



Antibiotic Stewardship Conference: FROM EXPERT CONSENSUS TO EUROPE-WIDE ACTION AT THE POINT OF CARE

CRP POCT AS A CATALYST FOR ANTIBIOTIC STEWARDSHIP IN PRIMARY
CARE - FROM NATIONAL SUCCESS STORIES TO EUROPE-WIDE ACTION

Panel Interaction

Norway, Denmark, Switzerland, Netherlands

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Panel Interaction Denmark

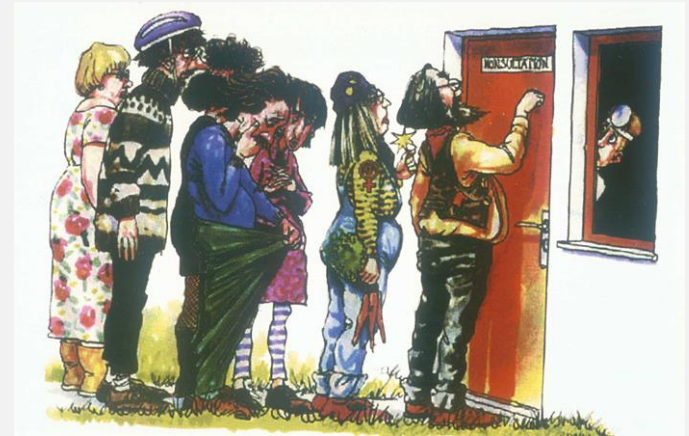
PROF. LARS BJERRUM
UNIVERSITY OF COPENHAGEN



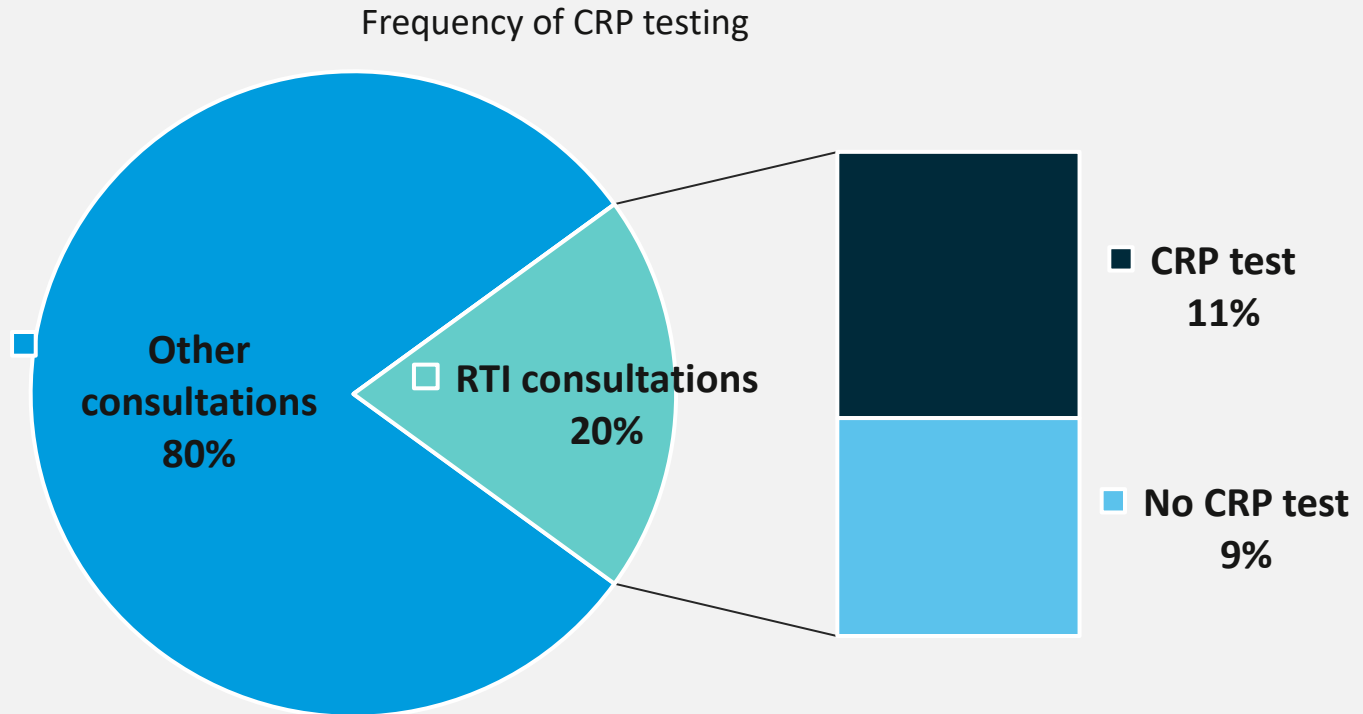
Facts and Figures

DENMARK: 5.9 MILLION INHABITANTS

- Approx. 15 million consultations per year
- Approx. 3 million consultations due to RTI per year
 - The majority of consultations due to RTI include a POC-CRP test
- A total of 1.5 - 2 million POC-CRP tests per year



CRP testing in patients with RTI in General Practice



When are GPs recommended to perform CRP testing?

Suspicion of Upper RTI:

- **Acute Rhino-sinusitis:** ✓
- Acute tonsillitis: no (use StrepA)
- Acute otitis: no (no POC test)

Suspicion of Lower RTI

- Acute Bronchitis ✓
- Pneumonia ✓
- COPD ✓
- **Suspicion of upper UTI** ✓

Luftvejsinfektioner

– diagnose og behandling



Dansk Selskab for Almen Medicin
2014

Data collection from GPs winter 2017-2018

- 143 GPs
- 7813 Patients with RTI

4617 Patients (59%) had a CRP test

- CRP > 20: > 25% got antibiotics
- CRP > 40: > 50% got antibiotics
- CRP > 50: > 75% got antibiotics

(BJGP 2021)

C-reactive protein cut-offs used for acute respiratory infections in Danish general practice

Jesper Lykkegaard^{1,2*}, Jonas Kanstrup Olsen^{1,2}, Rikke Vognbjerg Sydenham¹, Malene Plejdrup Hansen²

¹Research Unit for General Practice, Institute of Public Health, University of Southern Denmark, Odense, Denmark; ²Audit Project Odense, Research Unit for General Practice, Institute of Public Health, University of Southern Denmark, Odense, Denmark; ³Center for General Practice, Aalborg University, Aalborg, Denmark

Abstract

Background: GPs can use the C-reactive protein (CRP) point-of-care test (POCT) to assist when deciding whether to prescribe antibiotics for patients with acute respiratory tract infections (RTIs).

Aim: To estimate the CRP cut-off levels that Danish GPs use to guide antibiotic prescribing for patients presenting with different signs and symptoms of RTIs.

Design & setting: A cross-sectional study conducted in general practice in Denmark.

Method: During the winters of 2017 and 2018, 143 GPs and their staff registered consecutive patients with symptoms of an RTI according to the Audit Project Odense (APO) method. CRP cut-offs were estimated as the lowest level at which half of the patients were prescribed an antibiotic.

Results: In total, 7813 patients were diagnosed with an RTI, of whom 4617 (59%) had a CRP test performed. At least 25% of the patients were prescribed an antibiotic when the CRP level was >20 mg/L, at least 50% when CRP was >40 mg/L, and at least 75% when CRP was >50 mg/L. Lower thresholds were identified for patients aged ≥65 years and those presenting with a fever, poor general appearance, dyspnoea, abnormal lung auscultation, or ear/facial pain, and if the duration of symptoms was either short (≤1 day) or long (>14 days).

Conclusion: More than half of patients presenting to Danish general practice with symptoms of an RTI have a CRP test performed. At CRP levels >40 mg/L, the majority of patients have an antibiotic prescribed.

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Competing interest: The authors declare that no competing interests exist.

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CRP levels and antibiotic prescribing in Danish General Practice

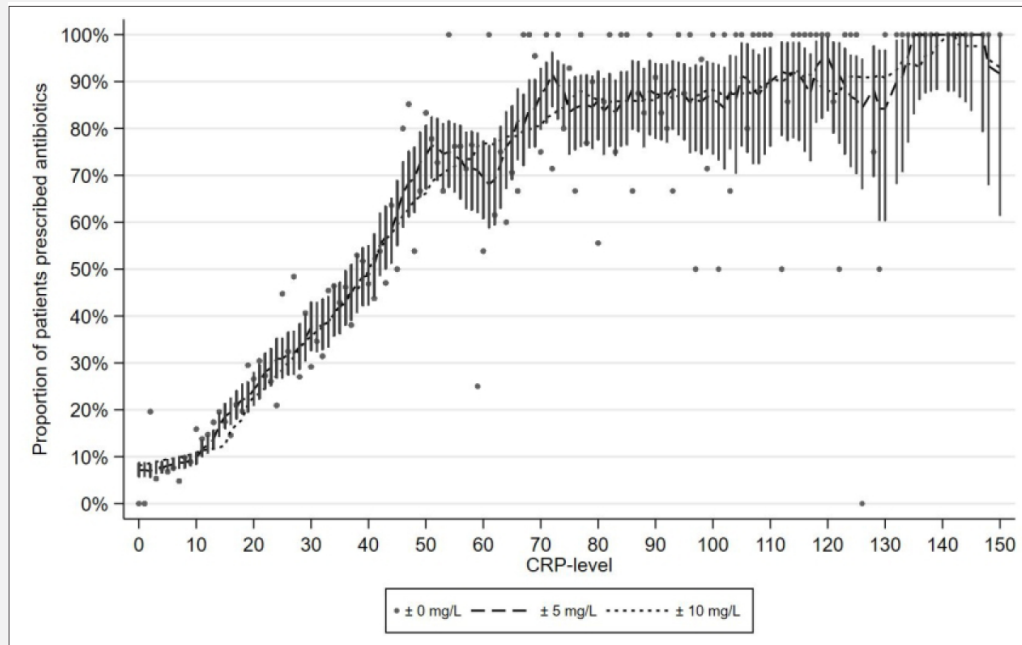


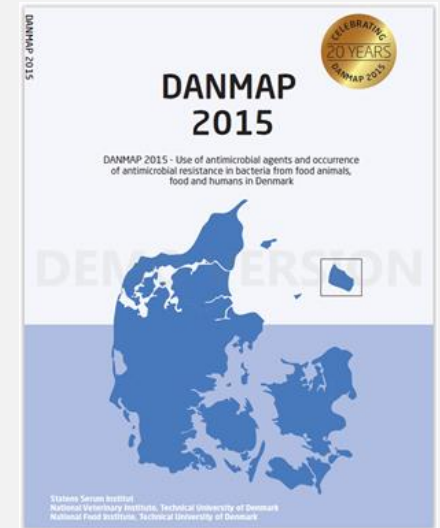
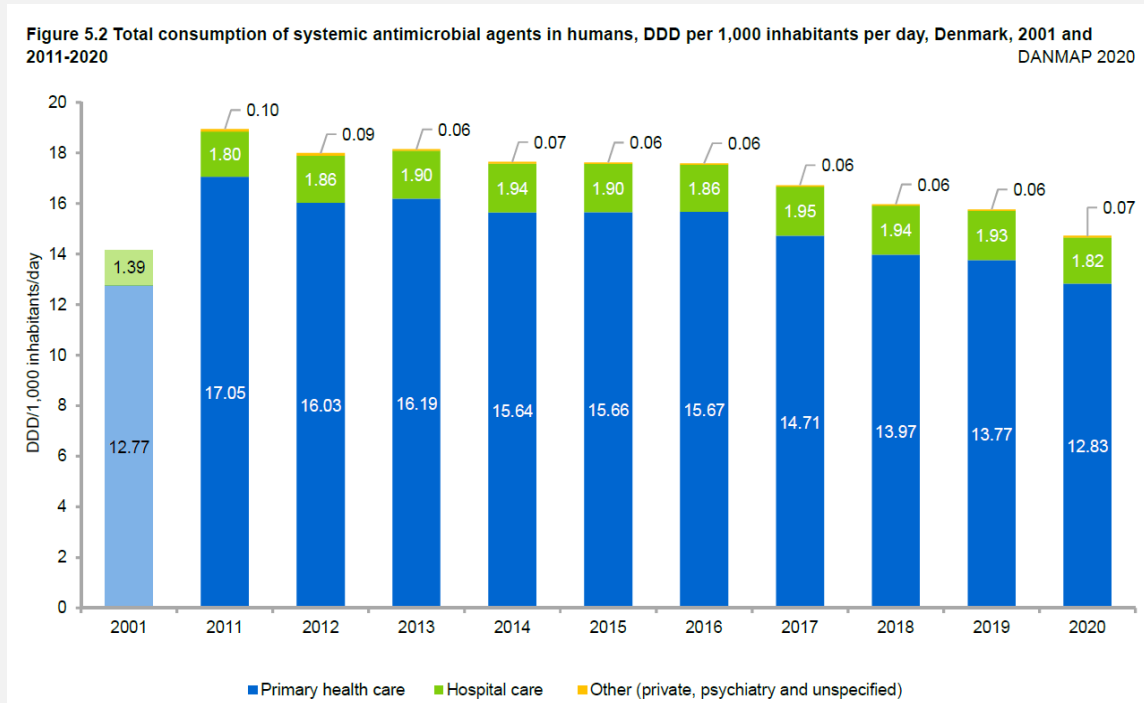
Figure 1 C-reactive protein (CRP) levels and the proportion of patients prescribed an antibiotic. Legends indicate the width of the interval around the index CRP level used to calculate the proportion of patients who were prescribed antibiotics, respectively 0, 5, and 10mg/L above and below. Bars indicate 95% confidence intervals. CRP levels 150–300mg/L not shown.

CRP tests in Denmark

Increasing number of CRP tests in Danish Primary Care, 2000-2021

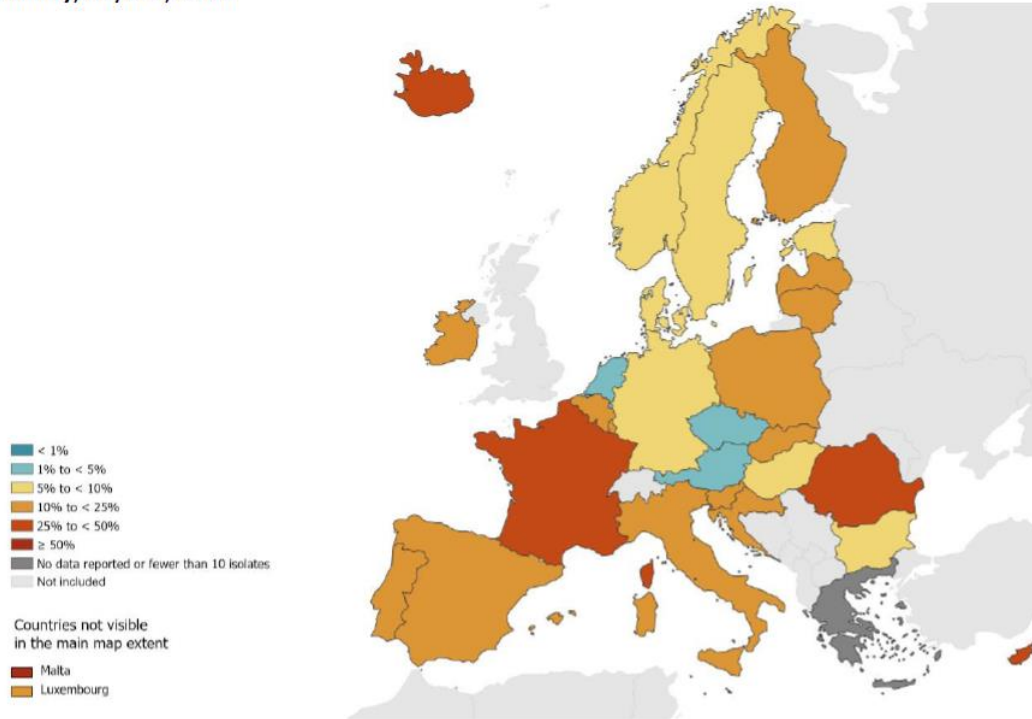


25% Reduction in consumption of antibiotics in Primary care 2011-2020

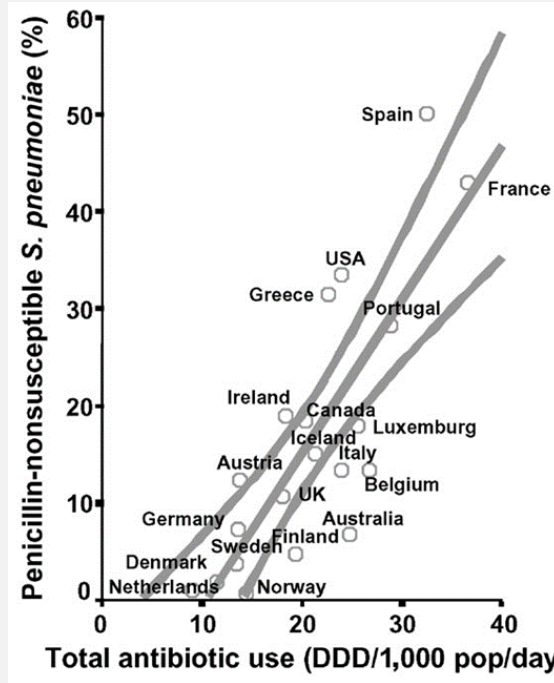
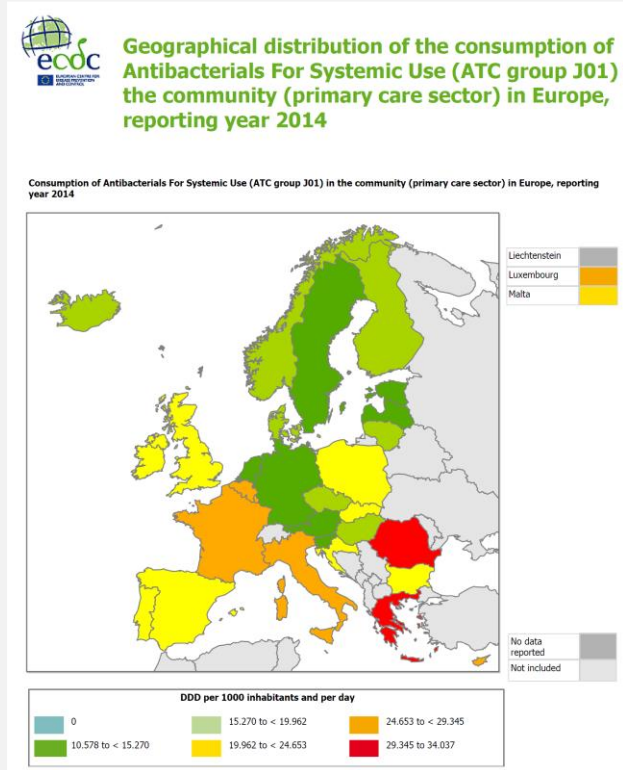


Pneumococci resistance in Europe 2020

Figure 9. *Streptococcus pneumoniae*. Percentage of penicillin^a non-wild type^b invasive isolates, by country, EU/EEA, 2020



Consumptions of antibiotics and antibiotic resistance in Europe



Linear correlation between antibiotic use and resistance

From: Emerging Infectious Diseases 2004;19(3):514

The journey to widespread adoption and mature use

DENMARK: FACILITATORS

How did it come about, that CRP was widely adopted?

- Scientific evidence convinced opinion leaders about the efficacy of CRP to reduce overuse of antibiotics and opinion leaders influenced the medical scientific societies:
- Danish College of GPs published national guidelines that recommend GPs to perform CRP in patients with RTI (sinusitis and lower RTI) before making a decision to prescribe or not to prescribe antibiotics

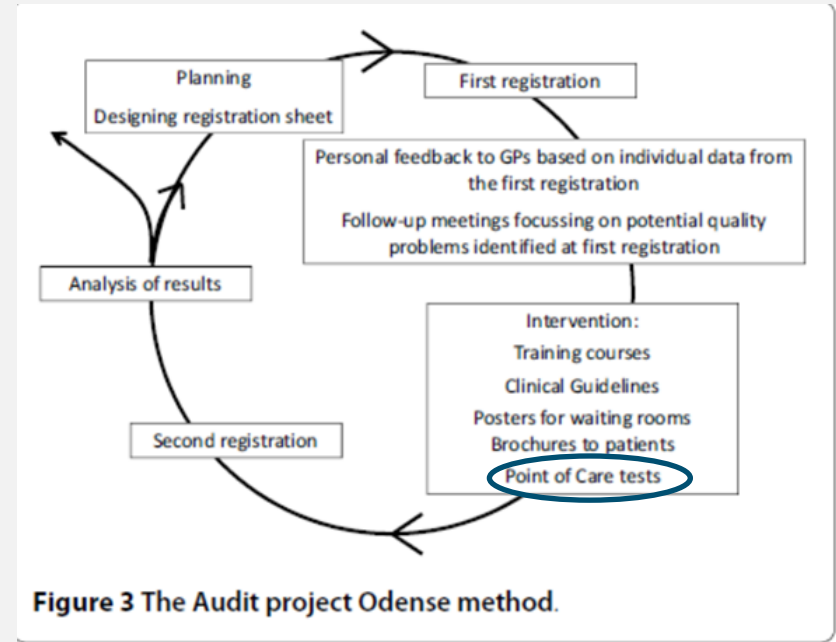


The journey to widespread adoption and mature use

DENMARK: FACILITATORS

How did it come about, that CRP was widely adopted?

- Danish Regions facilitated quality improvement programmes based on Audit and feedback on diagnostics and antibiotic use.
- The quality intervention programme was organised by Audit Project Odense (APO) and focussed on:
 - The diagnostic process
 - Symptoms, Signs, POC test (Strep A, CRP)
 - The decision to prescribe antibiotic or not
 - The choice of antibiotic



The journey to widespread adoption and mature use

DENMARK: FACILITATORS

How did it come about, that CRP was widely adopted?

- The agreement between the regions and the Danish General Practice organisation (PLO) includes a fee for service that gives economic incentive for GPs to perform CRP
 - As a result of this, most patients with RTI expect GPs to perform a POC test in the consultation before making a decision about antibiotic prescribing
- Danish patients are well informed about the risk of AMR.
 - Many patients prefer a test instead of unnecessary antibiotic prescribing
 - CRP makes it easy to explain patients when antibiotics are not needed

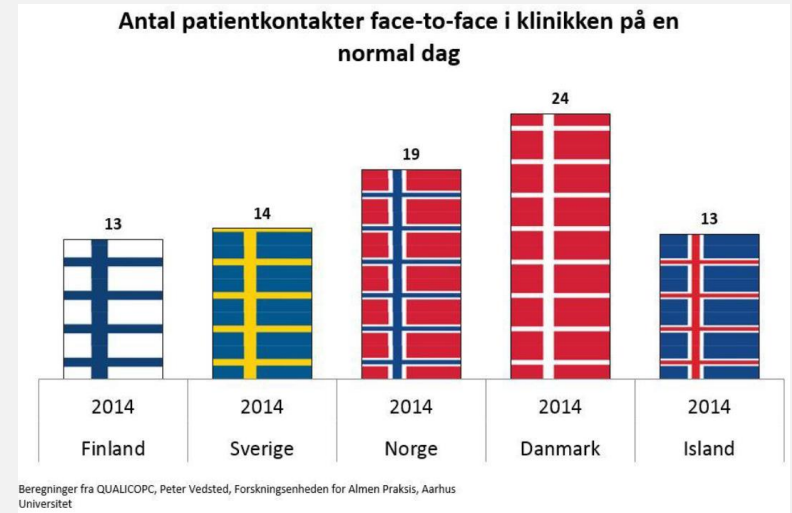


The journey to widespread adoption and mature use

DENMARK: BARRIERS AND PITFALLS

What were the barriers and pitfalls to implementation and how were they overcome?

- Time constraints: Many consultations per day and limited time to perform tests in a busy practice
 - It is Quick-and-easy just to prescribe..
 - Not sufficient time allocated for testing, analysing and informing patients about POC results
- Risk of over-diagnostics and over-treatment
- Risk of reduced self-care.
 - “I need to be tested asap to see if I need antibiotics”



The journey to widespread adoption and mature use

DENMARK: > 20 YEARS WITH CRP TESTING - WHAT IS BEST PRACTICE OVER THE YEARS

- Patients with RTIs:
- Consider to supplement the clinical examination with a CRP POC test to support and improve the final decision:
 - No antibiotics
 - Yes, antibiotic prescribing
- Perform CRP when needed and let the patient wait in practice until the result is available (or call back later)
- Allocate sufficient time to give the patient information about CRP result and the interpretation/consequences.



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Panel Interaction

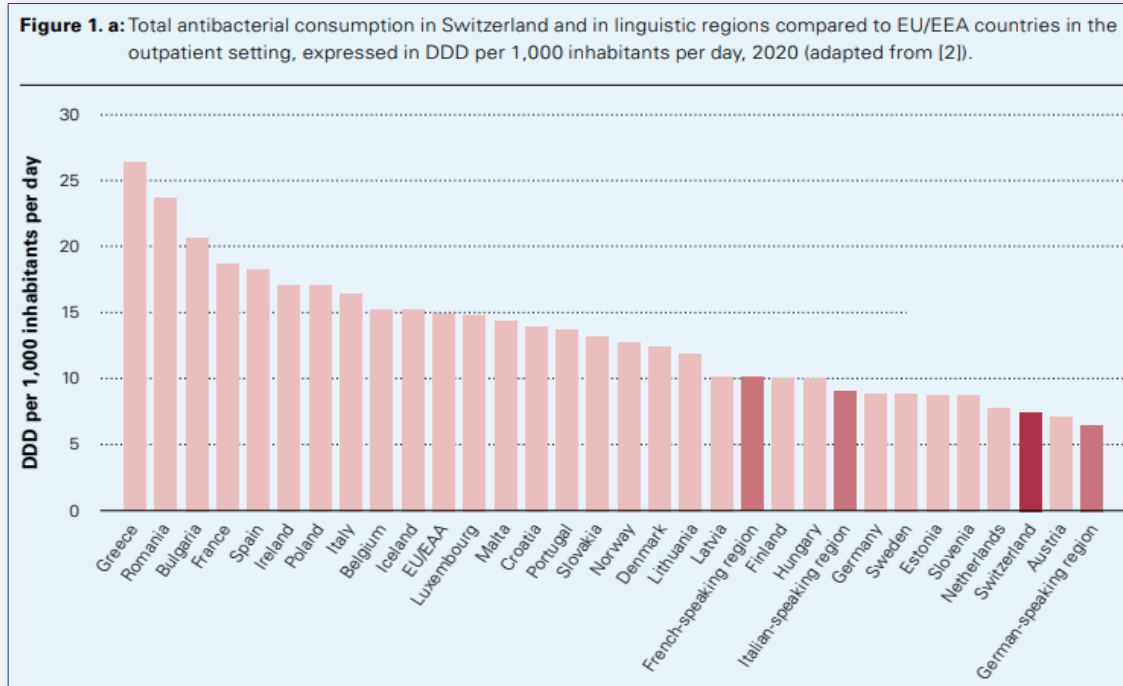
Switzerland

DR. ANDREAS PLATE
UNIVERSITY OF ZURICH



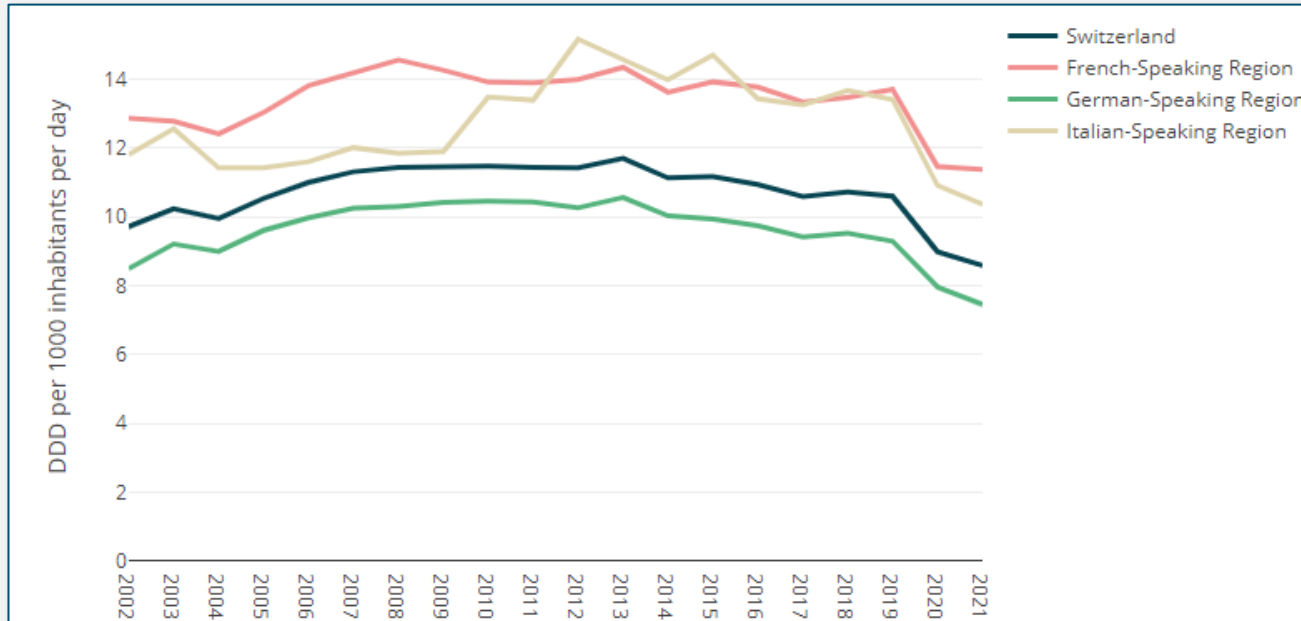
Antibiotic Consumption in Switzerland

4.5 million packages of antibiotics per year
(3.9 million households)



Swiss Antibiotic Resistance Report 2022

Antibiotic Consumption in Switzerland



Datasource: IQVIA™ Sales Data (Sell-In) from pharmaceutical industries to public pharmacies, self-dispensing physicians and hospitals.

Anresis.ch

CRP Point-of-Care testing in Switzerland

- CRP POCT is in use for many years in Switzerland
- 2012: >2.000 CRP POCT devices have already participated in the external quality controls
- Today CRP POCT: widely implemented in Primary Care & Walk-in clinics
- About 80% of Primary Care Practices have a point of care laboratory (≈ 7500)
- Each point of care lab performs an average of 570 CRP tests per year: $\approx 4.275.000$ CRP POCT / year
- Various devices available. CRP alone or in combination with White Cell Count
- Purchase and maintenance depends on the provider

Reimbursement

- Reimbursed: about 14.2 CHF at point of care (10 CHF at laboratory)
- Prerequisites for reimbursement:
 - The practice participates in external quality controls
 - The doctor holds a "practice laboratory" certificate

Practical Implementation

- CRP POCT is used in adults and children with acute infections.

Article

The Role of Point-of-Care C-Reactive Protein Testing in Antibiotic Prescribing for Respiratory Tract Infections: A Survey among Swiss General Practitioners

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* Correspondence: naharaamg37@gmail.com

Abstract: Understanding the decision-making strategies of general practitioners (GPs) could help reduce suboptimal antibiotic prescribing. Respiratory tract infections (RTIs) are the most common reason for inappropriate antibiotic prescribing in primary care, a key driver of antibiotic resistance (ABR). We conducted a nationwide prospective web-based survey to explore: (1) The role of C-reactive protein (CRP) point-of-care testing (POCT) on antibiotic prescribing decision-making for RTIs using case vignettes; and (2) the knowledge, attitudes and barriers/facilitators of antibiotic prescribing using deductive analysis. Most GPs (92–98%) selected CRP-POCT alone or combined with other diagnostics. GPs would use lower CRP cut-offs to guide prescribing for (more) severe

Citation: Martínez-González, N.A.; Plate, A.; Jäger, L.; Senn, O.; Neuner-Jehle, S. The Role of Point-of-Care

“Most GPs (92–98%) selected CRP-POCT alone or combined with other diagnostics.”

Practical Implementation

- CRP POCT is used in adults and children with acute infections.
- Devices are operated by medical assistants, nurses. Part of training.
- Patient's experience depends on the internal organization of the practice and the workload.
 - CRP POCT is done after the initial examination
 - Patient wait while next patient is in the room for results to be ready.

CRP POCT AS A CATALYST FOR ANTIBIOTIC STEWARDSHIP IN PRIMARY CARE - FROM NATIONAL SUCCESS STORIES TO EUROPE-WIDE ACTION

Panel Interaction

Norway

PROF. HASSE MELBYE
THE ARCTIC UNIVERSITY OF NORWAY



Facts and Figures

NORWAY

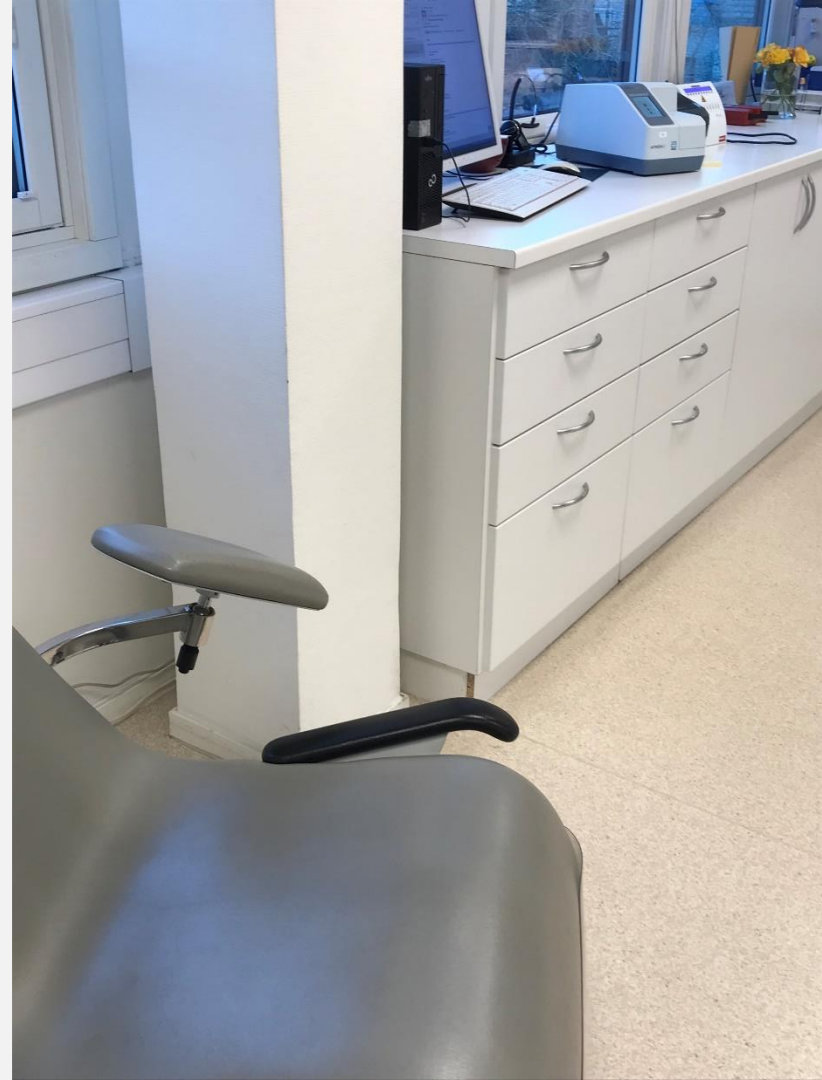
What happens in a Norwegian GP-office when a coughing man is visiting?



Facts and Figures

NORWAY

- After a clinical examination the GP usually orders a CRP test
- 10 minutes later, after a next patient, the CRP result is ready, and the consultation with the coughing man continues



Facts and Figures

NORWAY (5 MILL. INHABITANTS)

General practice offices

15 mill. consultations each year (2019) -
2.5 mill. CRP tests (16% of all consultations)

1.33 mill. respiratory tract infection (RTI) related consultations
0.8 million CRP tests (60%)

Out of hour/emergency clinics

1.3 million consultations each year
0.5 million CRP tests (38%)

CRP history in Norway

Before 1989:

only in hospital (Serum-CRP)

1989:

Nycocard CRP (semi-quantitative) whole blood test was developed

2000:

Nycocard CRP (quantitative) was launched and evaluated in Norway

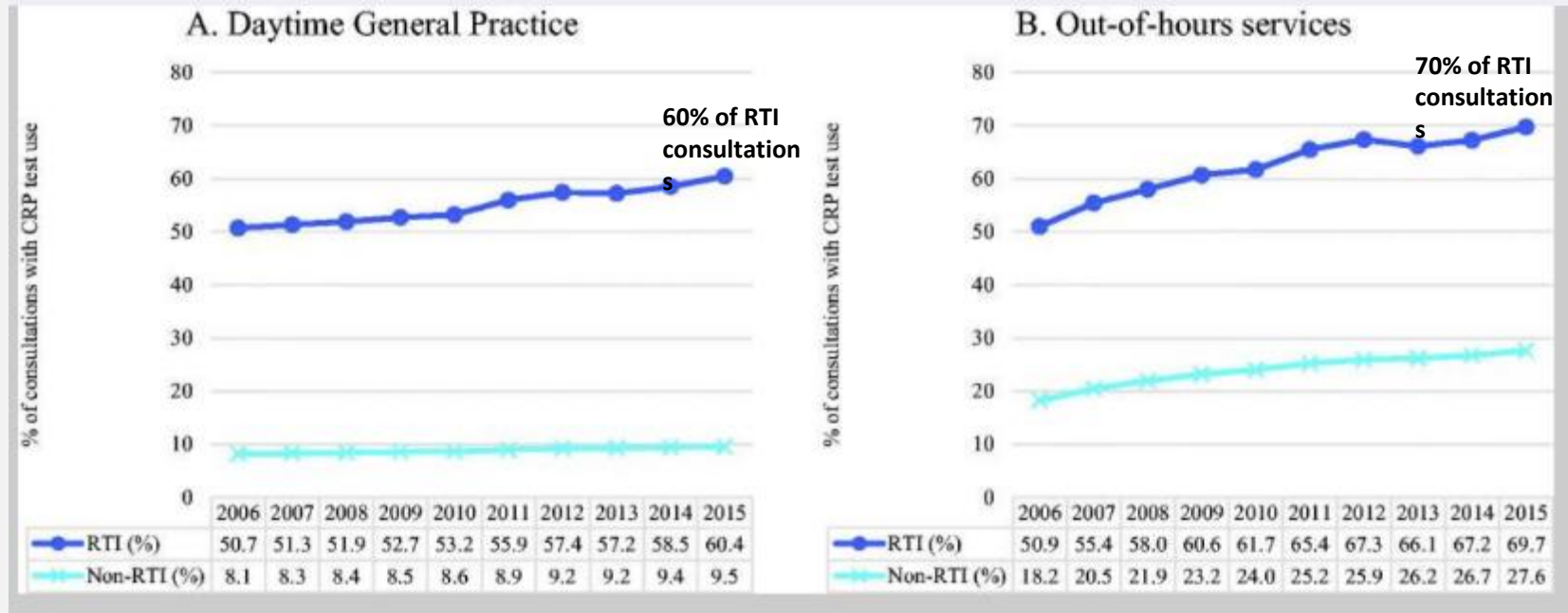
2005:

Afinion CRP (quantitative), the most used test in Norwegian primary care, used in 14% of consultations



Increased use between 2006 and 2015

NORWAY



Reimbursement

NORWAY

Around 1992:

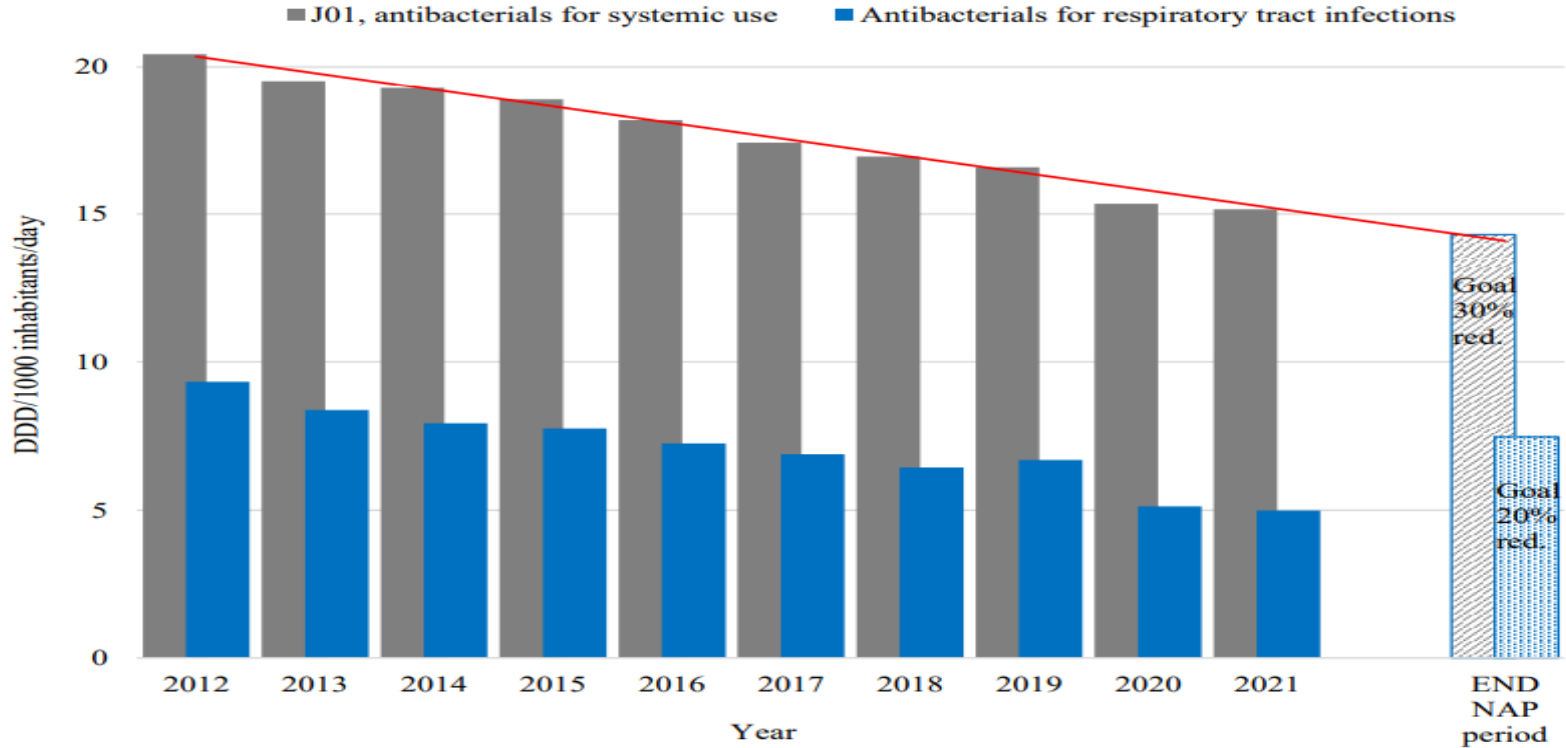
costs attached to CRP-testing became reimbursed, in the same way as ECG, microscopy for Candida, etc.

In 2022:

the reimbursement is **109 NOK (10 Euro)**:

- the state insurance pays 49 NOK,
- the patient pays 59 NOK.

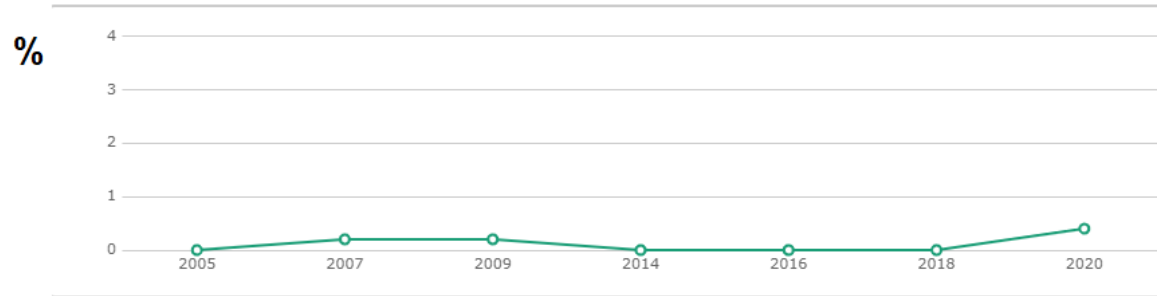
The use of antibiotics has dropped



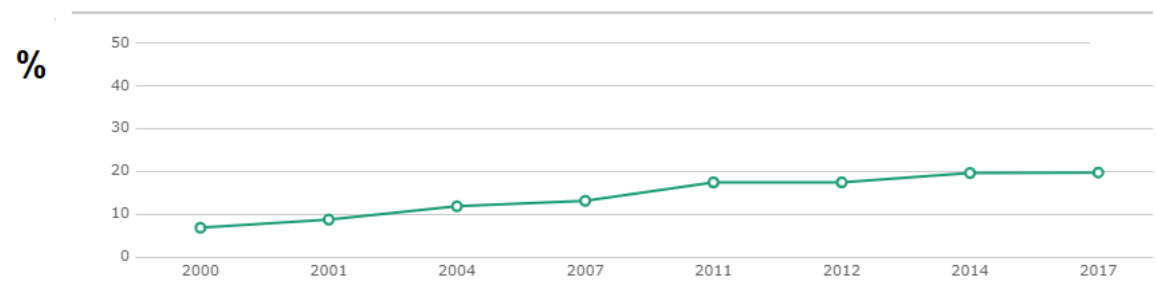
Resistance rates in Norway are stable and low



Pneumococci, penicillin resistance rate (%)



Haemophilus influenzae, ampicillin resistance rate (%)



CRP and Norwegian guidelines on antibiotics in primary care

Pneumonia

- CRP almost always raised in bacterial pneumonia (> 100 mg/L)
- Often > 200 mg/L if severe pneumonia
- CRP values between 50 and 150 mg/l is frequently seen in viral or atypical pneumonia, but also in influenza and acute bronchitis on day 2-5

COPD EXACERBATION

- Avoid antibiotics when there is no increased purulence and CRP <40 mg/L

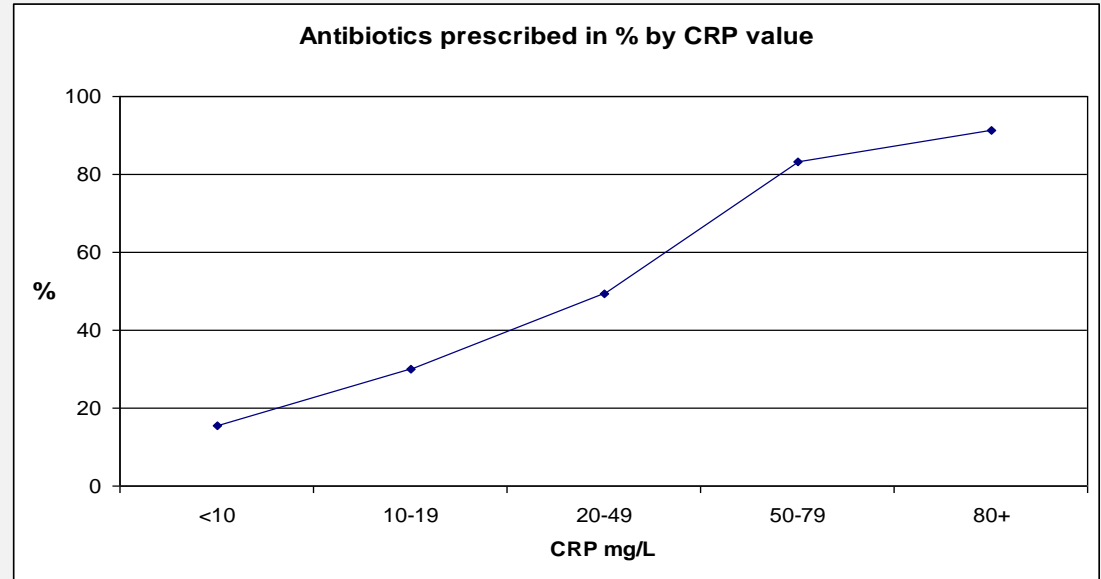
The Directorate of Health



Great impact of CRP values on antibiotic prescribing

OBSERVATIONAL EUROPEAN STUDY OF PATIENTS WITH ACUTE COUGH, 2010

- The Norwegian and Swedish GPs applied **CRP** POC test in 73% (372/503) of their patients:
 - **35%** were treated with antibiotics
- Among 300 patients in the same study from Wales **no CRP** POC test done:
 - **70%** were treated with antibiotics



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The Netherlands

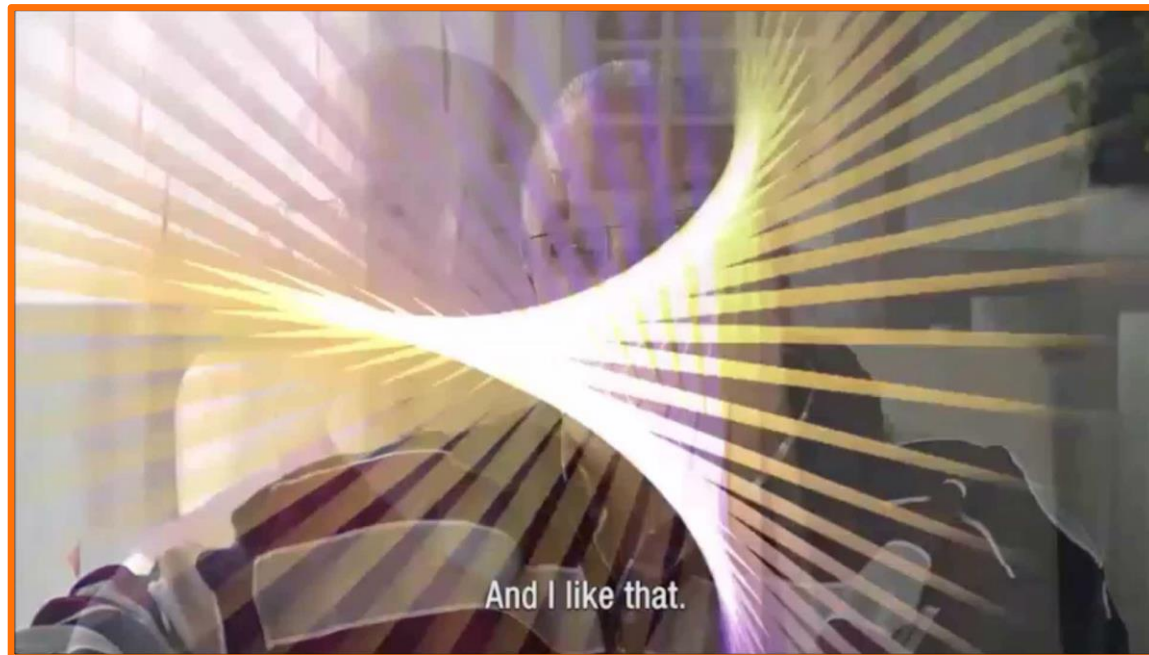
ROGIER HOPSTAKEN
PRIMARY HEALTH CARE CENTER
HAPERT EN HOOGELON,
STAR-SHL DIAGNOSTIC



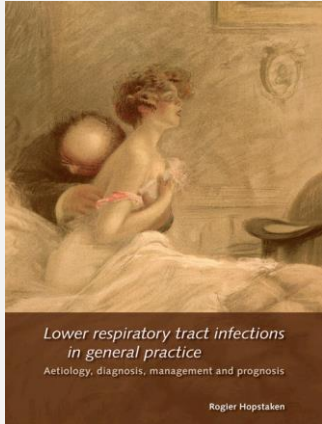
CRP POCT – The Netherlands case



EVIDENCE INTO ROUTINE PRACTICE

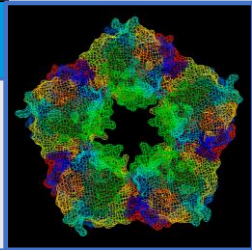


Role of CRP POCT



C-reactive protein

- Strongest predictor of pneumonia
- CRP < 20 mg/l excludes pneumonia
- Adds to history/physical exam
- POCT to change management



Hopstaken BJGP 2003

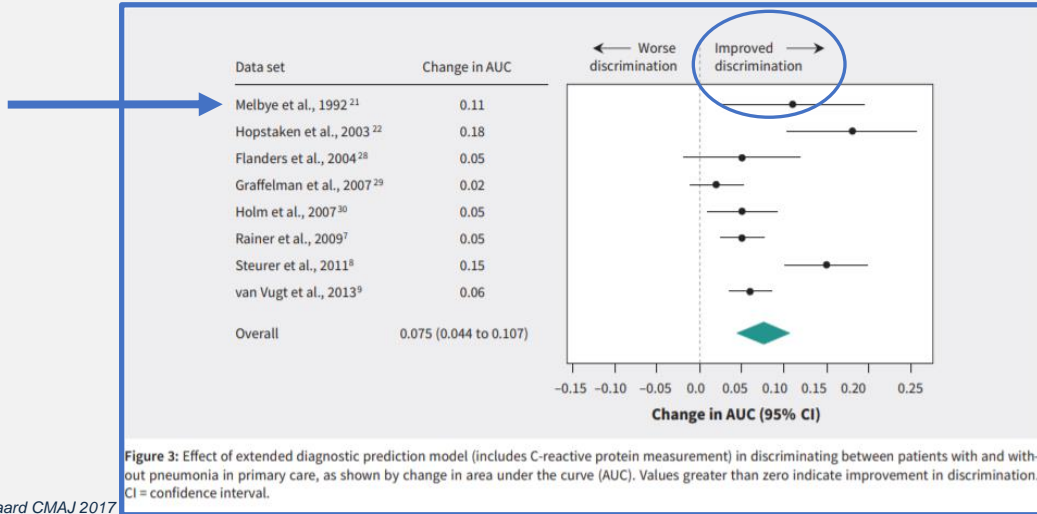


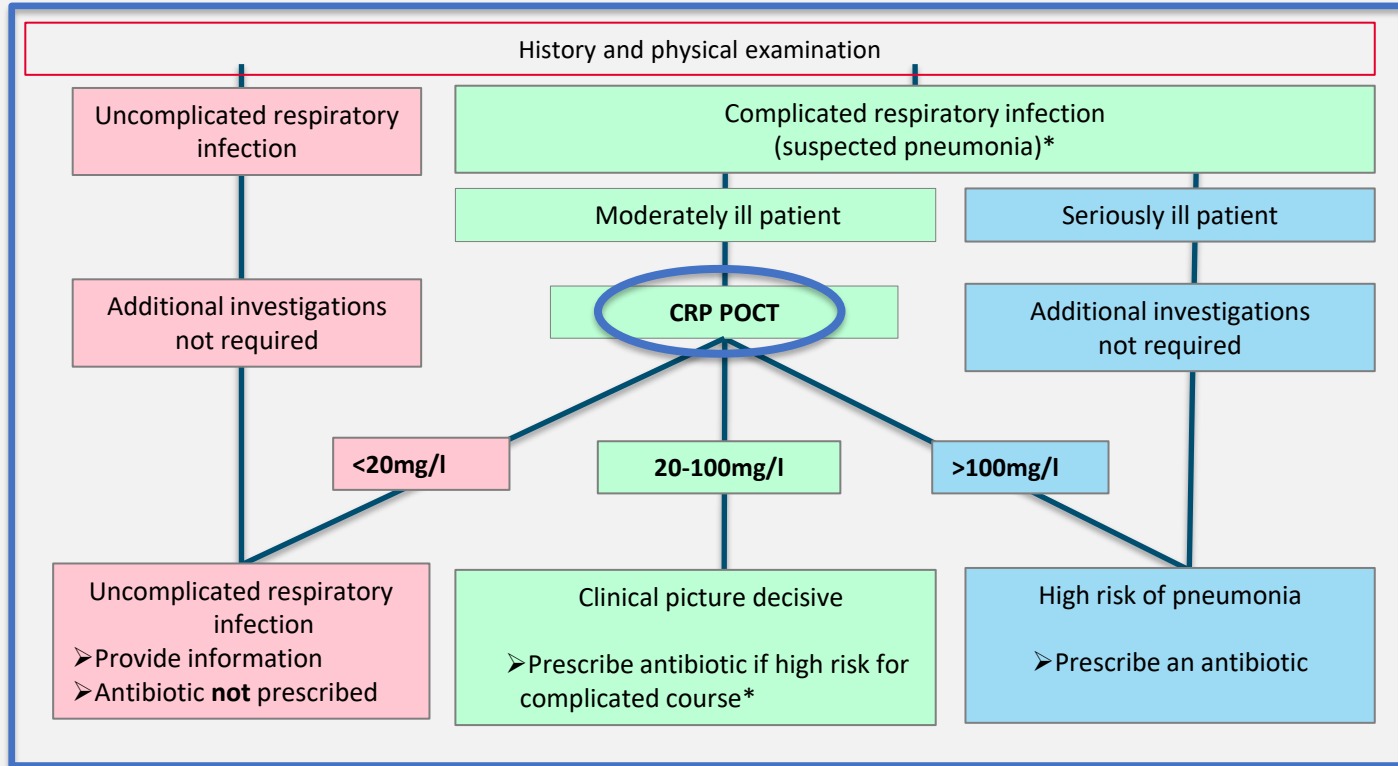
Figure 3: Effect of extended diagnostic prediction model (includes C-reactive protein measurement) in discriminating between patients with and without pneumonia in primary care, as shown by change in area under the curve (AUC). Values greater than zero indicate improvement in discrimination. CI = confidence interval.

Minnaard CMAJ 2017



Guidelines for Acute Cough, Dutch College of GPs

Figure: Flowchart management for respiratory tract infections



CRP

- Strongest predictor of pneumonia
- CRP < 20 mg/l excludes pneumonia
- Adds to history and physical examination
- POCT is necessary to change management

Enhanced consultation skills

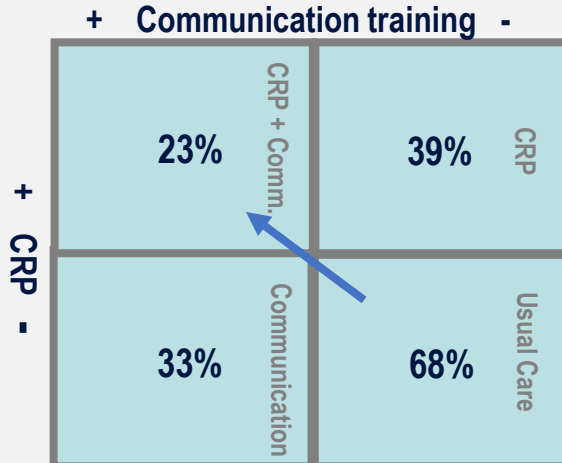
- Simulated patients
 - Context-rich training
 - Combination of general and LRTI items
- Competence ++ → Performance?

BMJ

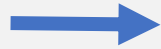
RESEARCH

Effect of point of care testing for C reactive protein and training in communication skills on antibiotic use in lower respiratory tract infections: cluster randomised trial

Jochen W L Cals, general practitioner trainee and researcher,¹ Christopher C Butler, professor of primary care medicine,² Roger M Hopstaken, general practitioner and researcher,³ Kerensa Hood, reader in statistics,^{2,4} Geert-Jan Dinant, professor of general practice¹



The Netherlands case



< 20	Very low probability of pneumonia
20 – 50	Low probability of pneumonia
50 – 100	Clear infection most probably acute bronchitis, possibly pneumonia
> 100	Serious infection consider pneumonia

Hopstaken BJGP 2003

Add CRP to history and physical exam

Proportion patients

70%

25%

5%



- e-learning
- implementation studies
- public discussions
- reimbursement
- guidelines
- involvement laboratories



What is point-of-care testing?

‘Every test at the point of care’

Many definitions...

Shepard; Practical guide to global POCT 2016



‘Process of indication, preparation, execution, communication, interpretation and follow-up of a laboratory test by a health care professional during a consultation with the patient’.

Hopstaken; Guideline POCT in general practice (Dutch); NHG-NVKC-NVMM-SAN; 2015

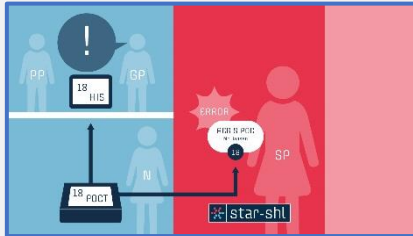
Point-of-care test

A point-of-care test in family practice is a test to support clinical decision-making, which is performed by a qualified member of the practice staff nearby the patient and on any part of the patient’s body or its derivatives, during or very close to the time of consultation, to help the patient and physician to decide upon the best suited approach, and of which the results should be known at the time of the clinical decision-making.

Schols; Fam Pract 2018



Quality-assured POCT in general practice



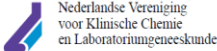



RICHTLIJN
POINT OF CARE TESTING (POCT) IN DE HUISARTSENZORG

Hopstaken RM¹, Kleinveld HA², Balen van JAM³, Krabbe JG⁴, Broek van den S⁵, Weel J⁶, Slingerland RJ⁶, Rutter C⁷, Kusters GCM⁸
¹Salto Diagnostisch Centrum Utrecht, ²Atrium MC Heerlen, ³NHG Utrecht, ⁴Medlon Enschede/Almelo, ⁵Izore Leeuwarden, ⁶Isala Zwolle, ⁷NVKK Verenigingsbureau Utrecht, ⁸Jeroen Bosch Ziekenhuis 's-Hertogenbosch

Keypoints Guideline POCT in general practice

- Knowledge/EBM
- Quality
- Collaboration
- ISO 15189, ISO 22870
- General practice (loose) norms

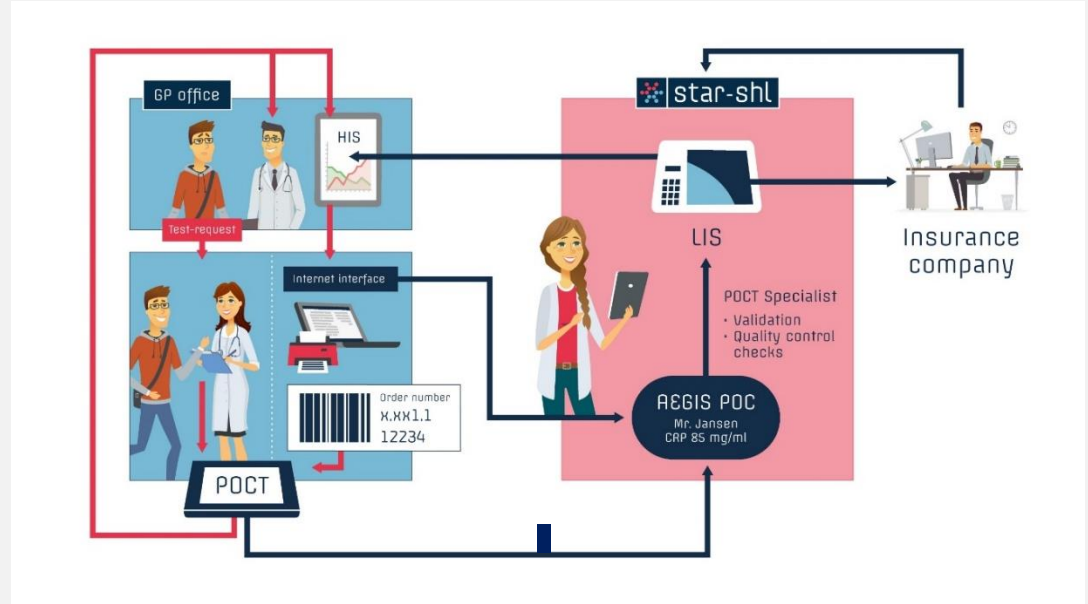
   

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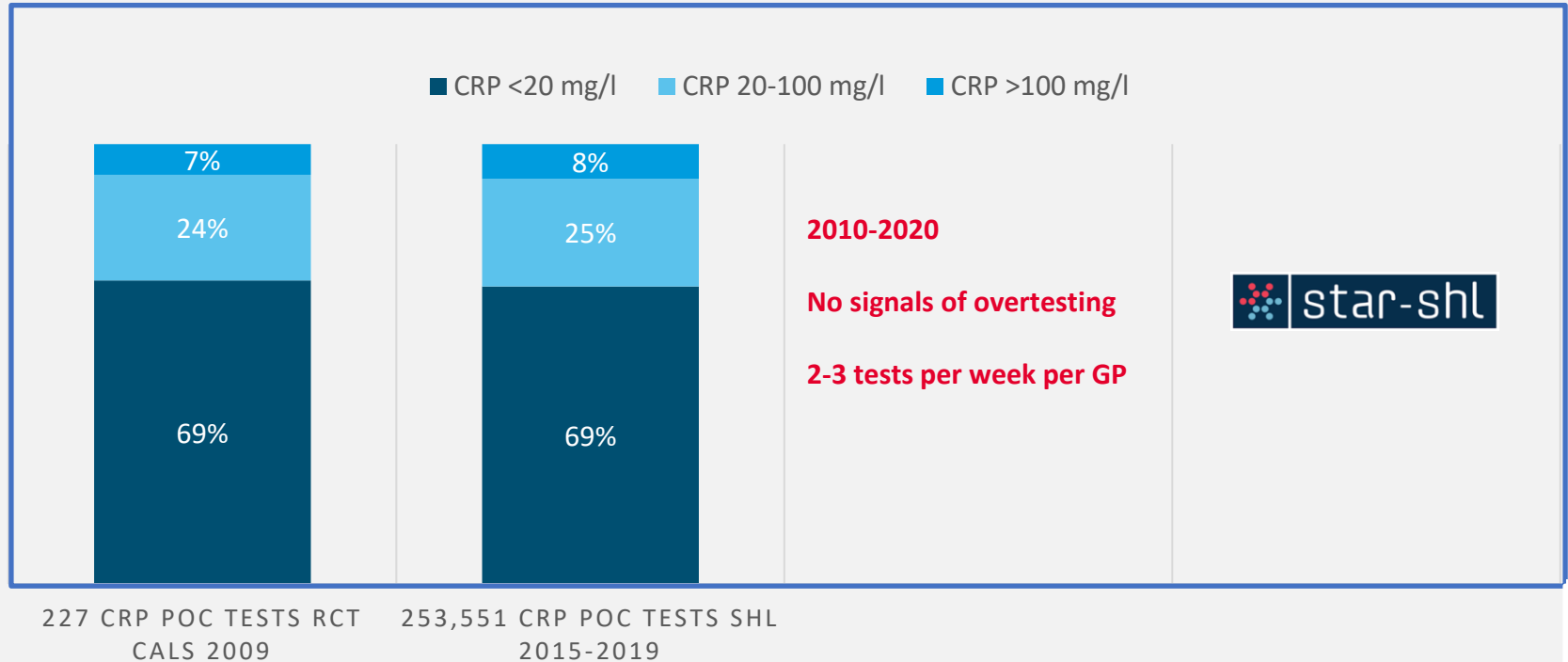
POCT process in our 400 primary care sites



Minnaard Scand J Clin Lab Invest 2013
Minnaard Scand J Clin Lab Invest 2015



CRP categories in RCT vs. routine care



CRP POCT = routine care



Conny Helder
Minister of Health, The Netherlands

'CRP point-of-care testing has contributed a lot to the care of our patients in the Netherlands.

We highly recommend to follow our example, and to start building this innovative case to improve care in your country.

Dr. Hopstaken and others will be happy to help out.'



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Q&A

ENASPOC

European Network
for Antibiotic Stewardship
at the Point of Care



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PANEL INTERACTION

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