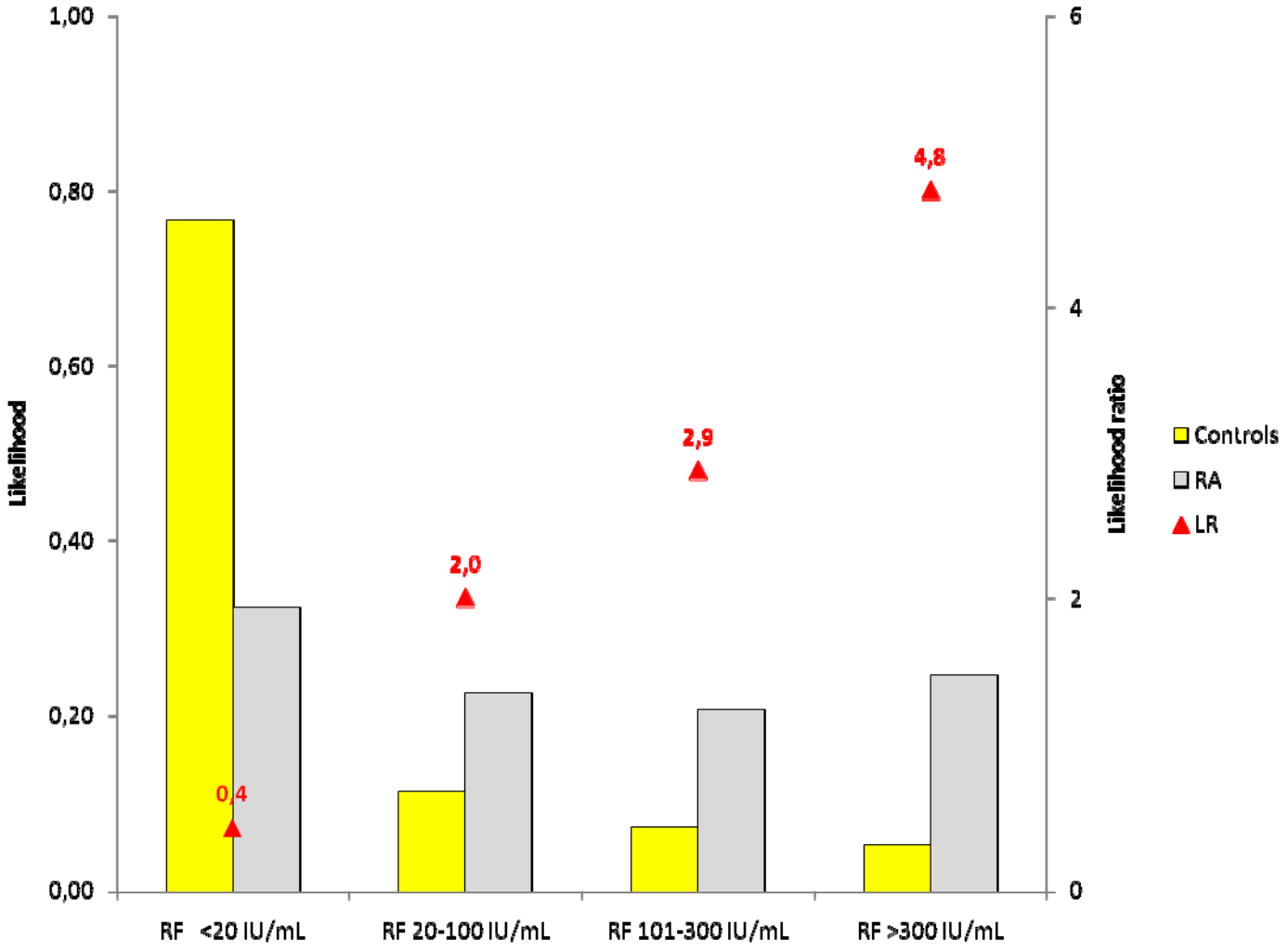

1
0,8
0,6
0,4
0,2
0
Likelihoods
30
25
20
15
10
5
0
Likelihood ratio
27,7
4,5
0,2
CCP < 7 Units/mL
CCP 7-25 Units/mL
CCP > 25 Units/mL
Controls
RA
LR

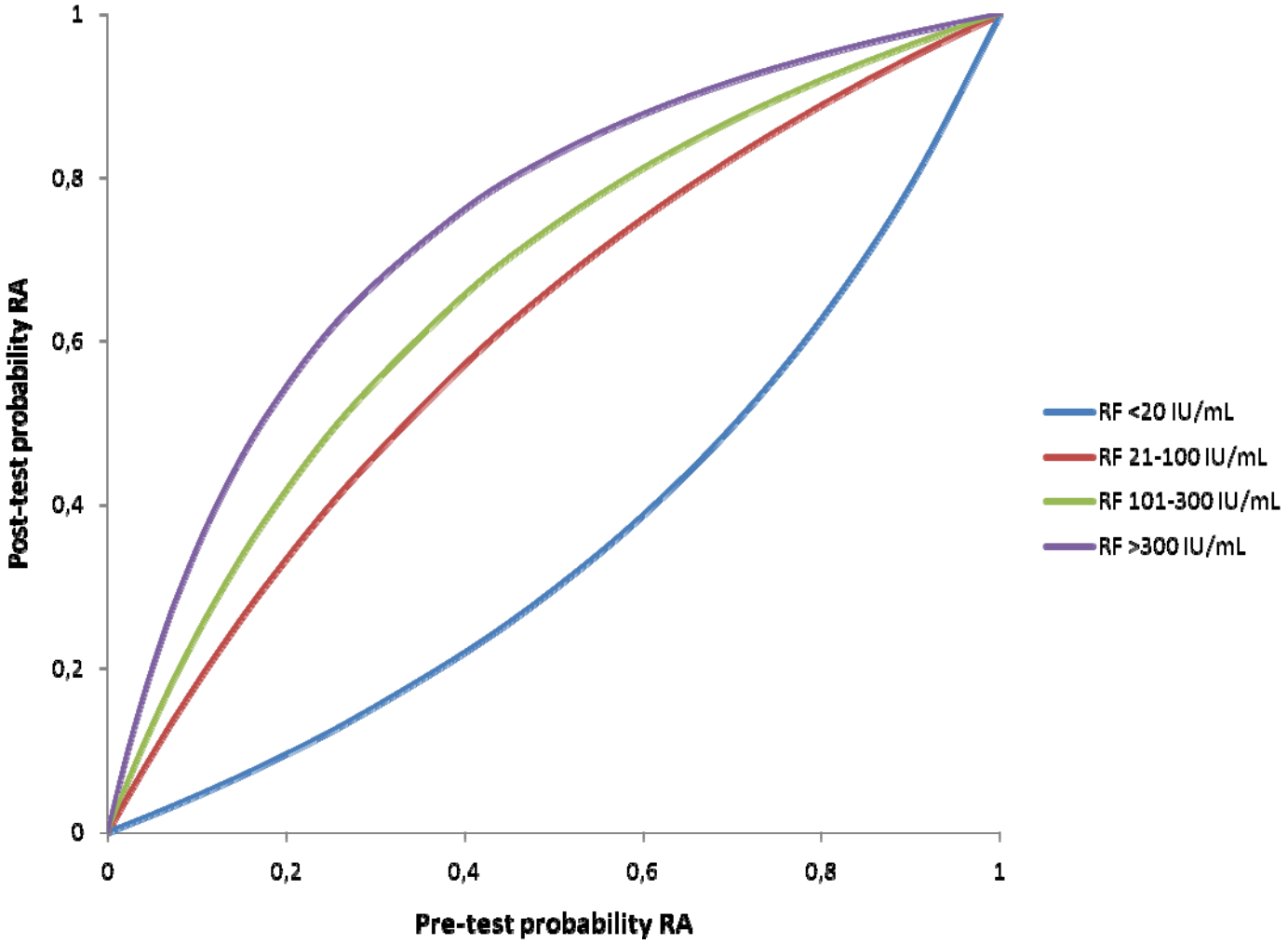

1
0,8
0,6
0,4
0,2
0
0
0,2
0,4
0,6
0,8
1
Post-test probability RA
Pre-test probability RA
CCP <7 Units/mL
CCP 7-25 Units/mL
CCP > 25 Units/mL

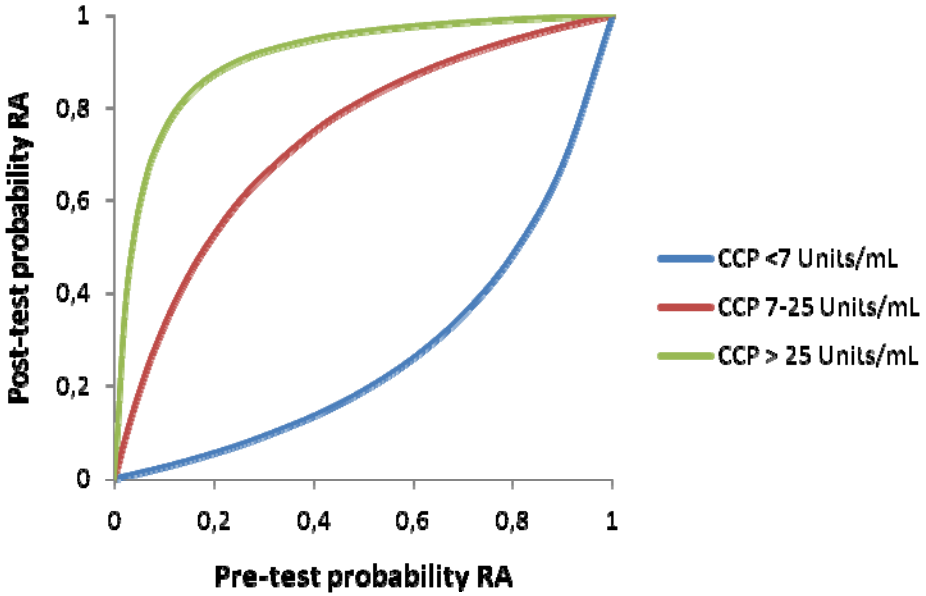

1,00
0,80
0,60
0,40
0,20
0,00
Likelihood
6
4
2
0
Likelihood ratio
0,77
0,11
0,07
0,05
RF <20 IU/mL
RF 20-100 IU/mL
RF 101-300 IU/mL
RF >300 IU/mL
Controls
RA
LR

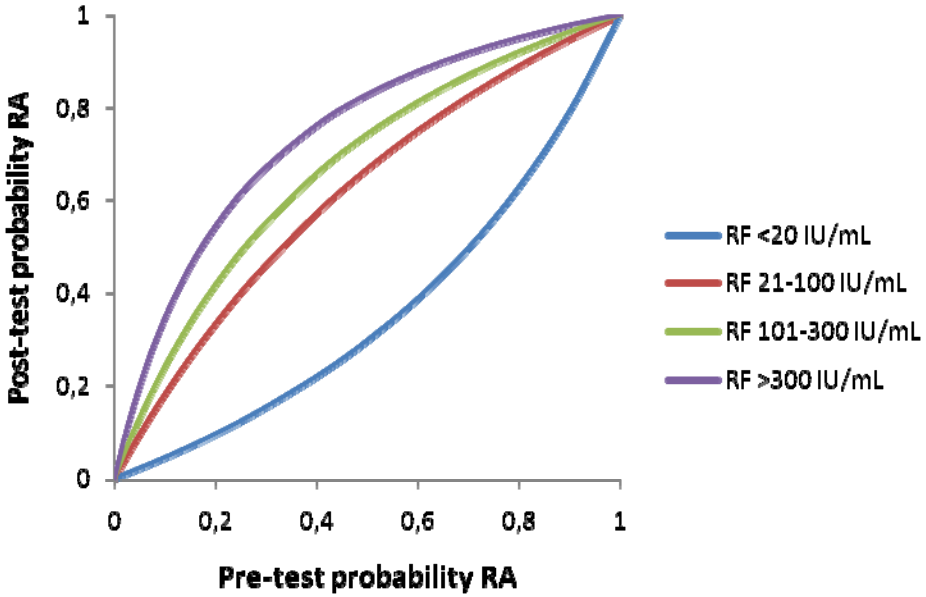

1,00
0,80
0,60
0,40
0,20
0,00
Likelihood
6
4
2
0
Likelihood ratio
0,32
0,23
0,21
0,25
RF <20 IU/mL
RF 20-100 IU/mL
RF 101-300 IU/mL
RF >300 IU/mL
Controls
RA
LR

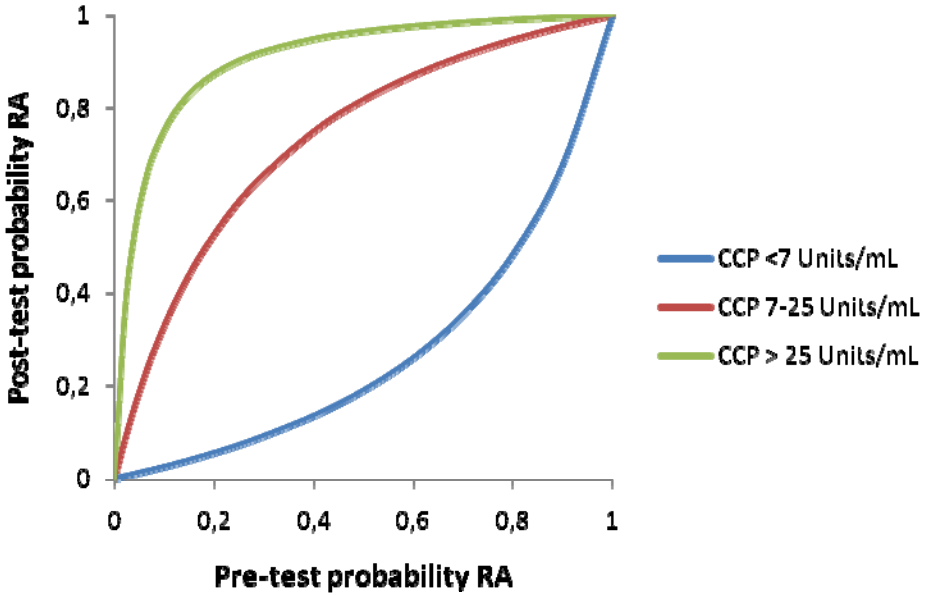

1,00
0,80
0,60
0,40
0,20
0,00
Likelihood
6
4
2
0
Likelihood ratio
0,77
0,32
0,11
0,23
0,07
0,21
0,05
0,25
RF <20 IU/mL
RF 20-100 IU/mL
RF 101-300 IU/mL
RF >300 IU/mL
Controls
RA
LR


1,00
0,80
0,60
0,40
0,20
0,00
Likelihood
6
4
2
0
Likelihood ratio
0,4
2,0
2,9
4,8
Controls
RA
LR
RF <20 IU/mL
RF 20-100 IU/mL
RF 101-300 IU/mL
RF >300 IU/mL

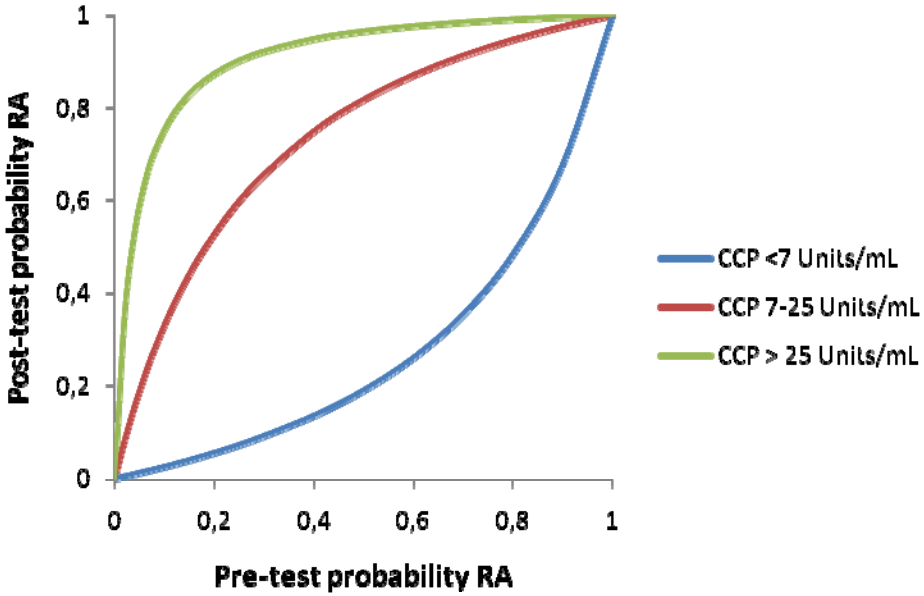

1
0,8
0,6
0,4
0,2
0
0
0,2
0,4
0,6
0,8
1
Post-test probability RA
Pre-test probability RA
RF <20 IU/mL
RF 21-100 IU/mL
RF 101-300 IU/mL
RF >300 IU/mL


Post-test probability RA
1
0,8
0,6
0,4
0,2
0
0
0,2
0,4
0,6
0,8
1
Pre-test probability RA
CCP <7 Units/mL
CCP 7-25 Units/mL
CCP > 25 Units/mL


Post-test probability RA
1
0,8
0,6
0,4
0,2
0
0
0,2
0,4
0,6
0,8
1
Pre-test probability RA
RF <20 IU/mL
RF 21-100 IU/mL
RF 101-300 IU/mL
RF >300 IU/mL



Female, 50 years old
Recent onset undifferentiated arthritis
Intermittent asymmetric tender and swollen small joints of the hands (n=5)
CRP: 10 mg/L



Female, 50 years old
Symmetric arthritis of upper and lower extremities
Tender and swollen small joints (n=12)
CRP: 70 mg/L

Conclusions

- We showed that a graphical representation is the best way to convey information on post-test probabilities.
- We illustrated how likelihood ratios depend on antibody level.
- Such knowledge may help with the interpretation of a specific test result.
- Clinical laboratories might consider to provide likelihoods ratios or probability data for autoantibody test result intervals.

Acknowledgments

- Department of laboratory medicine
  - P. Vermeersch
  - D. Coenen
- Internal medicine, rheumatology
  - P. Verschueren
  - R. Westhovens

References

- Vermeersch P and Bossuyt X.
  Comparative analysis of different approaches to report diagnostic accuracy.
  Arch Intern Med. 2010;170:734-5.
- Bossuyt X et al.
  Likelihood ratios as a function of antibody concentration for anti-cyclic citrullinated peptide antibodies and rheumatoid factor.
  Ann Rheum Dis. 2009;68:287-9.