

# CRP measurement in general practice – Influence on antibiotic prescribing in patients with respiratory tract infections:

Upper RTI: Lars Bjerrum

Lower RTI: Rogier Hopstaken

Bojnice, Slovakia 2009

Lars Bjerrum

University of Southern Denmark



# CRP Point-of-care tests in patients with upper respiratory tract infections – Why?

1. Is CRP a valid test in patients with URTI?
2. Is there an optimal cut-point for CRP?
3. Is there a need for CRP in patients with URTI?
4. Does CRP influence antibiotic prescribing in patients with RTI?
5. Did CRP influence antibiotic prescribing in patients participating in HAPPY AUDIT?
6. Conclusion



## EUROPE



Scale 1: 19,500,000

Lambert Conformal Conic Projection,  
standard parallels 40°N and 56°N

0 100 Kilometers  
0 100 Miles

Boundary representation is  
not necessarily authoritative.



# General Practice

## University of Southern Denmark, Odense



# Svendborg: My consultation





# DENMARK

- 5 million inhabitants
- 7.300 Km. Coastline
- 500 harbours
- 406 islands



# New Harbour, Copenhagen



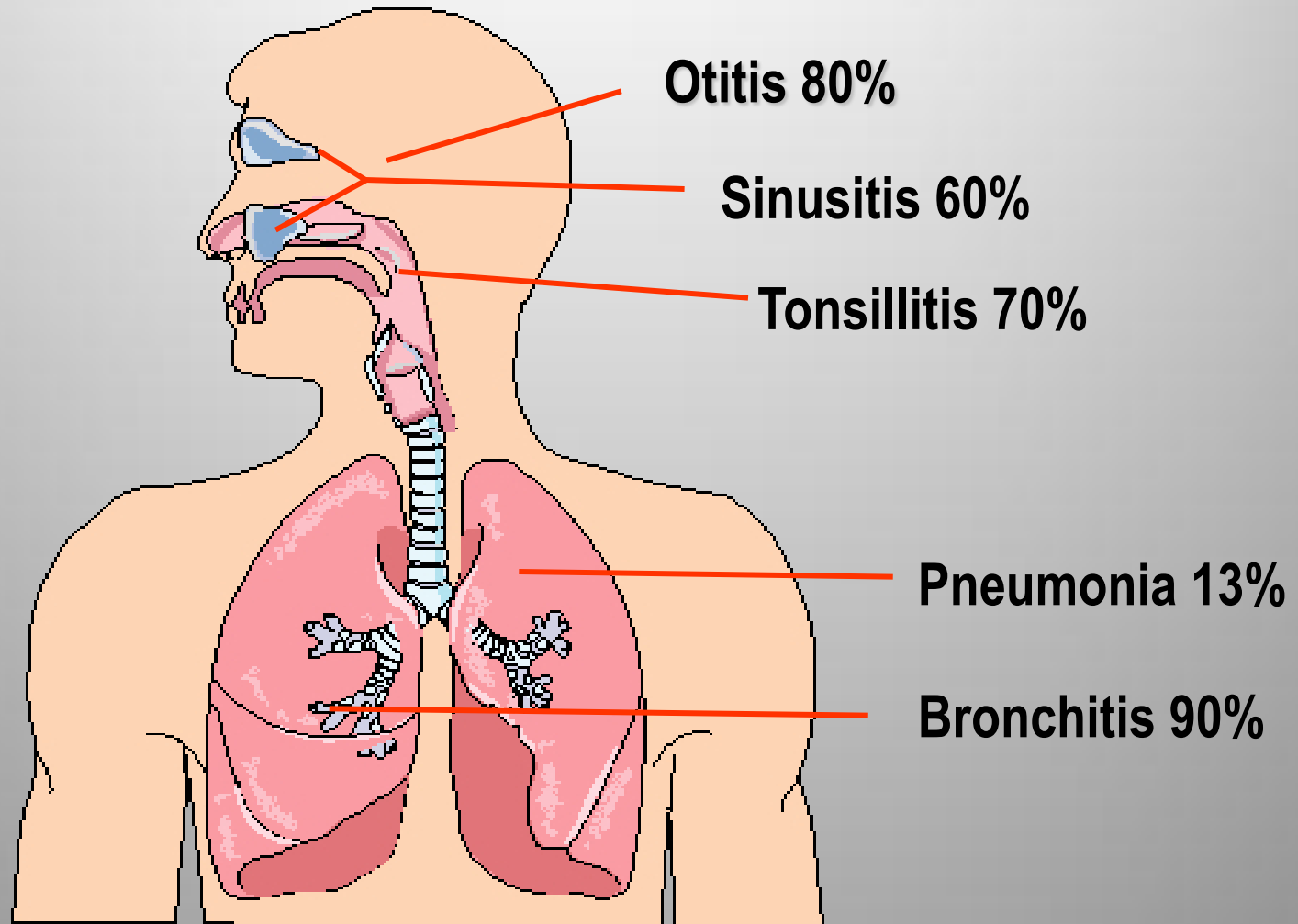
# Antibiotic treatment in general practice

- GPs are responsible for >90% of all prescriptions of antibiotics
- The majority of prescriptions are for patients with respiratory tract infections
- Most respiratory tract infections are caused by virus
- Overuse of antibiotics may lead to increased number of resistant bacteria





# Etiology: Virus



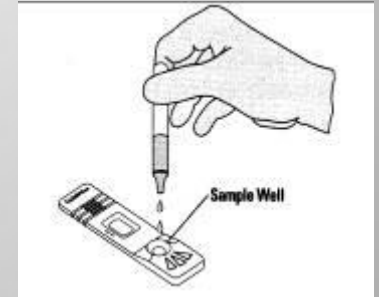
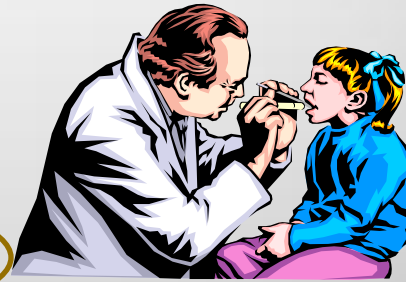
## Why are antibiotics prescribed for non-bacterial infections ?



- Doctors may be too busy to perform a thorough examination
- Doctors have no access to valid point of care tests
- A prescription can be used to terminate the consultation - if the GP is busy
- If doubt - you may prescribe "just to be safe"

# Diagnostic methods for upper respiratory infections in general practice

- Acute Tonsillitis/pharyngitis
  - Strep A
- Acute Sinusitis
  - C-Reactive Protein (CRP)
- Acute Otitis media
  - No appropriate point of care test is available





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# Validity of CRP in patients with acute sinusitis

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# Acute sinusitis

- One of the most difficult diagnoses in daily practice

Uncertain diagnosis results in a considerable overuse of

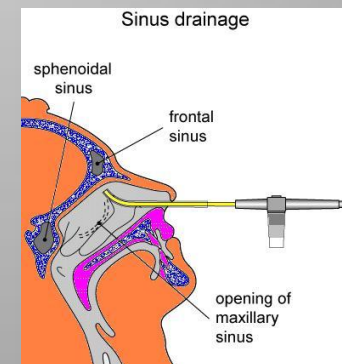
# Diagnosis of acute sinusitis

## Daily practice

- Unspecific symptoms:
  - ❑ Pain in teeth
  - ❑ Unilateral maxillary pain
  - ❑ Purulent nasal secretion,
  - ❑ Pain at bending forward,
  - ❑ Transillumination of sinus
- Lab test:
  - ❑ Increased CRP
  - ❑ Increased ESR

## ■ Gold standard

- ❑ CT-scan
- ❑ Sinus puncture with aspiration of purulent secretion
- ❑ culture of secretion with growth of bacteria





# Diagnosis of acute sinusitis

The aim is to

- **Identify patients who would benefit from antibiotics**
- **Avoid unnecessary antibiotic treatments**



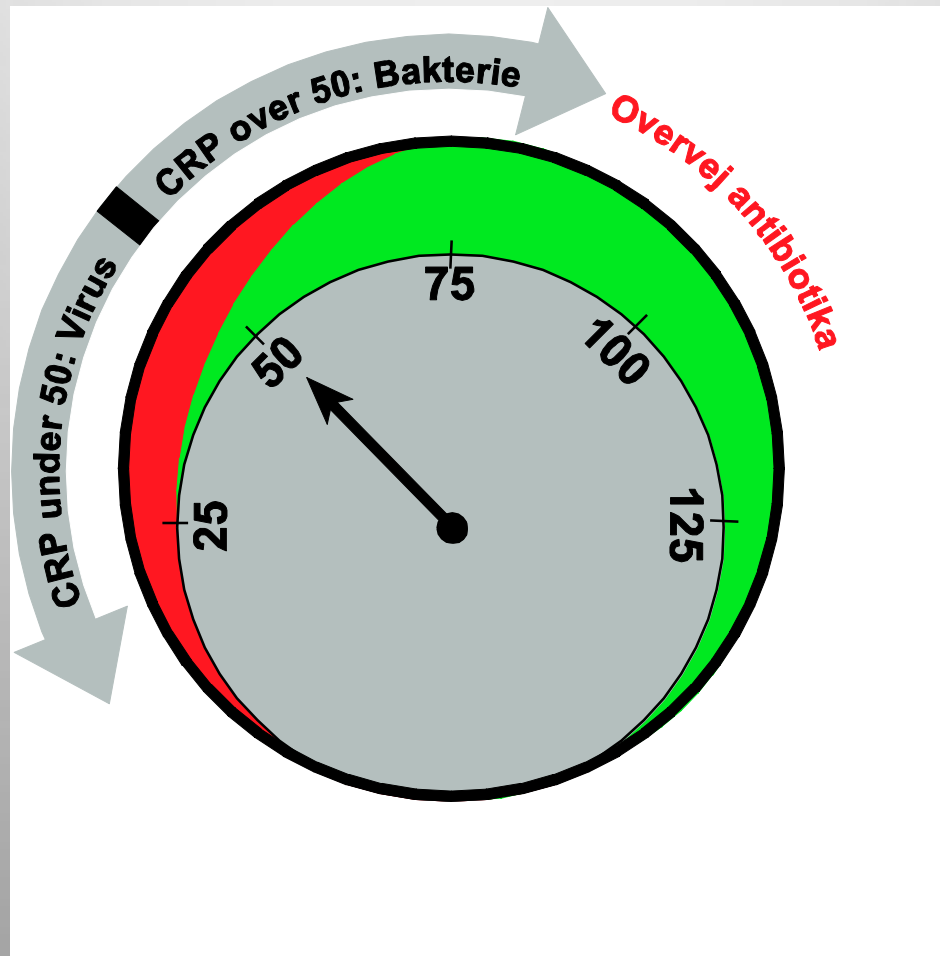
# CRP testing in sinusitis in general practice

- CRP and erythrocyte sedimentation rate (ESR) are of value to distinguish between virus and bacteria in patients with sinusitis\*
- Validity
  - CRP (>10 mg/l):
    - Likelihood ratio: 1.8 (Hansen et al 1995)
  - ESR (male>10, women>20):
    - Likelihood ratio: 1.7 (Lindbaek et al, 1996)
    - Likelihood ratio: 2.9 (Hansen et al 1995)

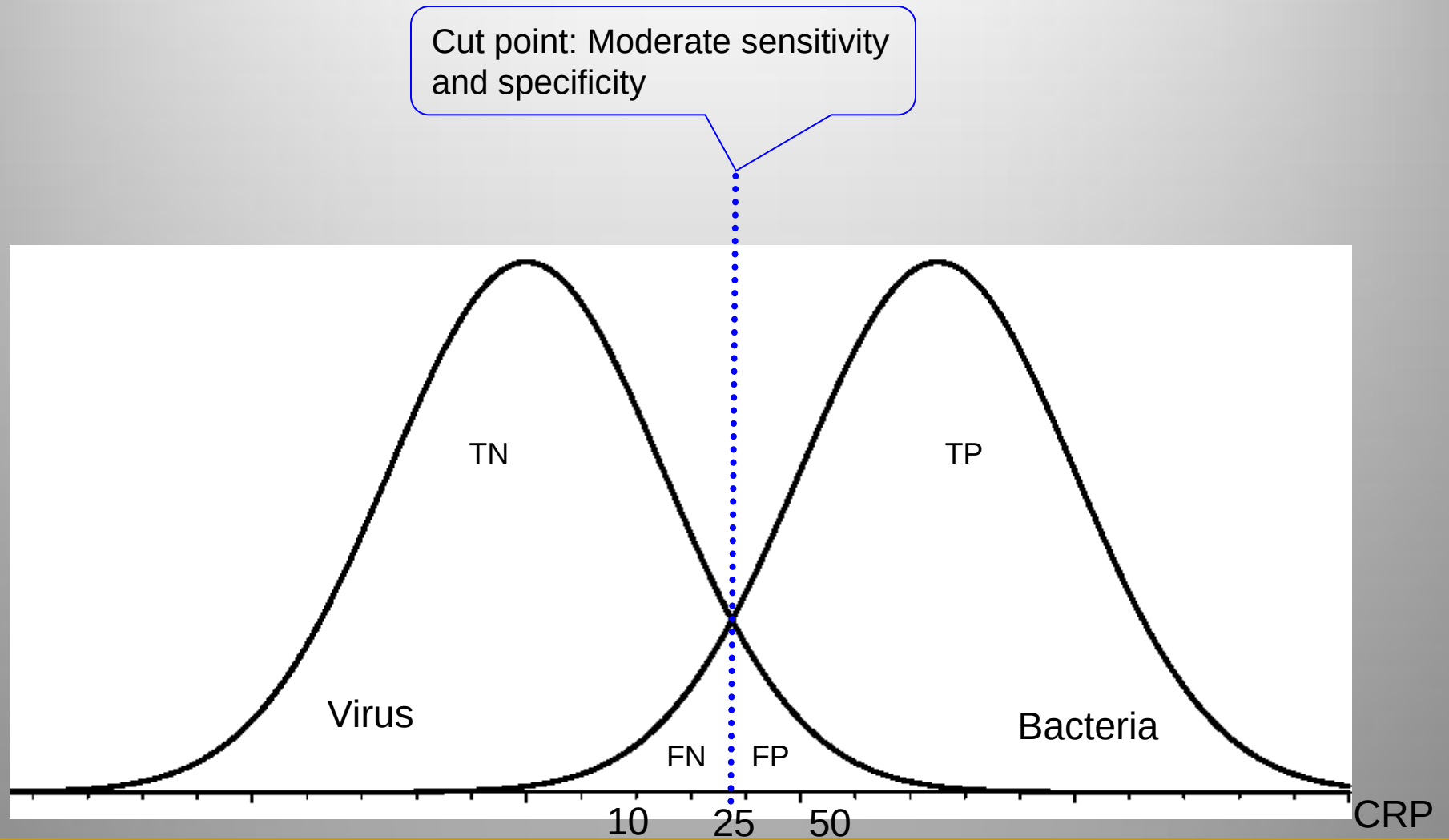
\*Dahler-Eriksen: The use of CRP, clinical organizational and economical aspects (dissertation, University of Aarhus, 1999)

\*Hansen JG et al Predicting acute maxillary sinusitis in a general practice population. BMJ 1995; 311: 233-236

# Is there an optimal cut-point for CRP in patients with Acute Sinusitis?

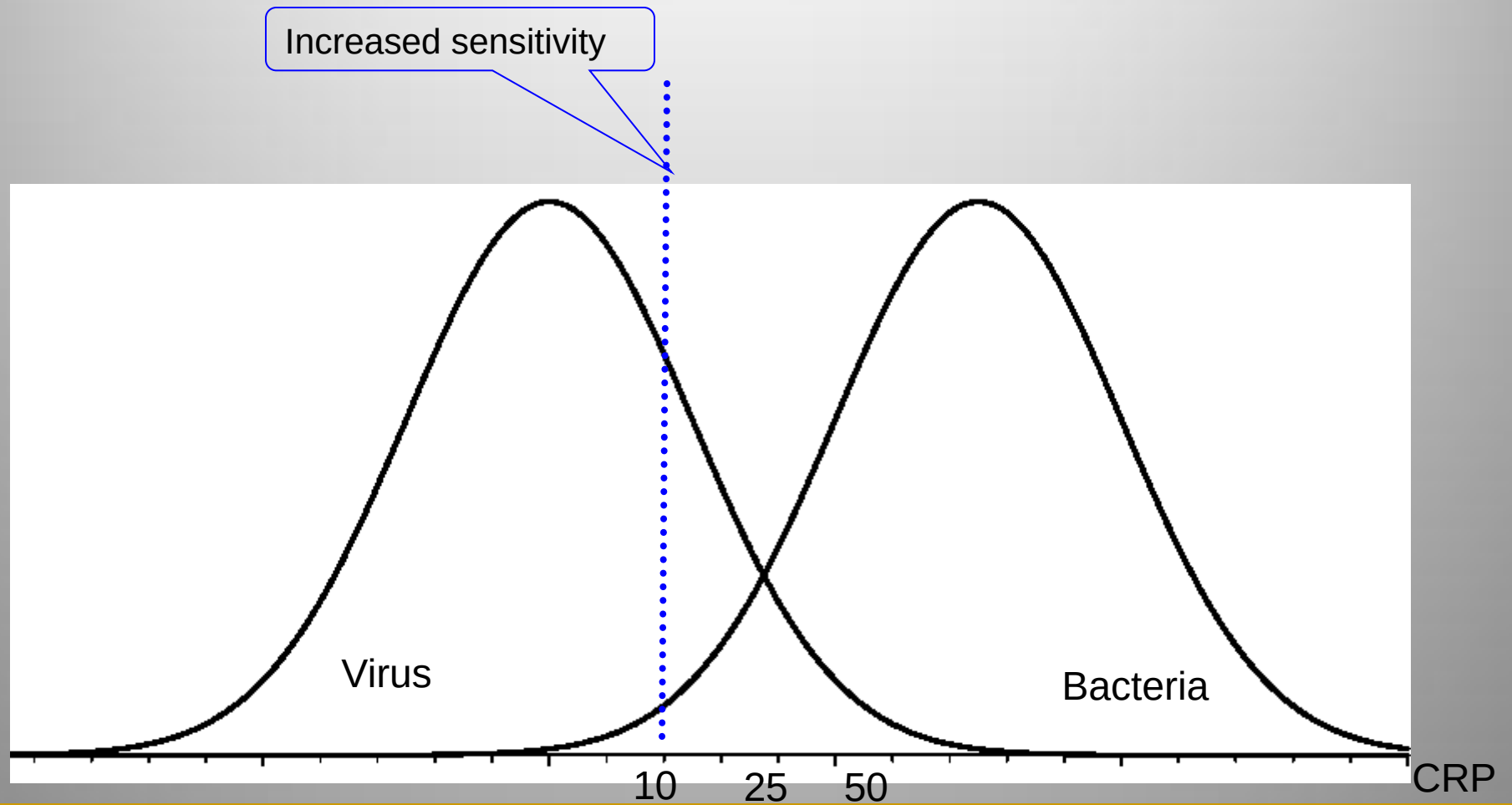


# Cut point for CRP, true and false values

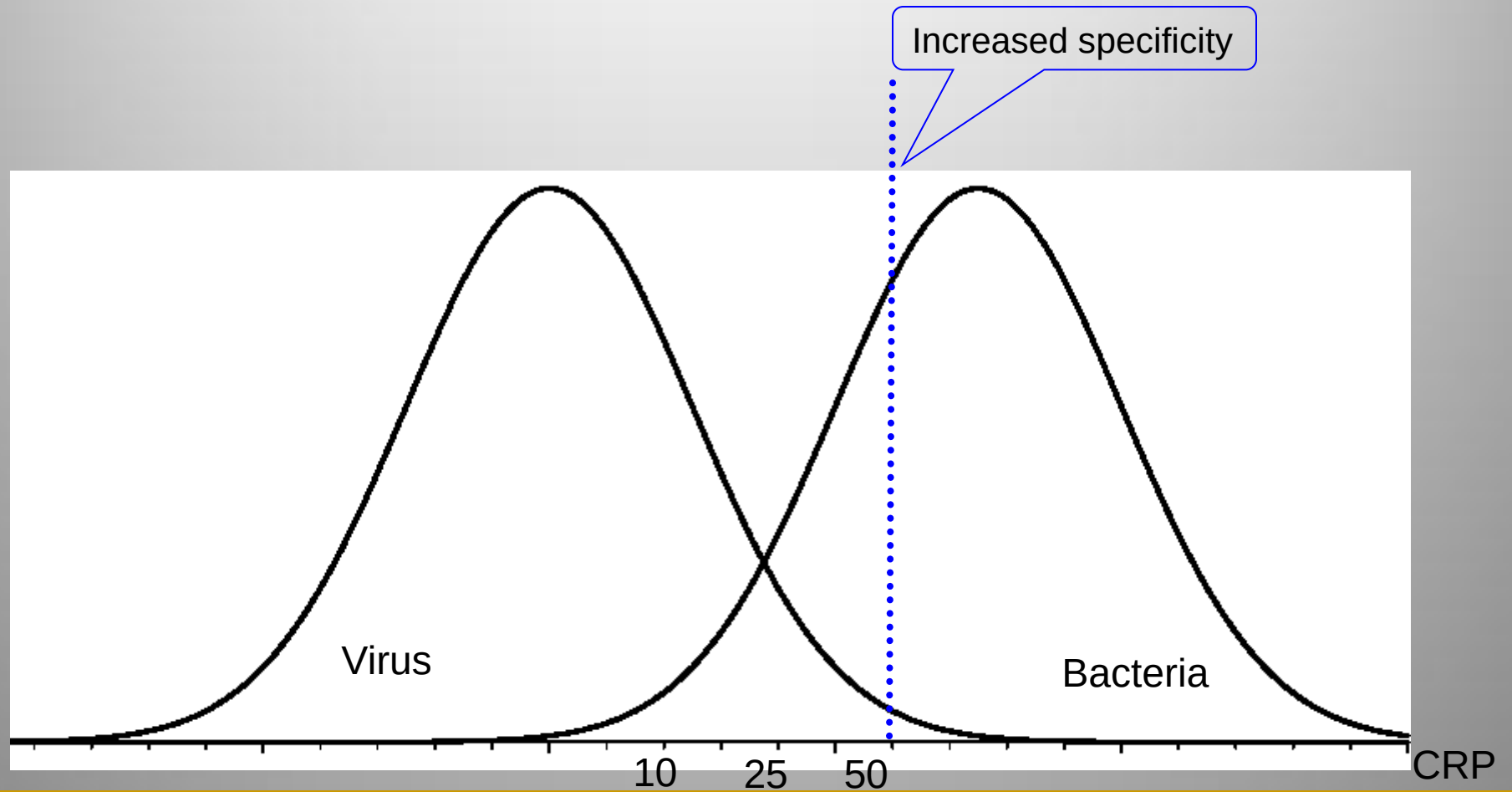




## Cut point for CRP, true and false values



## Cut point for CRP, true and false values



# Validity of CRP in patients with Sinusitis

## ■ Sensitivity and specificity:

- Cut-point 10mg/l
  - Sensitivity 73%
  - Specificity 60%
- Cut point 25mg/l
  - Sensitivity 52%
  - Specificity 77%
- Cut point 50mg/l
  - Sensitivity 33%
  - Specificity 89%

## ■ Predictive values:

- Cut-point 10mg/l
  - PV pos 0.68
  - PV neg 0.66
- Cut point 25mg/l
  - PV pos 0.73
  - PV neg 0.59
- Cut point 50mg/l
  - PV pos 0.79
  - PV neg 0.54

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Jens Georg Hansen et al:

## Predicting acute maxillary sinusitis in a general practice population

BMJ 1995;311:233-236 (22 July)

- **Objective:** To evaluate the diagnostic value of symptoms, signs, erythrocyte sedimentation rate, and C reactive protein for acute maxillary sinusitis.

**Design:** Prospective cohort study.

**Setting:** Danish general practice in cooperation with the otorhinolaryngology and neuroradiology department at Aalborg County Hospital.

**Subjects:** 174 patients aged 18-65 years who were suspected by the general practitioner of having acute maxillary sinusitis.

**Main outcome measure:** The independent association of symptoms, signs, erythrocyte sedimentation rate, and concentration of C reactive protein in patients with acute maxillary sinusitis defined as purulent or mucopurulent antral aspirate.

**Results:** Only raised erythrocyte sedimentation rate ( $P=0.01$ ) and raised C reactive protein ( $P=0.007$ ) were found to be independently associated with a diagnosis of acute maxillary sinusitis. The combination of the two variables had a sensitivity of 0.82 and a specificity of 0.57.

- **Conclusion:**
  - Low diagnostic value of symptoms and signs
  - A raised value of CRP is a better basis for deciding to give antibiotics than a clinical examination
-

## Symptoms and signs in culture-proven acute maxillary sinusitis in a general practice population

JENS GEORG HANSEN,<sup>1</sup> TOVE HØJBJERG<sup>2</sup> and JØRN ROSBORG<sup>3</sup>

<sup>1</sup>General Practice Lindenborgvej, Aalborg SV, Denmark; Departments of <sup>2</sup>Clinical Microbiology and <sup>3</sup>Otorhinolaryngology, Aalborg Hospital, Aarhus University Hospital, Aalborg, Denmark

Hansen JG, Højbjerg T, Rosborg J. Symptoms and signs in culture-proven acute maxillary sinusitis in a general practice population. APMIS 2009; 117: 724–9.

The objective of this study was to assess symptoms and signs in patients with maxillary sinusitis. The main outcome measures were symptoms and signs, erythrocyte sedimentation rate (ESR), and C-reactive protein (CRP) concentration and confirmed infection with the predominant bacterial pathogens *Streptococcus pneumoniae* and *Haemophilus influenzae*. The predominant organisms found in patients with acute maxillary sinusitis were *S. pneumoniae* and *H. influenzae*. Body temperature  $> 38^{\circ}\text{C}$  and maxillary tenderness were significantly associated with the presence of *S. pneumoniae* and *H. influenzae*. CRP concentration and confirmed infection with the predominant bacterial pathogens were significantly associated with increasing ESR and CRP symptoms and signs, with the exception of body temperature  $> 38^{\circ}\text{C}$  and maxillary tenderness. Elevated ESR and CRP values were significantly associated with positive bacterial culture results. On the other hand, absence of these symptoms and signs did not exclude maxillary sinusitis.

Key words: Acute maxillary sinusitis; symptoms; signs; microbiology; general practice. Jens Georg Hansen, Lindenborgvej 93, DK-9200 Aalborg SV, Denmark. e-mail: jg@lindenborgvej.dk

Hansen JG et al: APMIS 2009

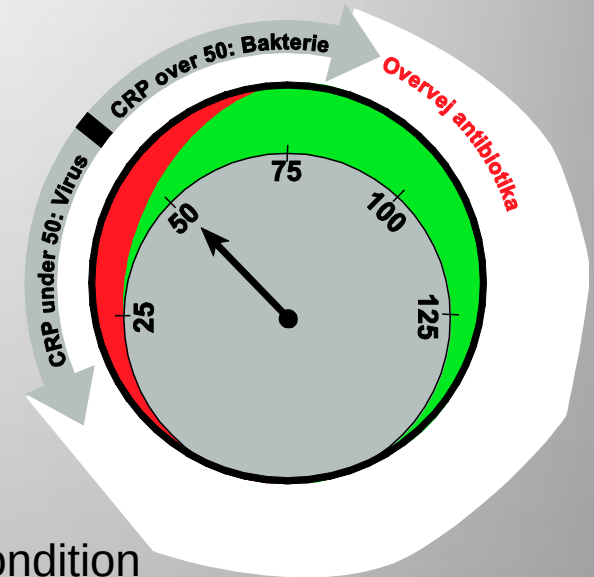
**Table 5.** Association between the concentration of C reactive protein (CRP) and the results of culture for *Streptococcus pneumoniae* or *Haemophilus influenzae* from either one or both maxillary sinuses in 45 patients with acute maxillary sinusitis compared with 82 patients with an absence of acute sinusitis

| CRP<br>(mg/l) | Acute maxillary sinusitis (n) |           |        | OR<br>(95% CI) |
|---------------|-------------------------------|-----------|--------|----------------|
|               | Unilateral                    | Bilateral | Absent |                |
| < 11          | 8                             | 4         | 63     |                |
| 11–49         | 10                            | 7         | 10     | 8.9 (4–22)     |
| > 49          | 11                            | 5         | 8      | 10.5 (4–27)    |



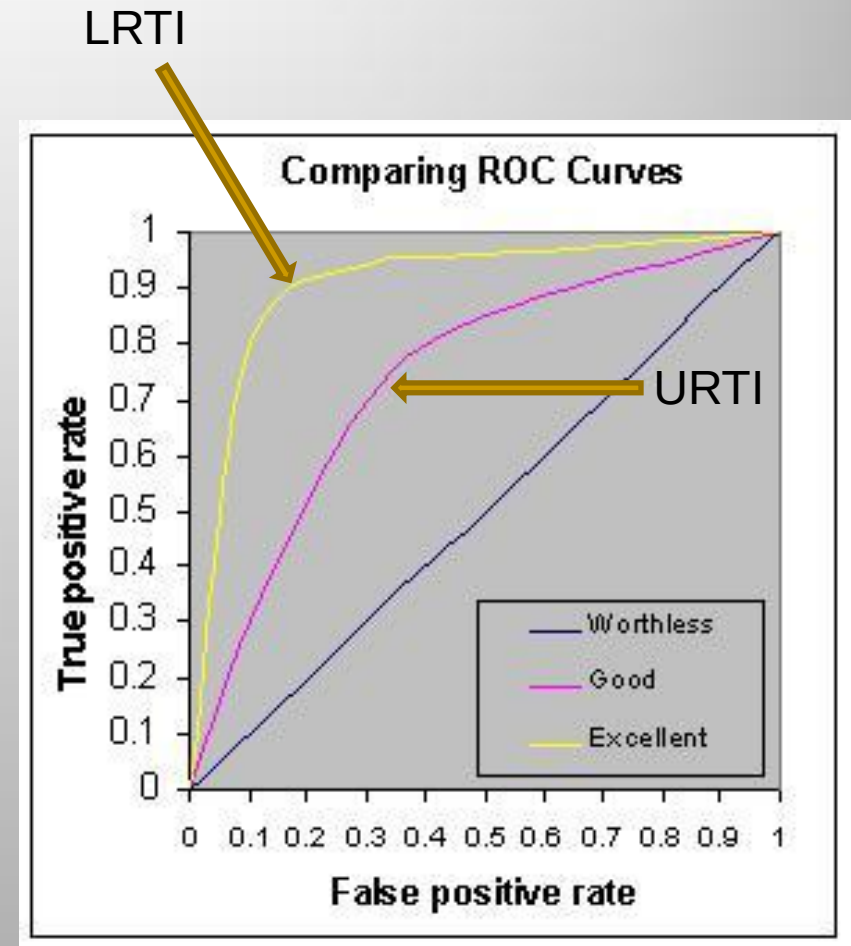
# Consequence of CRP testing in patients with Acute Sinusitis

- CRP < 10: Most probably Virus
- CRP > 50: Most probably Bacteria
  
- 0-10 mg/l
  - Low probability of a bacterial infection
    - Follow the patient without antibiotics
    - New CRP within 1-2 days
- 10-50 mg/l
  - Grey zone, the consequence depends on the clinical condition
    - Expectation without antibiotics
    - New CRP after 1-2 days
    - Antibiotic prescription if increased CRP
- >50 mg/l
  - High probability of a bacterial infection
    - Antibiotic prescription
    - Control the patient after a few days
    - New CRP to control the effect of treatment



# Receiver Operating Curve (ROC) and test validity

- Classification of the accuracy of a diagnostic test:
- Area under the curve:
  - ❑ 0.9-1.0 = excellent (A)
  - ❑ 0.8-0.9 = good (B)
  - ❑ 0.7-0.8 = fair (C)
  - ❑ 0.6-0.7 = poor (D)
  - ❑ 0.5-0.6 = fail (F)

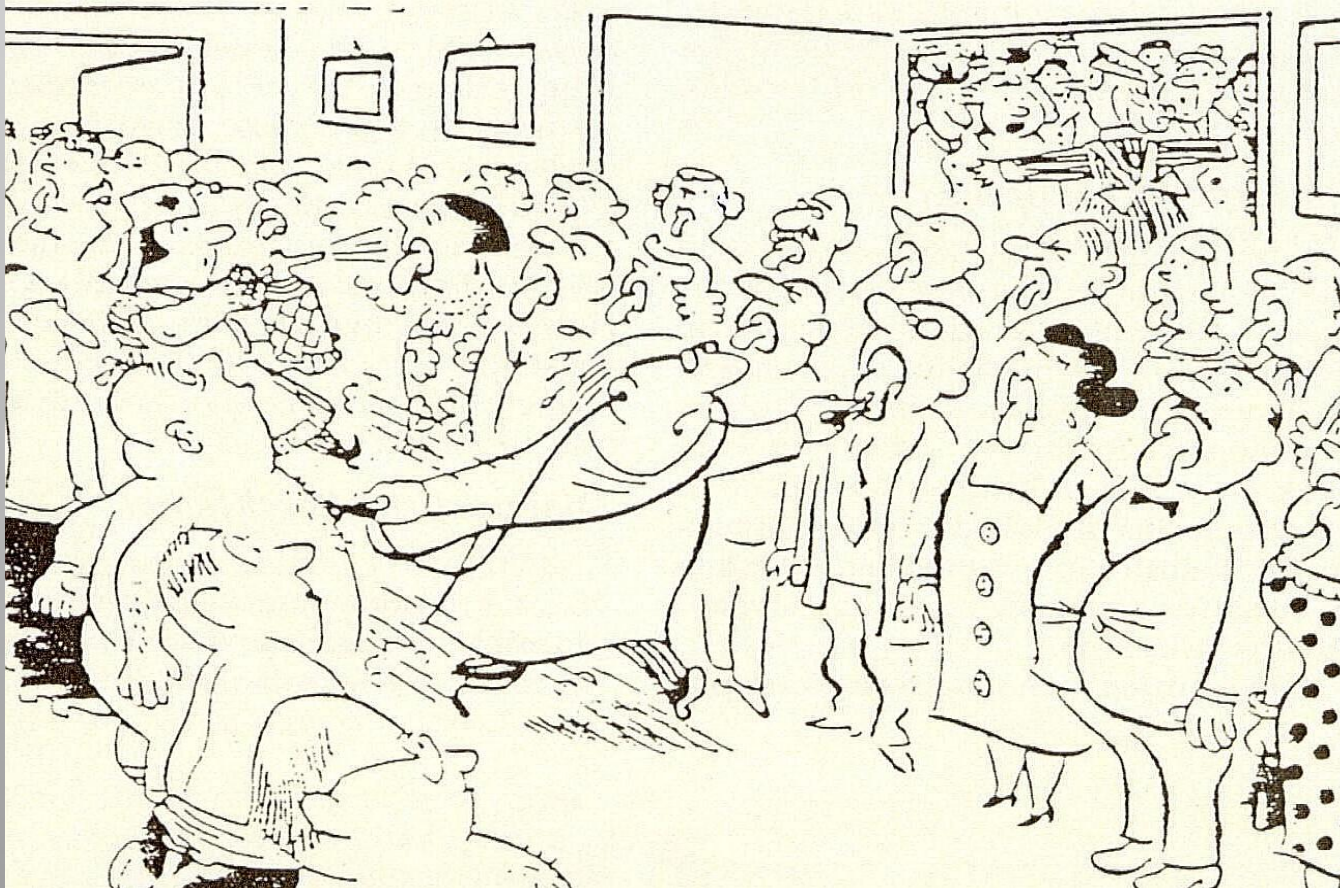


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Is there really a need for CRP  
measurement in patients with upper  
respiratory tract infections?

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General practitioners are busy people that need valid tests to distinguish between viral and bacterial infections



## What do patients with respiratory infections want from the GP ?



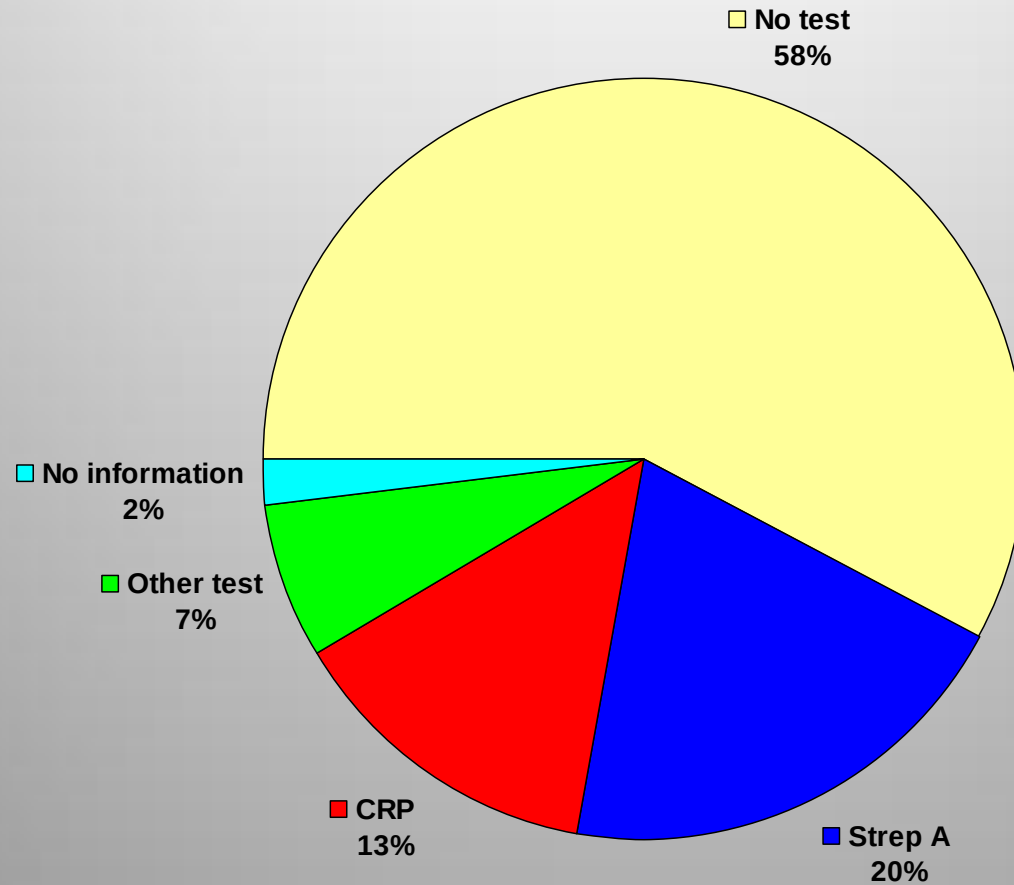
- Doctors are highly influenced by patients demand.
- Testing and Prescribing are ways of showing the patient that the GP understands the patient's problem and is willing to help
- Do patients with RTI expect the doctor to prescribe antibiotics?
  - Nordic countries: Infrequently
  - Southern European countries: Frequently
  - Slovakia?
- Do patients with RTI expect the doctor to perform a point of care test?
  - Nordic countries: Frequently – too frequently?
  - Southern Europe: Generally, no access to POC tests
  - Slovakia?





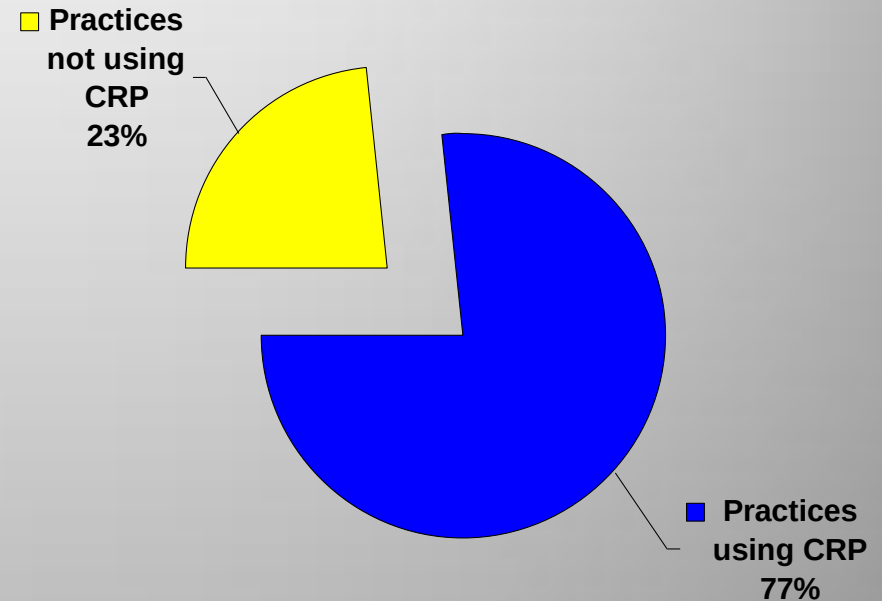
***Antibiotics: “one of the most uncomfortable prescribing decisions general practitioners make”***

# Use of point of care tests in patients with respiratory tract infections in DK.

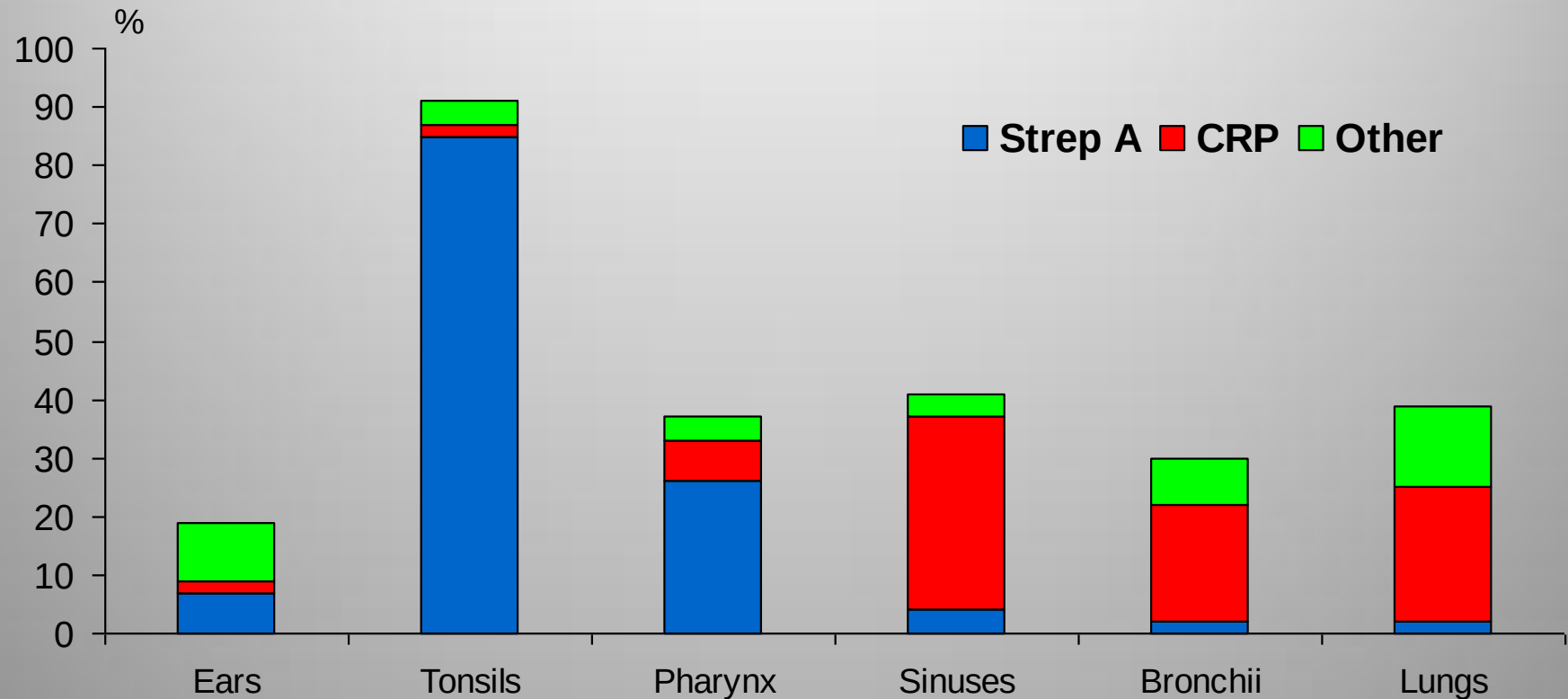


# CRP in general practice in Denmark

- CRP was introduced in general practice in Denmark about 10 years ago
- Today more than 3/4 of GPs have implemented the test in practice



# Diagnostic tests according to focus

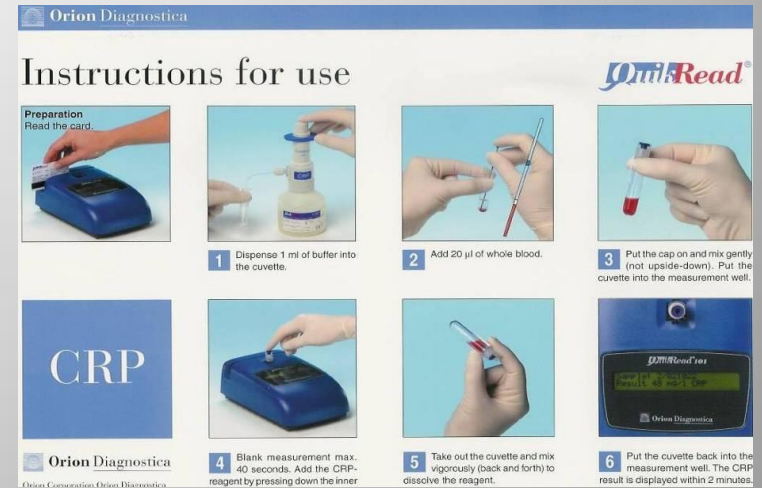


# Use of CRP in Danish general practice

NycoCard CRP

Axis-Shield Afinion

Orion QuikRead CRP





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Measurement of CRP in general practice  
-Does it influence the use of antibiotics?

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# C-reactive protein measurement in general practice may lead to lower antibiotic prescribing for sinusitis

Lars Bjerrum, Bente Gahrn-Hansen and Anders P Munck

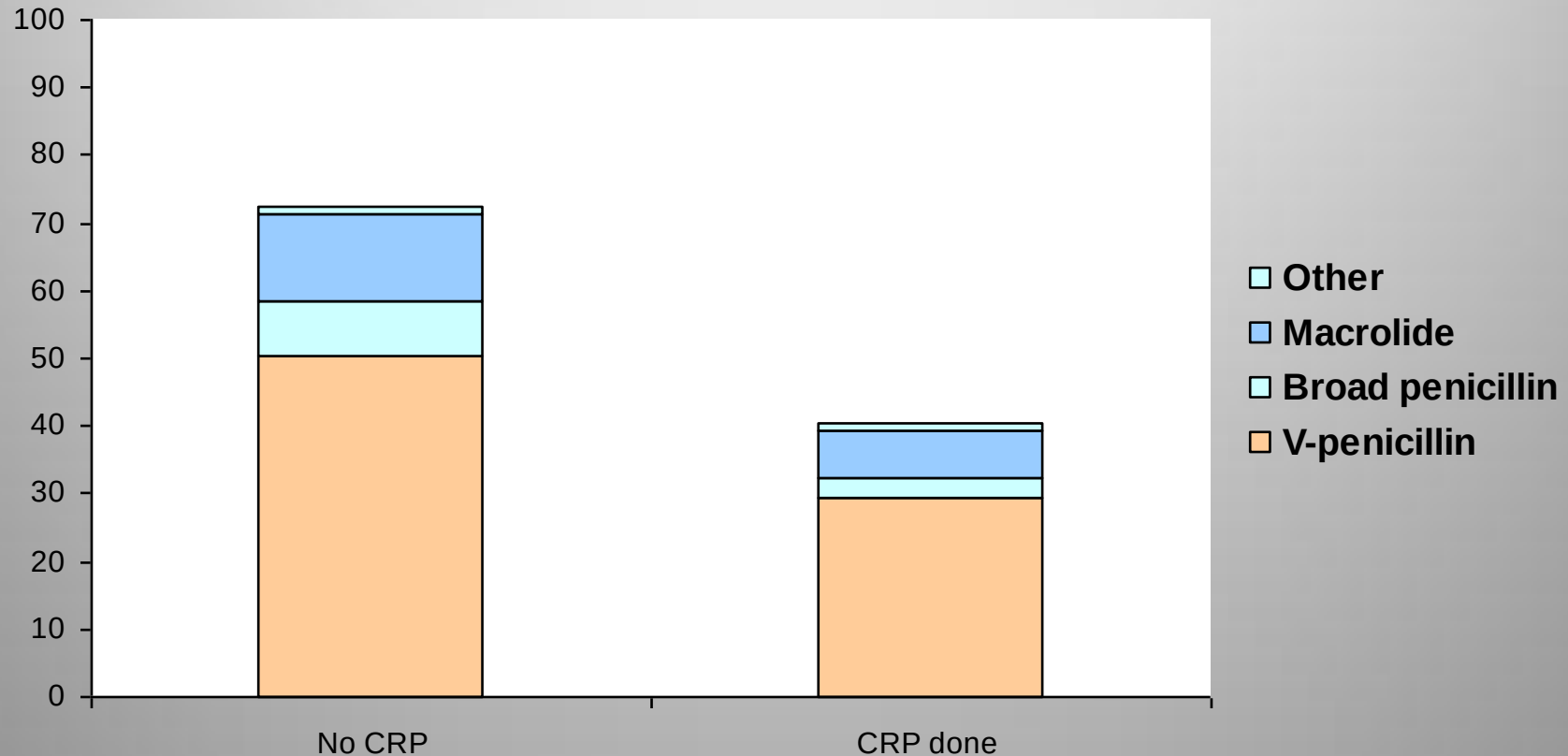
## SUMMARY

**Background:** Symptoms of bacterial sinusitis overlap with viral sinusitis, and it is difficult to distinguish between the two conditions based only on a clinical examination. Uncertain diagnosis results in the significant overuse of antibiotics, which is considered to be one of the most important reasons for development of bacterial resistance to antibiotics. Raised C-reactive protein (CRP) level is an indicator of bacterial infection and the CRP rapid test has been shown to be useful for

## Introduction

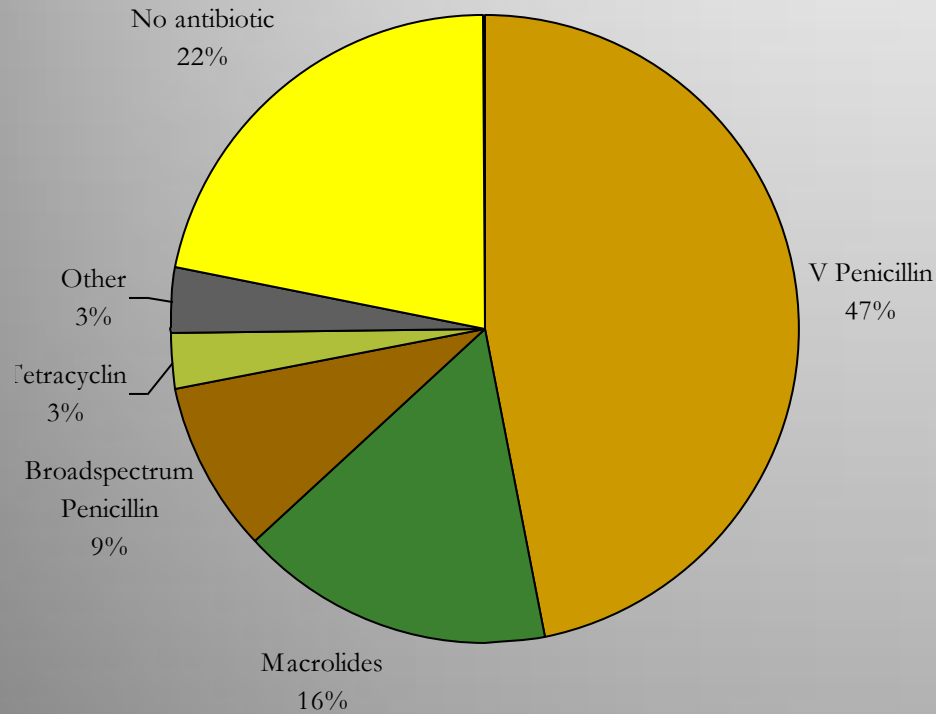
ACUTE sinusitis is an inflammation of the paranasal sinuses lasting for up to 4 weeks, and is caused by either bacterial (purulent sinusitis) or viral (serous sinusitis) infection.<sup>1</sup> Acute sinusitis is a frequently occurring problem in general practice, and it is challenging for the general practitioner (GP) to diagnose. The 'gold standard' to assess the etiology is a sinus puncture followed by aspiration and bacterial cul-

# Treatment of sinusitis in relation to performing of CRP

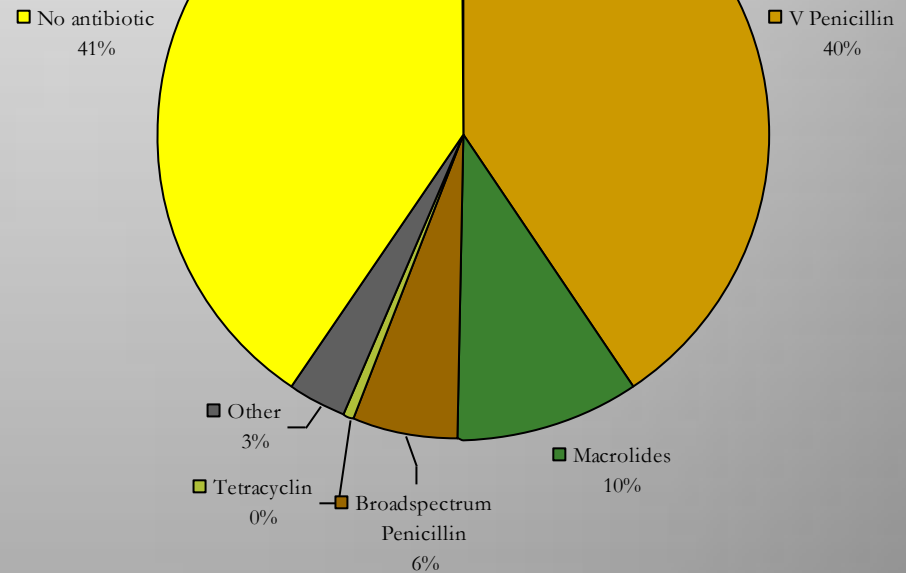


# Choice of antibiotics for sinusitis in relation to practice use of CRP

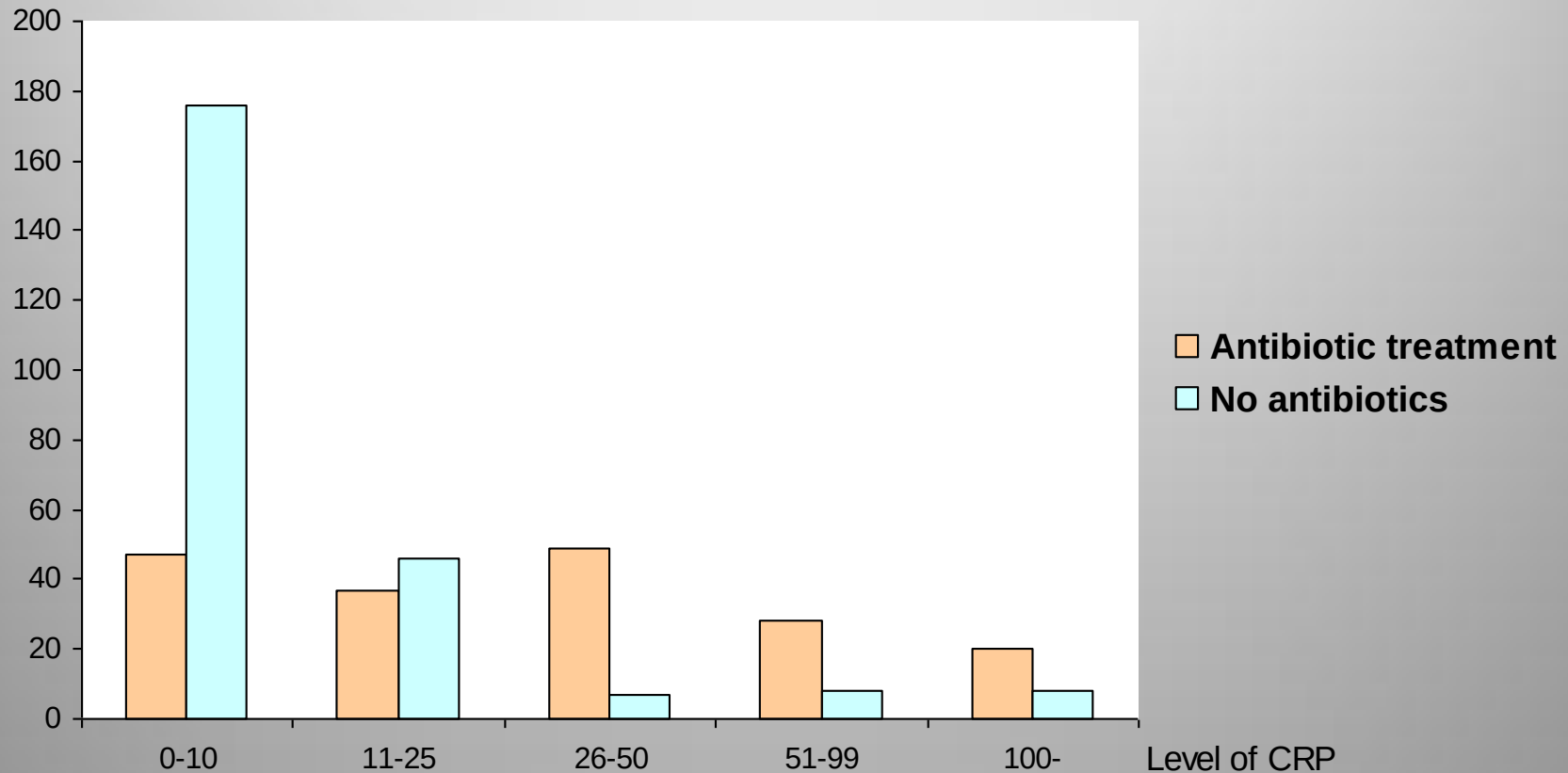
## Practices not using CRP



## Practices using CRP



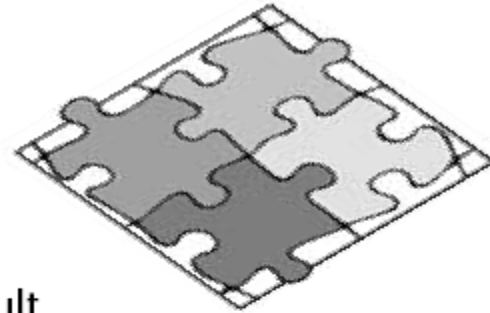
# Treatment of sinusitis in relation to the result of CRP



## HOW THIS FITS IN

### *What do we know?*

Symptoms of bacterial sinusitis overlap with viral sinusitis, and it is difficult to distinguish between the two conditions based on a clinical examination. Uncertain diagnosis may result in the overuse of antibiotics and so contribute to the development of bacterial resistance to antibiotics. Raised C-reactive protein (CRP) level is an indicator of bacterial infection, and the CRP rapid test has been shown to be useful for the diagnosis of bacterial sinusitis in general practice.



### *What does this paper add?*

Implementing the CRP rapid test in general practice may lead to a reduction in antibiotic prescribing to patients with sinusitis.



Logistic regression relating practice characteristics to prescribing of antibiotics for patients with sinusitis



|                                            | <b>Odds ratio</b> | <b>Confidence interval</b> |
|--------------------------------------------|-------------------|----------------------------|
| <b>Patient age</b>                         | <b>1.01</b>       | <b>1.00-1.02</b>           |
| <b>Patient sex</b>                         | <b>1.02</b>       | <b>0.80-1.30</b>           |
| <b>Practice with access to CRP</b>         | <b>0.43*</b>      | <b>0.33-0.58</b>           |
| <b>Number of listed patients</b>           | <b>1.00</b>       | <b>0.99-1.01</b>           |
| <b>Number of years working in practice</b> | <b>1.0</b>        | <b>1.00-1.00</b>           |
| <b>Type of practice (solo/group)</b>       | <b>1.41*</b>      | <b>1.12-1.77</b>           |
| <b>Workload in practice</b>                | <b>0.92</b>       | <b>0.81-1.11</b>           |

# Lesson learnt

- Implementing CRP test in general practice may lead to a reduction in antibiotic prescribing for patients with sinusitis
- The chance of avoiding antibiotics in a practice with access to CRP is double as high as the chance in a practice without access to CRP



## Effect of intervention promoting a reduction in antibiotic prescribing by improvement of diagnostic procedures: a prospective, before and after study in general practice

Lars Bjerrum · Josep M. Cots · Carl Llor ·  
Núria Molist · Anders Munck

Received: 1 May 2006 / Accepted: 18 July 2006  
© Springer-Verlag 2006

### Abstract

**Objective** To investigate if an intervention aimed at improving the quality of the diagnostic procedures in Spanish general practice could lower antibiotic prescribing in patients with respiratory tract infections (RTIs).

**Methods** GPs in the intervention group ( $n=17$ ) registered all patients with RTIs during a 3-week period before and after the intervention. The intervention was aimed at reducing prescribing of inappropriate antibiotics for RTIs by improving the diagnostic procedures and thereby helping the GPs to distinguish between bacterial and viral infections. It consisted of courses in management of RTI according to local clinical guidelines, and included implementation of two rapid diagnostic tests (StrepA and CRP measurement). Diagnoses and prescribing of antibiotics

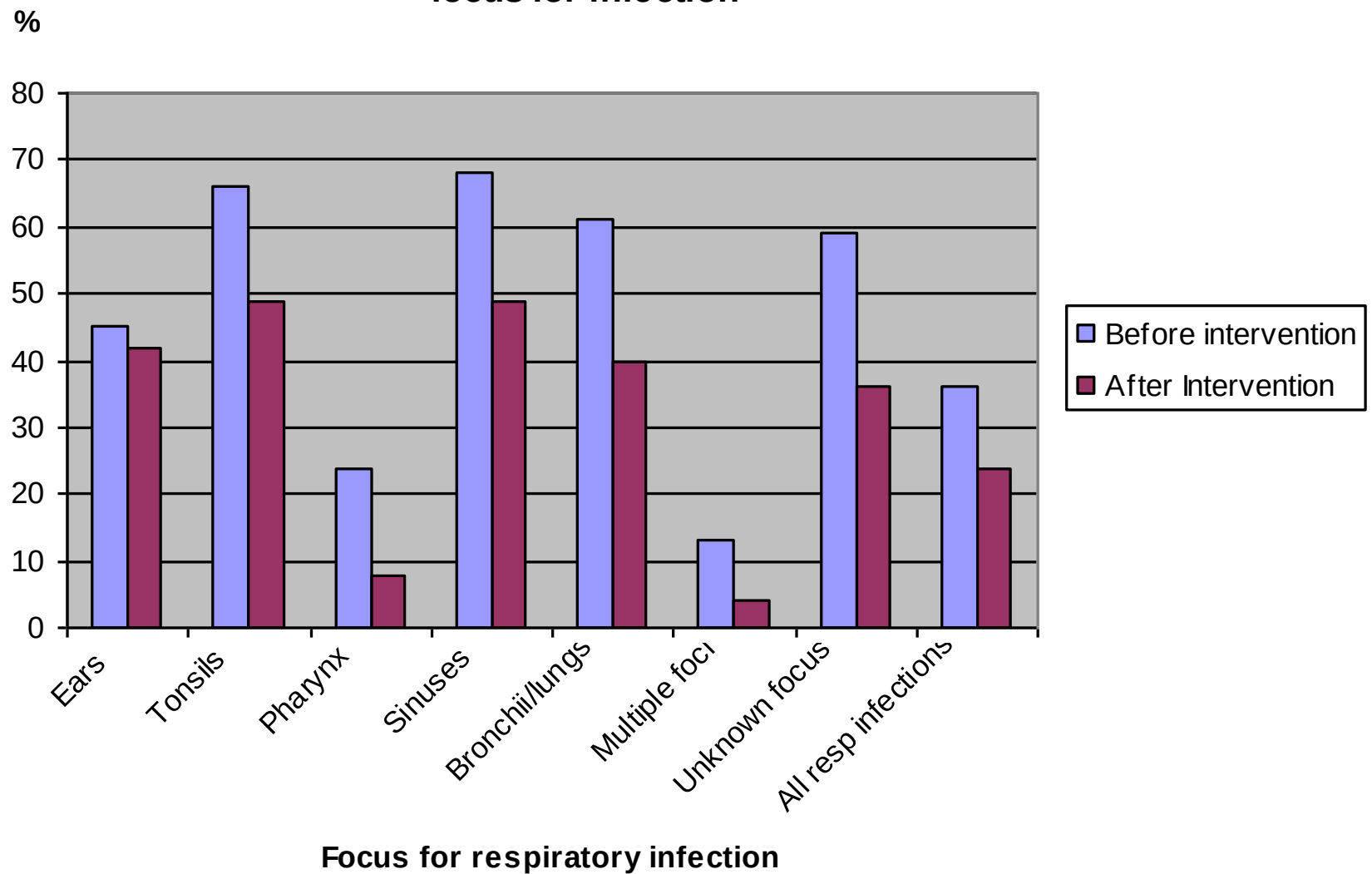
were assessed before and after the intervention, and compared to a control group not exposed to intervention (35 GPs).

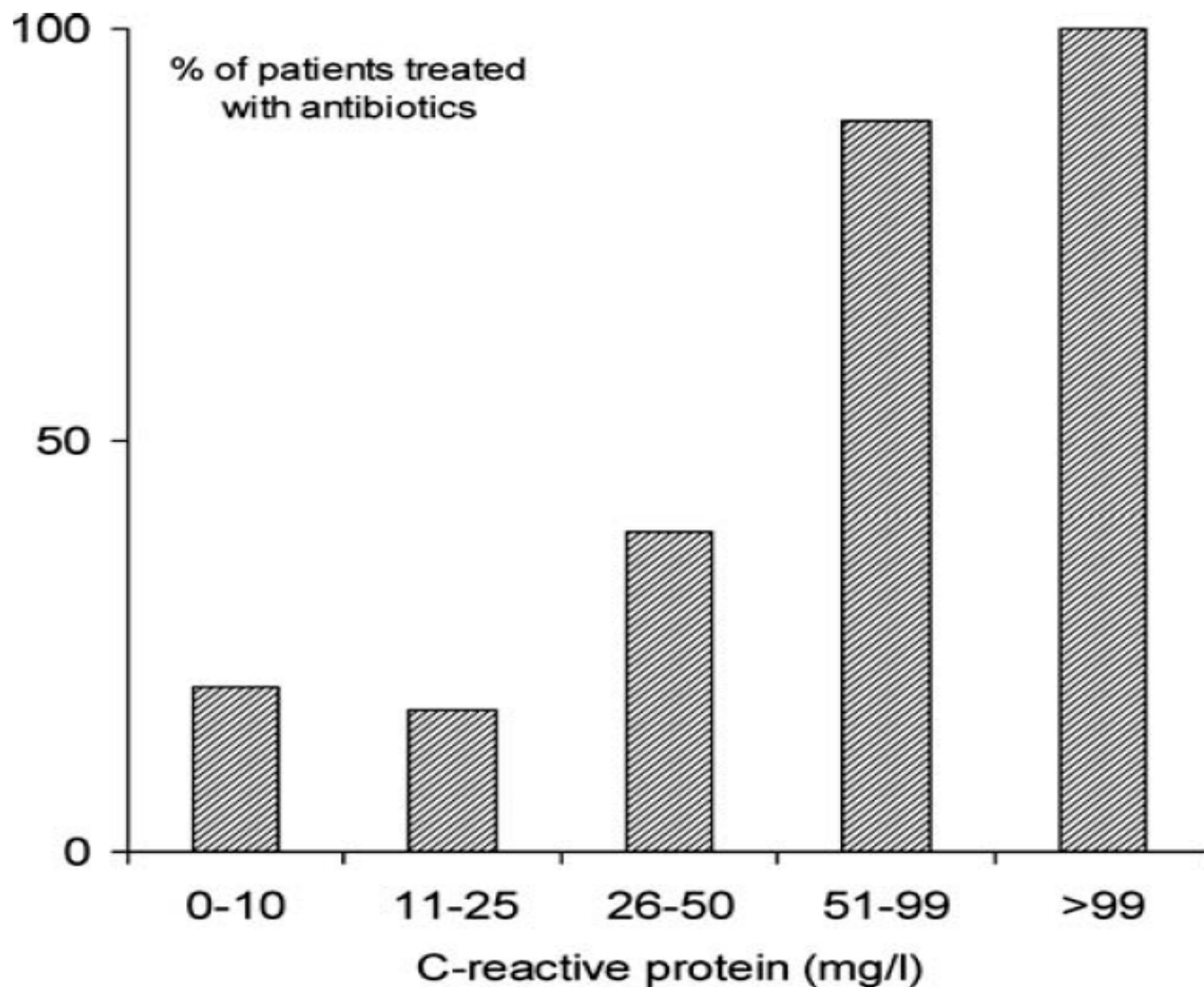
**Results** The intervention led to a significant reduction in antibiotic prescribing. Before the intervention 36% (29%–44%) of consultations were followed by antibiotic prescribing, after the intervention 24% (20%–29%). Antibiotic prescribing in the control group not exposed to intervention was 32% (27%–38%). The reduction was most pronounced in patients with sinusitis and lower RTIs.

**Conclusion** Quality improvement of diagnostic procedures may lead to a reduction of antibiotic prescribing in primary health care in Spain.

**Keywords** Antibiotics · General practice · Intervention · Diagnostic procedures · Respiratory tract infections

## Percentage of consultations with antibiotic prescribing in relation to focus for infection





**Fig. 2** Percentage of antibiotic prescribing for patients with suspected lower respiratory infections in relation to the result of CRP

# Global perspectives by implementing laboratory test for patients with RTI in general practice

- Will GPs be better to distinguish between bacterial and viral infections?
- Will inappropriate antibiotic prescriptions be reduced?





**AMERICA'S HOTTEST NEW THEME PARK**

**Littleton  
Remembers**

**The Long  
Air War  
Ahead**

**U.S. News**  
& WORLD REPORT

MAY 16, 1999

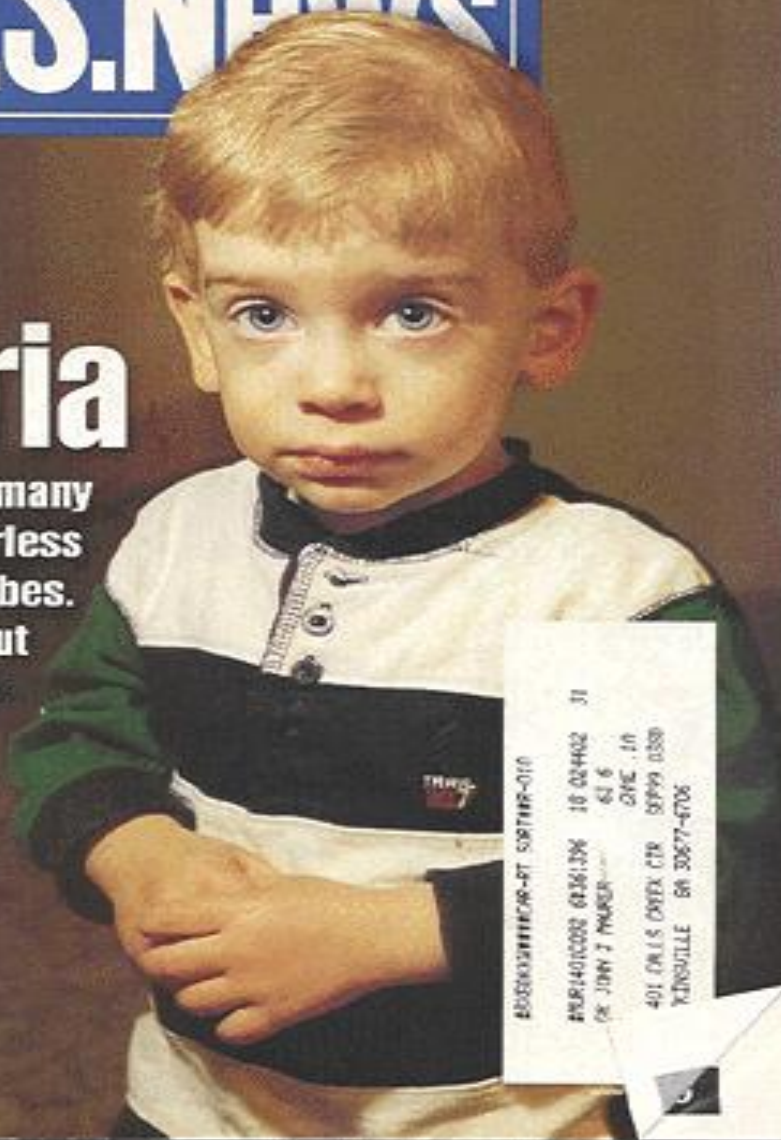
# Killer Bacteria

Because of overuse, many  
antibiotics are powerless  
against deadly microbes.  
This boy survived—but  
many others may not

**Digital TV  
Comes of Age**

**A New Plan  
for Social  
Security**

**Pat Buchanan  
Punches Away**



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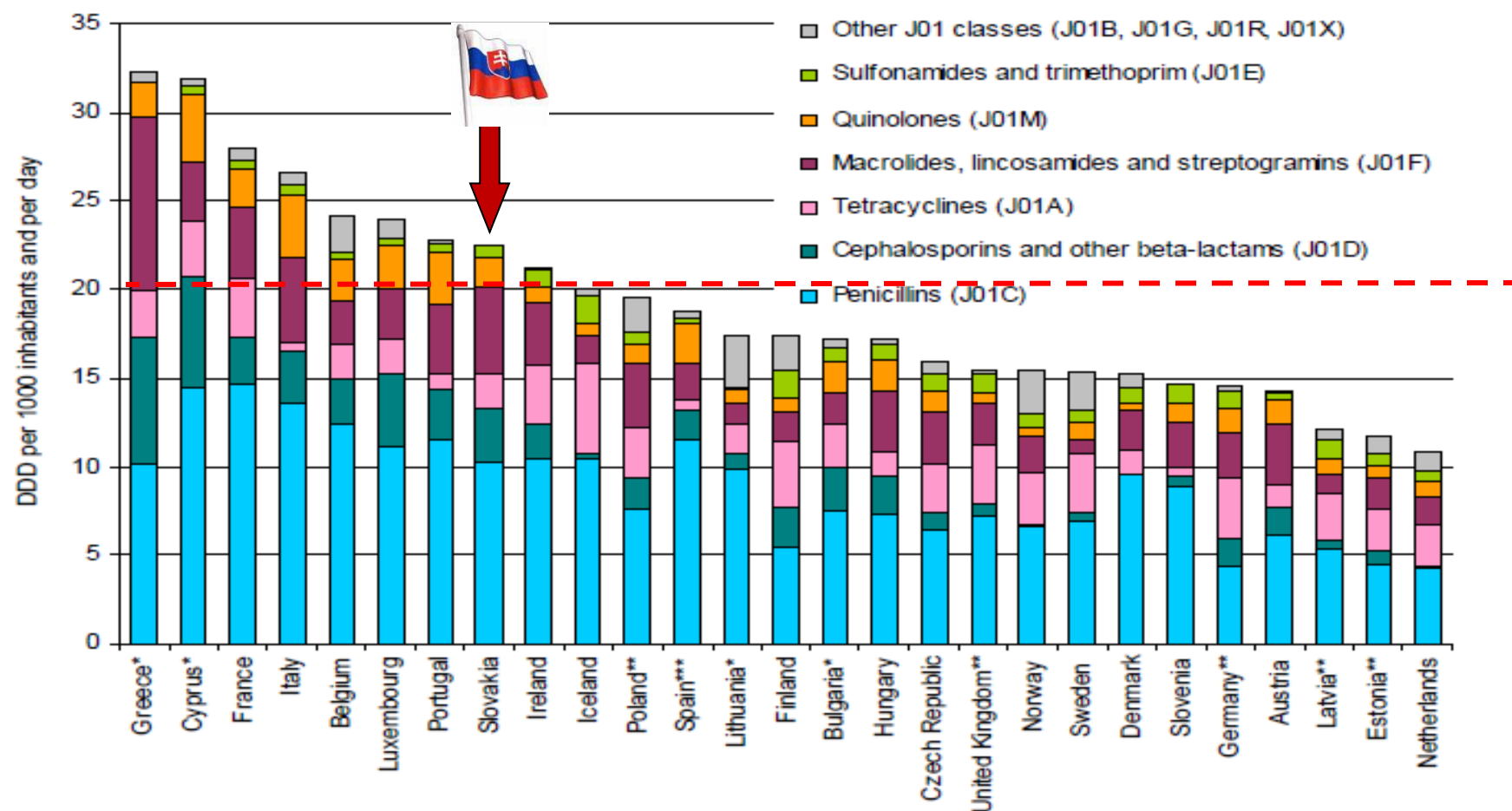
OK JOHN J MURPHY 61 6

ONE 10

401 ORLS CRYST CTR 507100 0380

KINGVILLE GA 30677-4706

# Total Outpatient Antibiotic Use (ATC J01) in 27 European Countries, 2006



\* Total use, i.e. including inpatients, for Bulgaria, Cyprus, Greece and Lithuania.

\*\* 2005 data for Estonia, Germany, Latvia, Poland and United Kingdom.

\*\*\* Reimbursement data, which do not include over-the-counter sales without a prescription for Spain.



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## Welcome

### Kickoff meeting 12-13.4. Programme and registration

**FP6 programme:** Scientific Support to Policies (SSP)

**Project title:** Health Alliance for Prudent Prescribing, Yield And Use of Anti-microbial Drugs In the Treatment of Respiratory Tract Infections

**Acronym:** HAPPY AUDIT

**Project number:** 044154

**EC contribution:** 1.492.300 €

**Duration:** 36 months

**Starting date:** 01/04/2007

**Instrument:** Specific Targeted Research Project (STREP)

**Facts about the use of antibiotics for patients with respiratory tract infections:**

- Most respiratory tract infections are caused by virus
- Most respiratory infections are not dangerous
- Very few respiratory infections are serious or life-threatening
- Only few respiratory infections need acute treatment
- Most prescriptions are issued for fear of serious infections –



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**[apo@health.sdu.dk](mailto:apo@health.sdu.dk)**

# HAPPY AUDIT

## Objective

- *to reduce the occurrence of bacterial resistance*
  - *by reducing prescribing of unnecessary antibiotics for respiratory tract infections*
  - *by improving the use of appropriate antibiotics in suspected bacterial infections*
  - *by improving the quality of diagnostic procedures for RTIs in general practice*







# HAPPY AUDIT

- Nordic region
  - Denmark 102 GPs
  - Sweden 77 GPs
- Balticum region
  - Lithuania 31 GPs
  - Kaliningrad 39 GPs
- Region Hispano-America:
  - Spain 309 GPs
  - Argentina 60GPs
- TOTAL 618 GPs

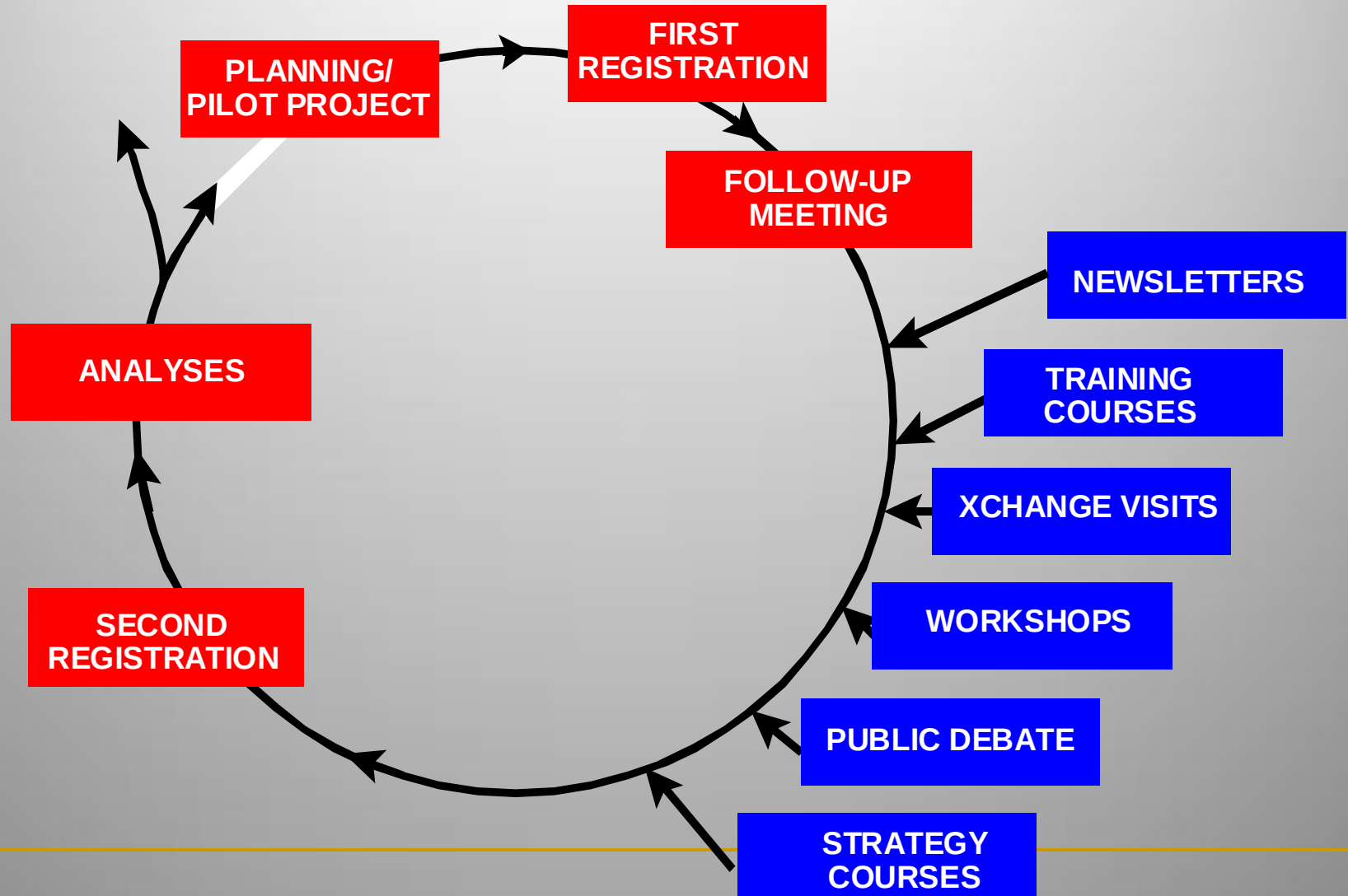


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Дата регистрации

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# The Audit circle:





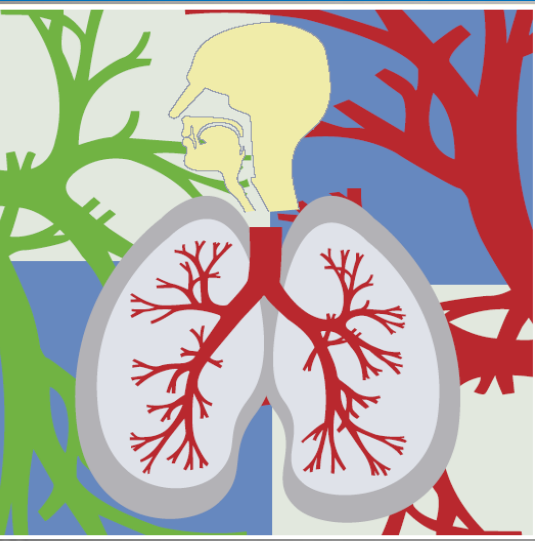
# Intervention material for professionals

- Reports with aggregated and individual results based on 1. registration
- Happy Audit Guidelines
- Laboratory tests and instructions



# HAPPY AUDIT

Respiratory  
infections in general  
practice



Results from  
6 countries



## Reports

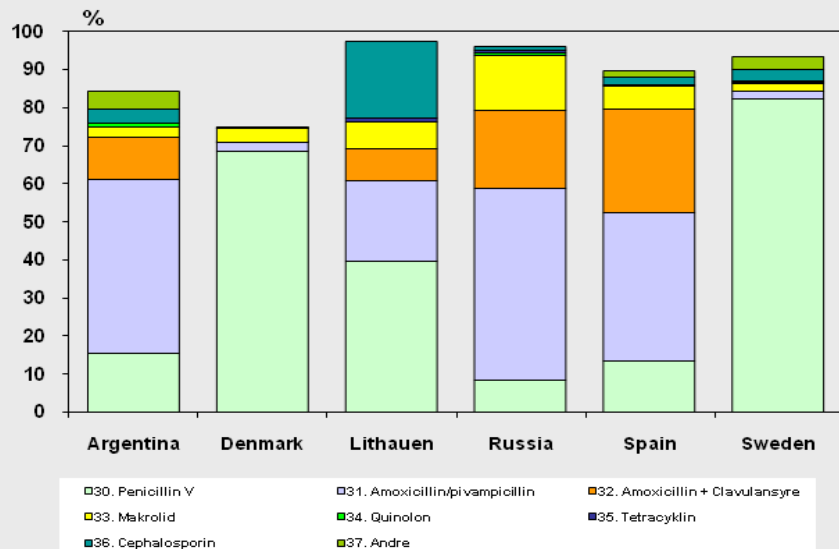
Reports in national  
language including  
individual results were sent  
to all participating GPs



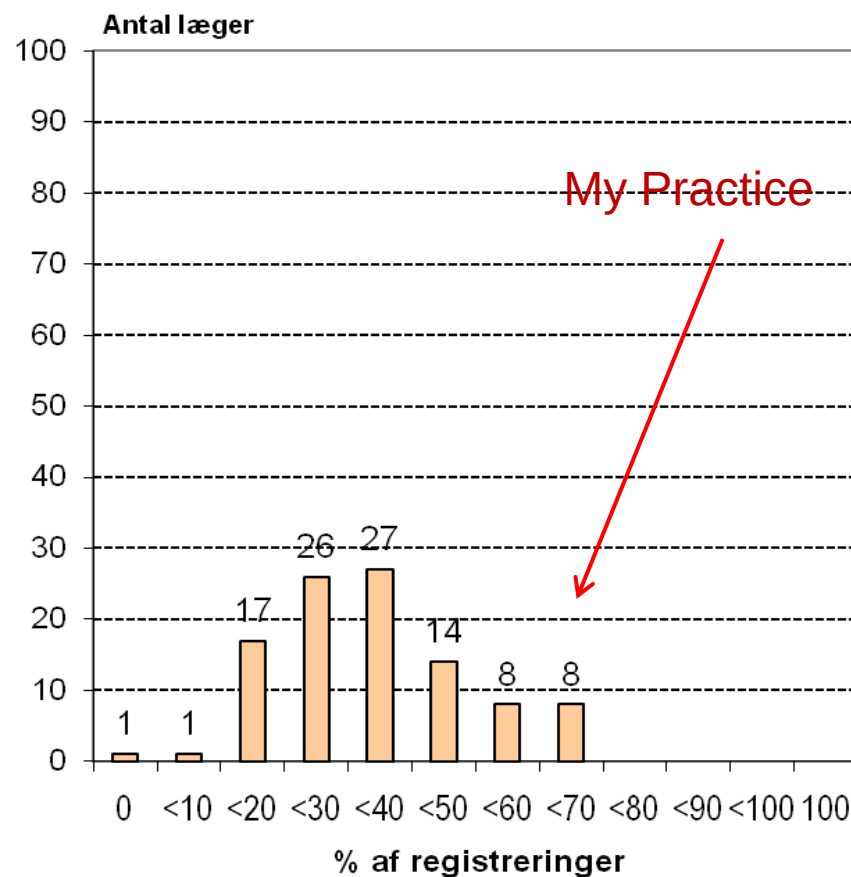


# Reports: Individual results

## Antibiotics



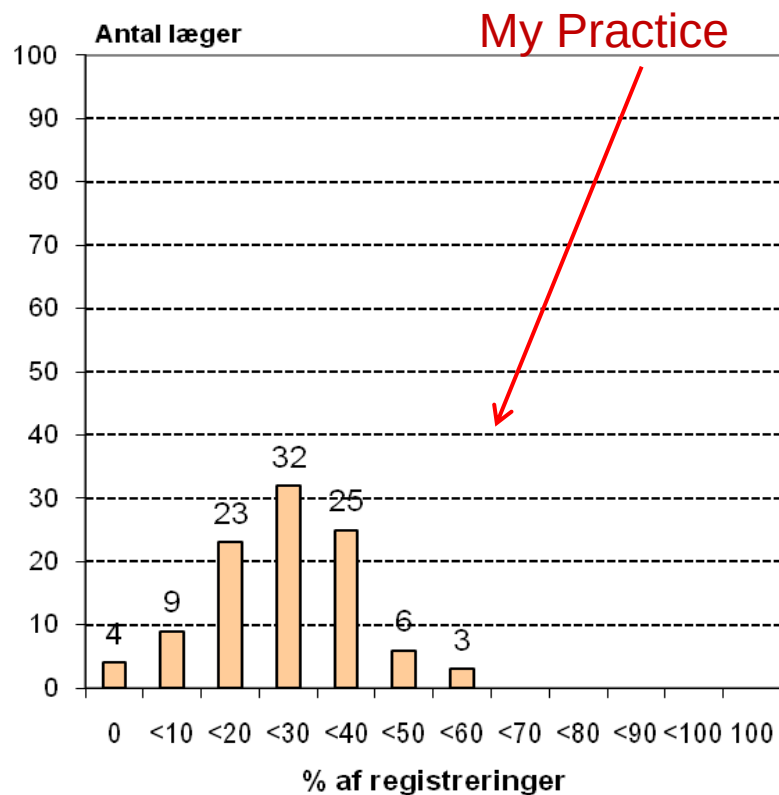
## Antibiotika Antibiotics



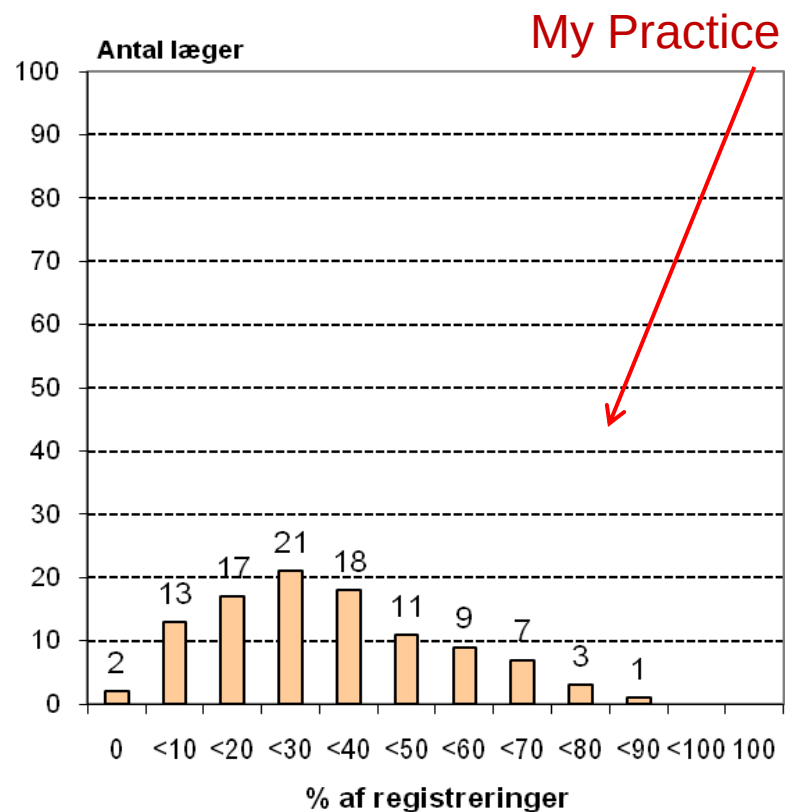


# Reports: Individual results

Strep A  
Strep A



CRP  
CRP



# Guidelines



## **VEJLEDNING I DIAGNOSTIK OG BEHANDLING AF LUFTVEJSINFEKTIONER I ALMEN PRAKSIS**



## **GUÍAS PARA EL DIAGNÓSTICO Y TRATAMIENTO DE LAS INFECCIONES DEL TRACTO RESPIRATORIO EN ATENCIÓN PRIMARIA**



### Akut tonsillitis

#### Definition

Infektion i tonsiller forårsaget af virus eller bakterier.

#### Symptomer og fund

Symptomerne er karakteriseret ved ondt i halsen, synkesmerter og almen sygdomsfølelse. Der kan desuden være feber. De objektive fund er meget varierende, fra næsten ingen synlige forandringer til udtalt forstørrelse af tonsiller, hyperæmisk slimhinde, belægninger på tonsiller og hævede lymfeknuder på halsen.

#### Diagnose

Omkring 2/3 af tilfældene er forårsaget af virus og 1/3 af bakterier.

Målet med diagnostikken er at identificere og behandle patienter med en bakterieinfektion. I de fleste lande er det kun gruppe A streptokokker (*Streptococcus pyogenes*, S.p.), der kræver behandling. I lande med endemisk forekomst af difteri er en bakteriedyrkning obligatorisk.

#### Patienter over 4 år

For patienter over 4 år bør den kliniske undersøgelse fokusere på forekomsten af 4 diagnostiske kriterier (Centor kriterier):

- Feber > 38.5 grader
- Hævede og ømme lymfeknuder på halsen
- Belægninger på tonsiller
- Fravær af hoste

#### Mulig virusinfektion

Patienter med halssmerter ledsaget af symptomer på en virusinfektion (f.eks. hoste, snue, hæshed, universel glandelsvulst, blister i ganen) og/eller forekomsten af maksimalt et Centor-kriterie har højst sandsynligt en virusinfektion. Hos disse patienter bør der ikke foretages Strep A test på grund af den øgede risiko for falsk positive resultater.





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# Intervention material for Patients

- Brochures about Respiratory Tract Infections
- Posters in doctors waiting rooms

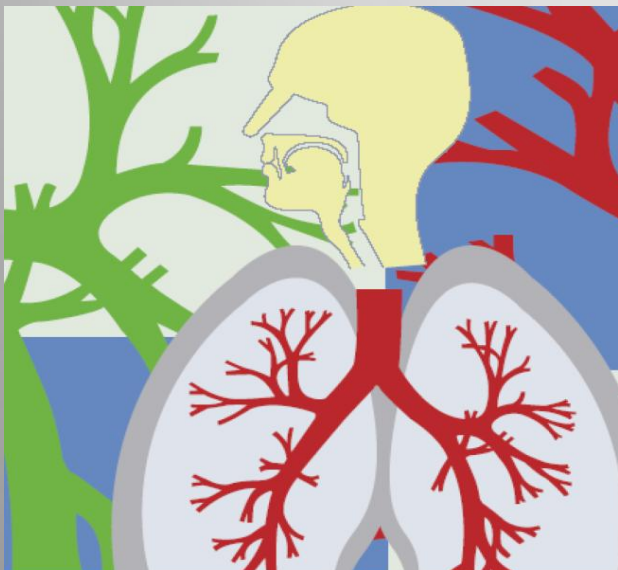
# Brochures

## FARINGITIS

Si Usted tiene dolor de garganta y además tos o congestión nasal, presenta entonces una infección causada por un virus y, por tanto, debe tratarse como un resfriado. Los antibióticos no serán por tanto eficaces.

Si su garganta está afectada, tiene fiebre y se siente enfermo, pero no tiene tos ni le gotea la nariz, entonces su infección podría estar causada por una bacteria. Es difícil probar si la infección es causada por una bacteria (estreptococo) o por un virus. Una manera de ayudar al médico es haciendo una prueba rápida en la consulta y si ésta indica una infección bacteriana causada por bacterias, entonces le podría ser útil la penicilina.

Debido a que la mayoría de las infecciones bacterianas son curadas por su propio sistema inmunitario tan rápidamente como lo hace la penicilina, solamente aquéllos que realmente estén enfermos se podrían beneficiar usándola.



**Información para pacientes**

**CONSEJOS CUANDO ALGUIEN  
DE SU FAMILIA TENGA  
UNA INFECCIÓN**

**El Proyecto Happy Audit  
Un Proyecto Europeo de Médicos de Familia**



## CATARRO



Un catarro o resfriado común comienza con una congestión nasal y algunas veces fiebre. Pueden aparecer dolor de garganta y tos después de unos pocos días.

El color del moco (amarillo o verde) que aparece después de unos días es causado por su sistema inmune y no es un signo de infección bacteriana que debiera ser tratado con antibióticos. La mayoría de los resfriados se curan a los 7-10 días.

Centenares de virus distintos causan el "catarro común". Los niños tienen entre 6 y 8 catarros anuales y los adultos, aproximadamente cuatro al año.

Habitualmente no es necesario utilizar pruebas de laboratorio para confirmar el diagnóstico de un resfriado.

Los antibióticos no sólo no son eficaces sino que pueden ser perjudiciales y tener efectos secundarios.

*Usted debería visitar a su médico si tiene: dolor de garganta, problemas de boca, no es capaz de tragar saliva o tiene fiebre alta y siente malestar general.*

*No es necesario que acuda a su médico ni tampoco debe tomar antibióticos cuando tiene un resfriado. En caso de necesidad puede usar analgésicos o antitérmicos.*



# Posters

# INFECCIONES

## ¿VIRUS O BACTERIAS? ¿CUÁL ES LA DIFERENCIA?

Los virus causan infecciones virales y las bacterias causan infecciones bacterianas. Los virus son mucho más pequeños que las bacterias y frecuentemente se diseminan con facilidad en el aire. Los antibióticos no tienen ningún efecto sobre los virus.

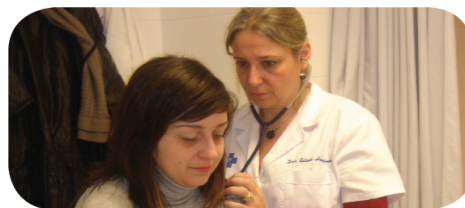
## ¿CUÁNDO PUEDEN SER ÚTILES LOS ANTIBIÓTICOS?

La mayoría de las infecciones, incluyendo las bacterianas, se curan gracias a nuestro sistema inmunitario. Es un sistema altamente eficiente y cura la mayoría de las infecciones. Sólo cuando estamos afectados por infecciones bacterianas, los antibióticos pueden ser de utilidad.

## ANTIBIÓTICOS- ¡UNA CLASE IMPORTANTE DE MEDICAMENTOS!

Cuando se utilizan correctamente, los antibióticos pueden curar enfermedades infecciosas y salvar vidas. Sin embargo, utilizados incorrectamente pueden ser perjudiciales. Debido a que muchos antibióticos son prescritos a niños de corta edad, es de suma importancia que los padres los utilicen con prudencia.

**ASÍ, ¿NO SIEMPRE CURARÁN LOS ANTIBIÓTICOS  
TODAS LAS INFECCIONES?**  
*CORRECTO ¡CONSULTE SIEMPRE A SU MÉDICO!*



**COJA UN FOLLETO PARA MÁS  
INFORMACIÓN SOBRE**

Catarro - Faringitis - Gripe  
Sinusitis - Otitis - Bronquitis

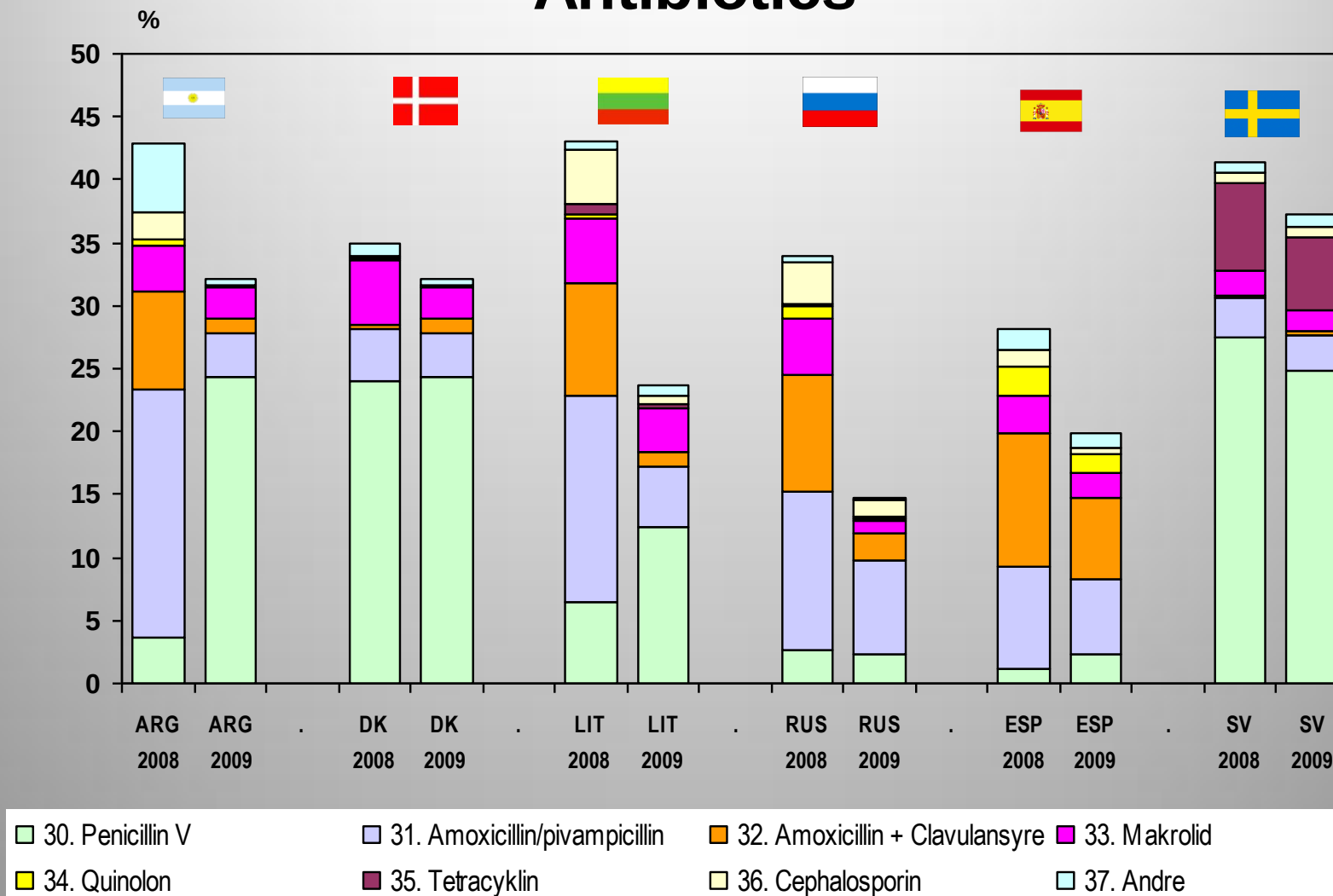


**HAPPY  
AUDIT**

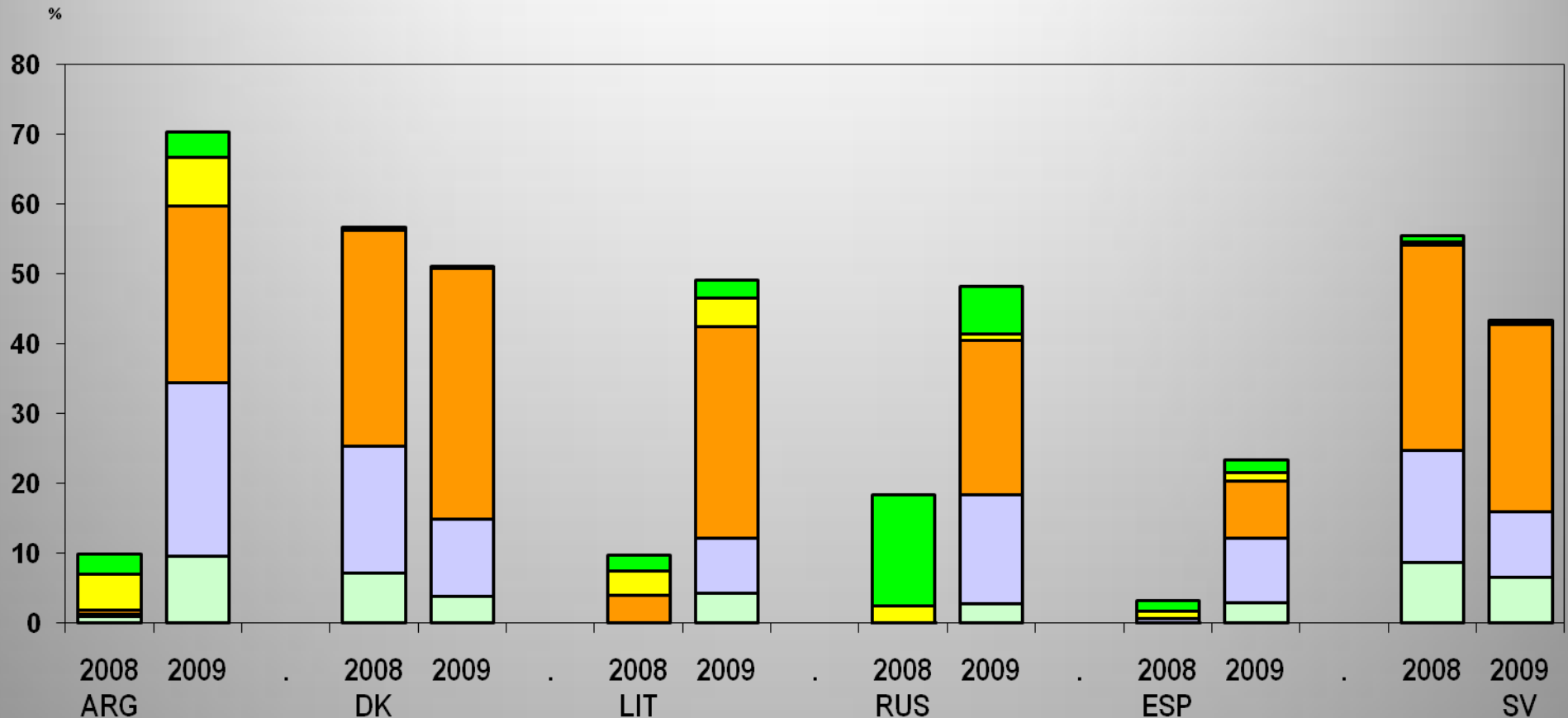
UN PROYECTO EUROPEO DE MÉDICOS DE FAMILIA

|                                                                                    |           | Number of doctors |      | Number of patients registered |       | Number of patients treated with antibiotics |            |
|------------------------------------------------------------------------------------|-----------|-------------------|------|-------------------------------|-------|---------------------------------------------|------------|
|                                                                                    |           | 2008              | 2009 | 2008                          | 2009  | 2008                                        | 2009       |
|   | Argentina | 60                | 48   | 4374                          | 3641  | 1780 (41%)                                  | 1170(32%)  |
|   | Denmark   | 102               | 78   | 3904                          | 3706  | 1351 (35%)                                  | 1185 (32%) |
|   | Lithauen  | 31                | 28   | 2706                          | 1976  | 1152 (43%)                                  | 468 (24%)  |
|   | Russia    | 39                | 37   | 3685                          | 3284  | 1215 (33%)                                  | 481 (15%)  |
|   | Spain     | 309               | 281  | 16751                         | 12760 | 4675 (28%)                                  | 2530 (20%) |
|  | Sweden    | 77                | 39   | 1853                          | 895   | 764 (41%)                                   | 333 (37%)  |
|                                                                                    | Total     | 618               | 511  | 33273                         | 26262 | 10937 (33%)                                 | 9669 (24%) |

# Antibiotics



# INVESTIGATIONS



16 15 14 13 12

12. Strep A positiv  
13. Strep A negativ  
14. CRP målt

15. Røntgen af thorax positiv  
16. Røntgen af thorax negativ  
17. Ingen af førnævnte

12. Strep A positive  
13. Strep A negative  
14. CRP (mg/l)

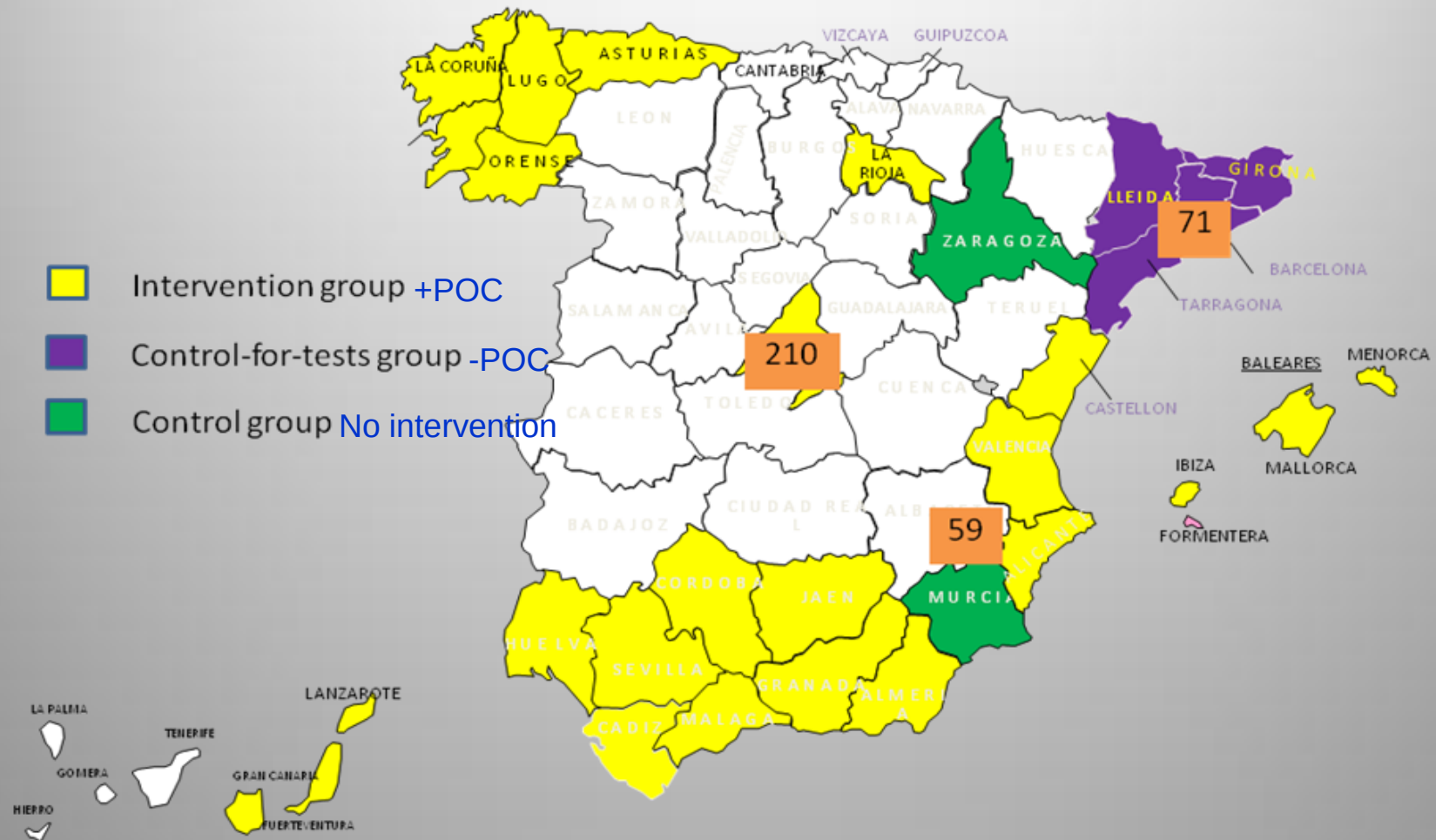
15. X-ray of thorax positive  
16. X-ray of thorax negative  
17. None of the above



What was the effect of introducing POC tests on the use of antibiotics?

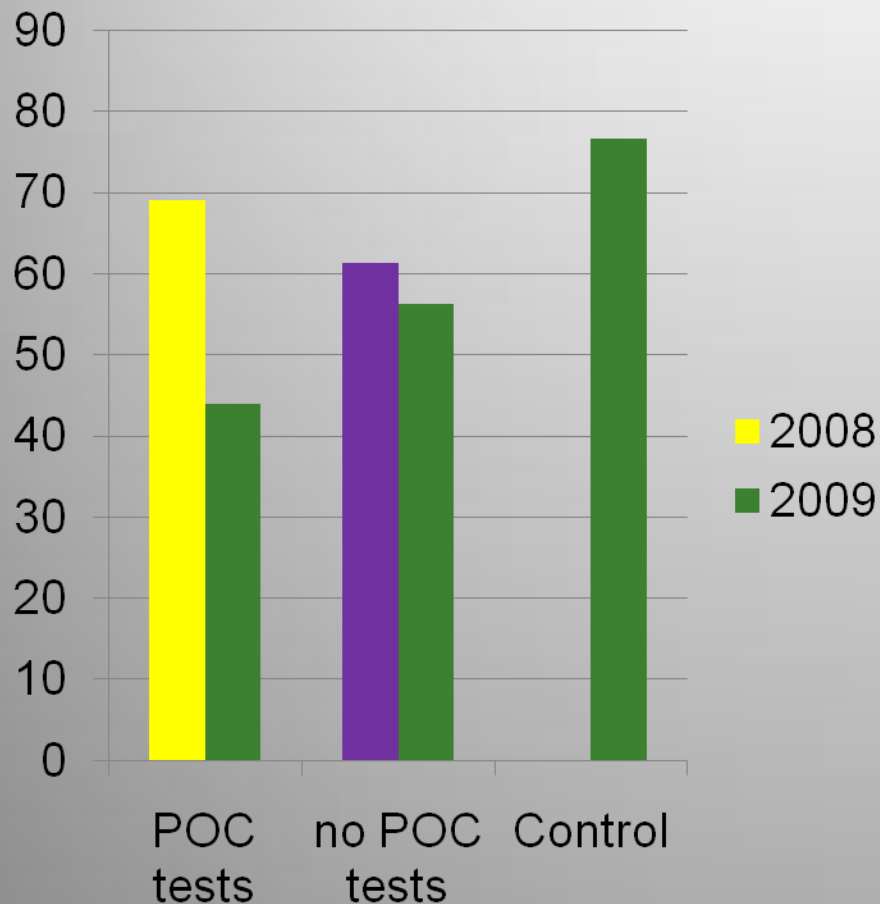


Figure 1. Areas in Spain in the second register, 2009



# HAPPY AUDIT intervention in Spain:

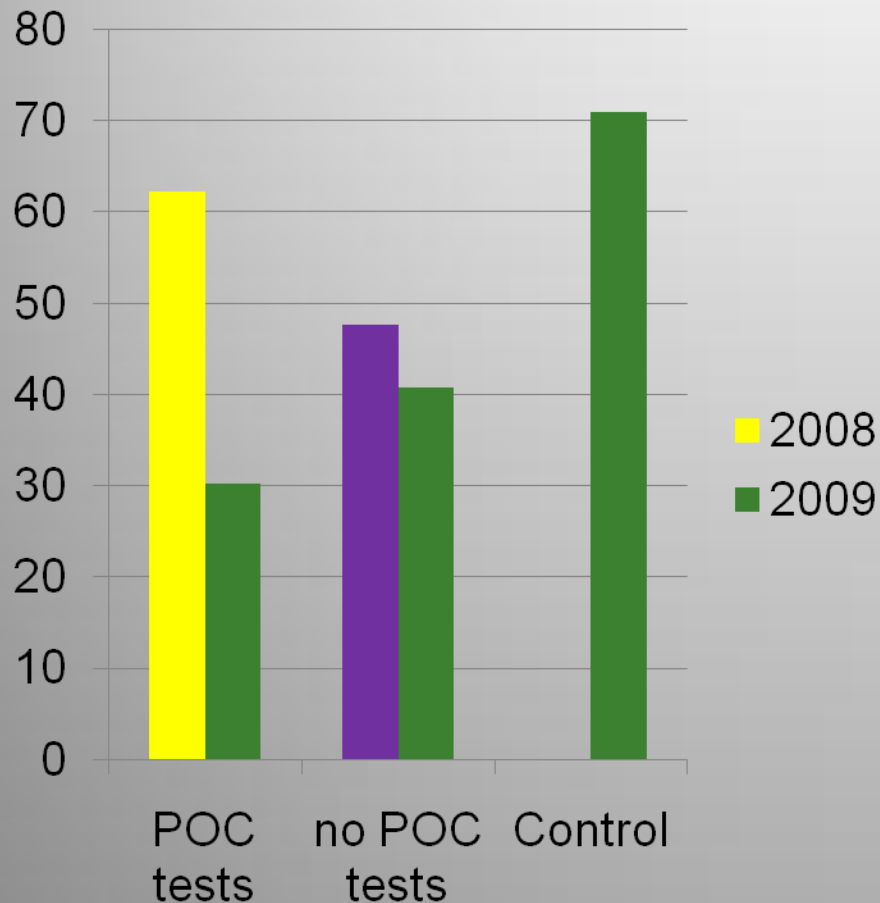
## Influence of antibiotic prescribing for all RTIs



- Intervention including the introduction of POC testing
  - Reduction in antibiotic prescribing: 36.4%
- Intervention without the introduction of POC testing
  - Reduction in antibiotic prescribing: 8.3%

# HAPPY AUDIT intervention in Spain:

## Influence of antibiotic prescribing for acute bronchitis



- Intervention including the introduction of POC testing
  - Reduction in antibiotic prescribing: 51.5%
- Intervention without the introduction of POC testing
  - Reduction in antibiotic prescribing: 14.4%

Figure 4. Utilization of C-reactive protein stated by the 210 physicians assigned to the intervention group in 2009

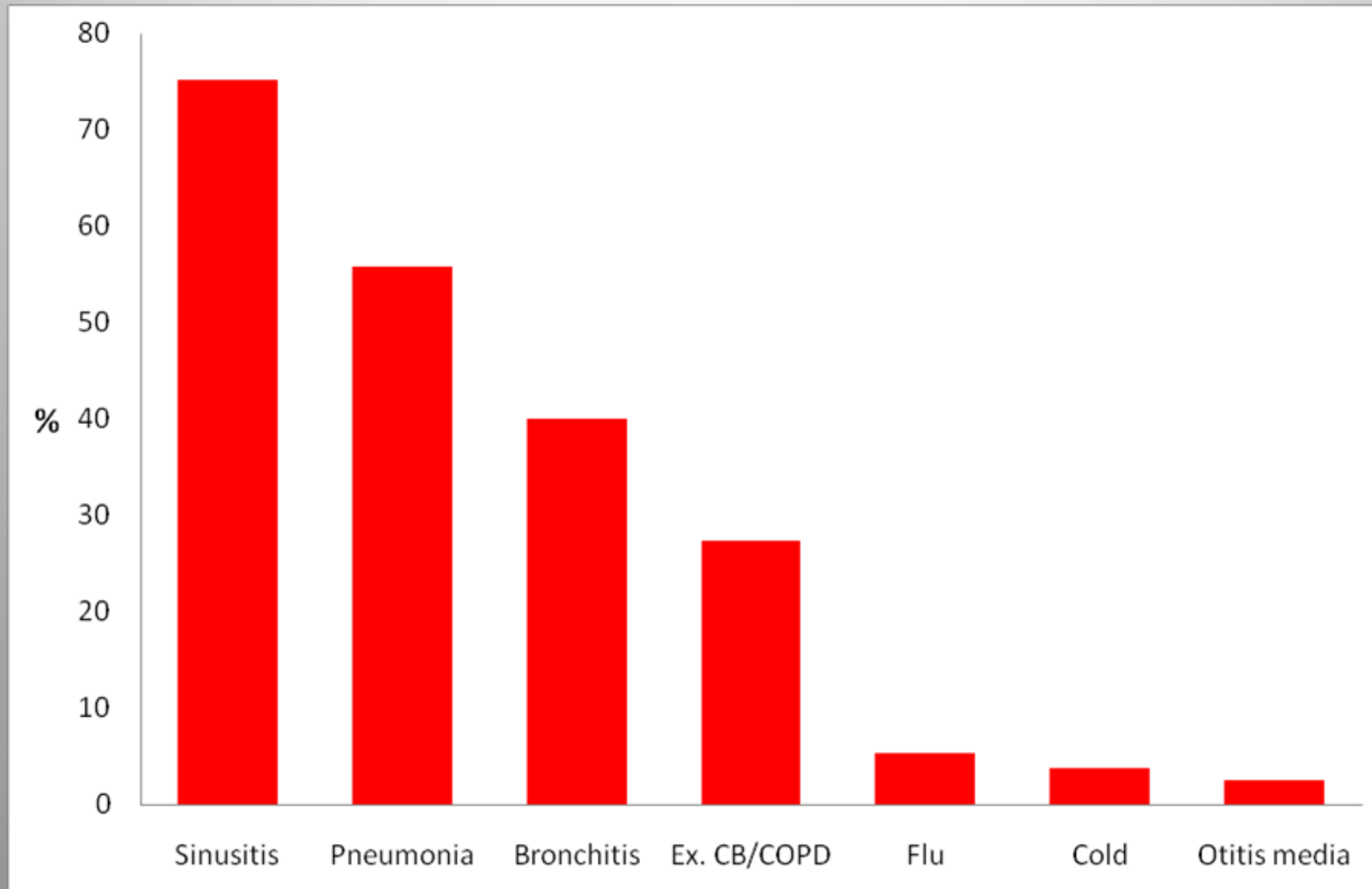
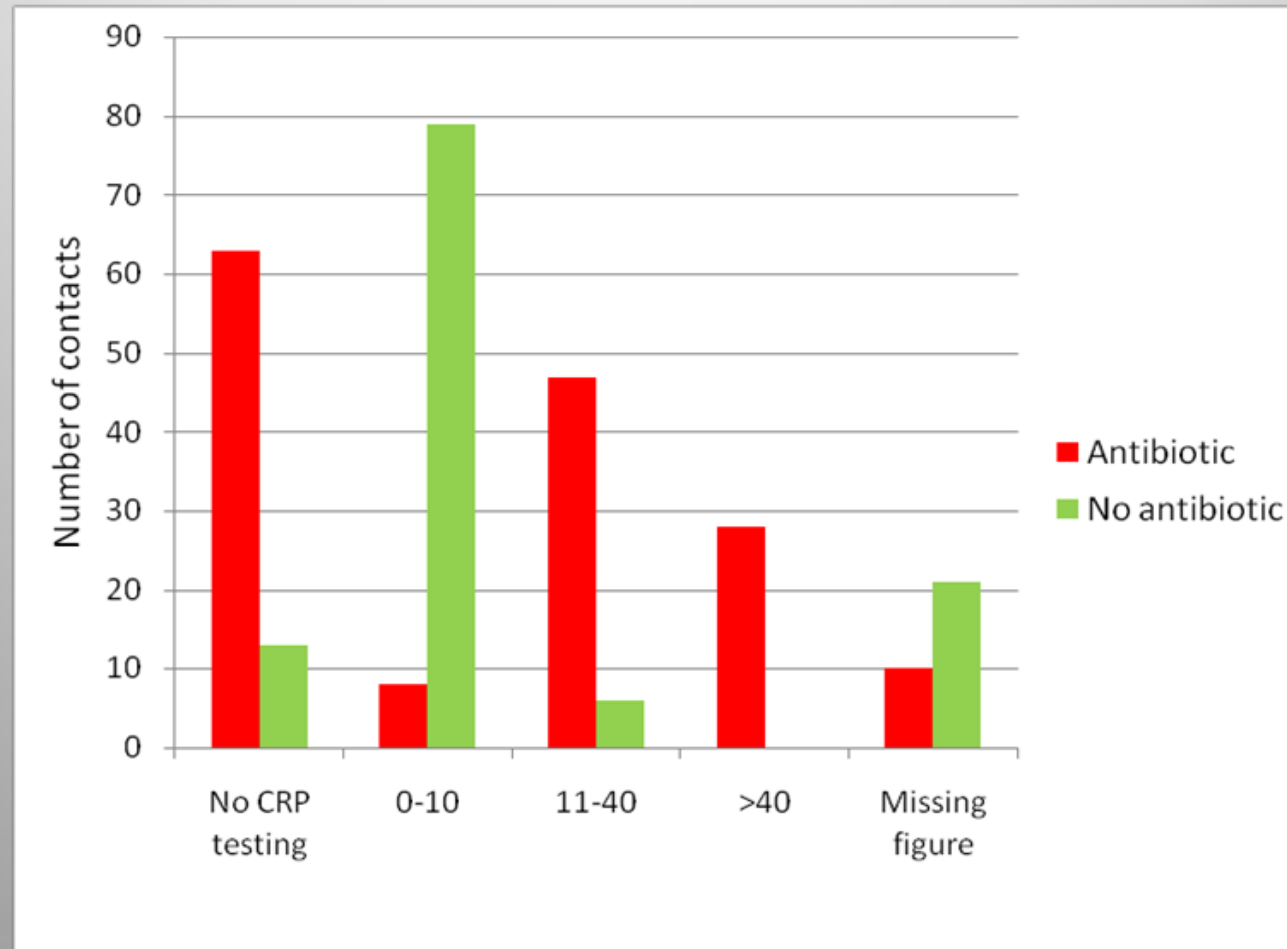


Figure 7. Contacts of sinusitis treated or not with antibiotics depending on the utilization of C-reactive protein testing and its result





# Conclusions I

## Use of CRP testing in Primary care

- CRP rapid-testing is of value in general practice
- Main indication areas in RTIs
  - Sinusitis – validity moderate
  - Lower RTI – validity high
- The result should always be interpreted in combination with a clinical evaluation
- No specific defined cut-off point
- Serial measurement is sometimes of great value



# Conclusions II

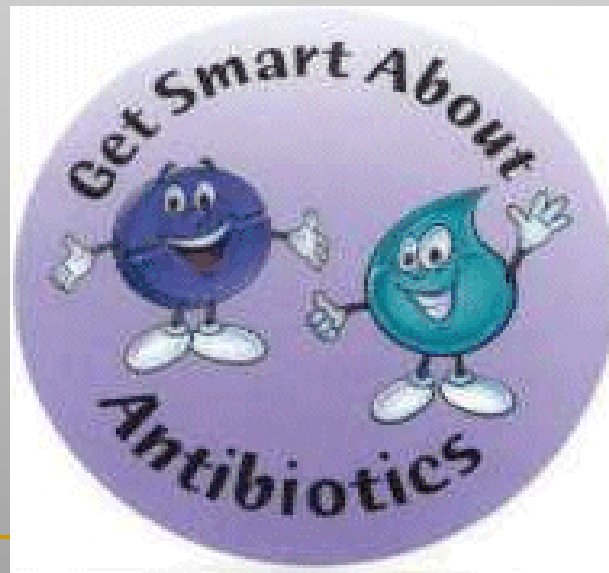
## Use of CRP testing in Primary care



- CRP testing in general practice helps the GP to avoid inappropriate prescribing of antibiotics
- It leads to a considerable reduction in antibiotic use

***"The more you use it,  
- the faster you lose it"***

*Burke JP, Lancet 1995;345:977*



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CRP

Possible disadvantages

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# Medicalising effect of POC-testing?

