

Infection Prevention in a connected world: A Dutch experience



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20-3-2018



- **Nothing to declare**
- **No conflict of interest**
- **Receiving Funds from:**
EU H2020/Marie Curie, EU/Interreg,
UMCG, Dutch Ministry of Health, Dutch
Ministry of Economics

The European Union's Horizon 2020
COFUND programme



University Medical Center Groningen
(UMCG)

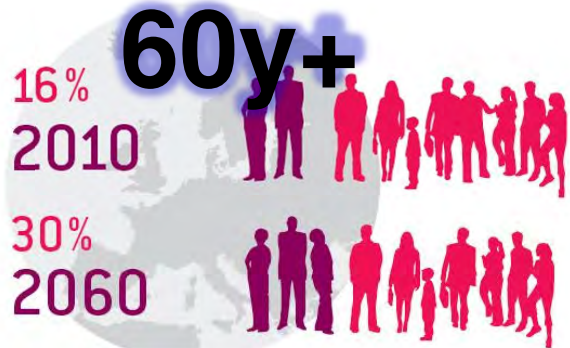


Ministerie van Volksgezondheid,
Welzijn en Sport

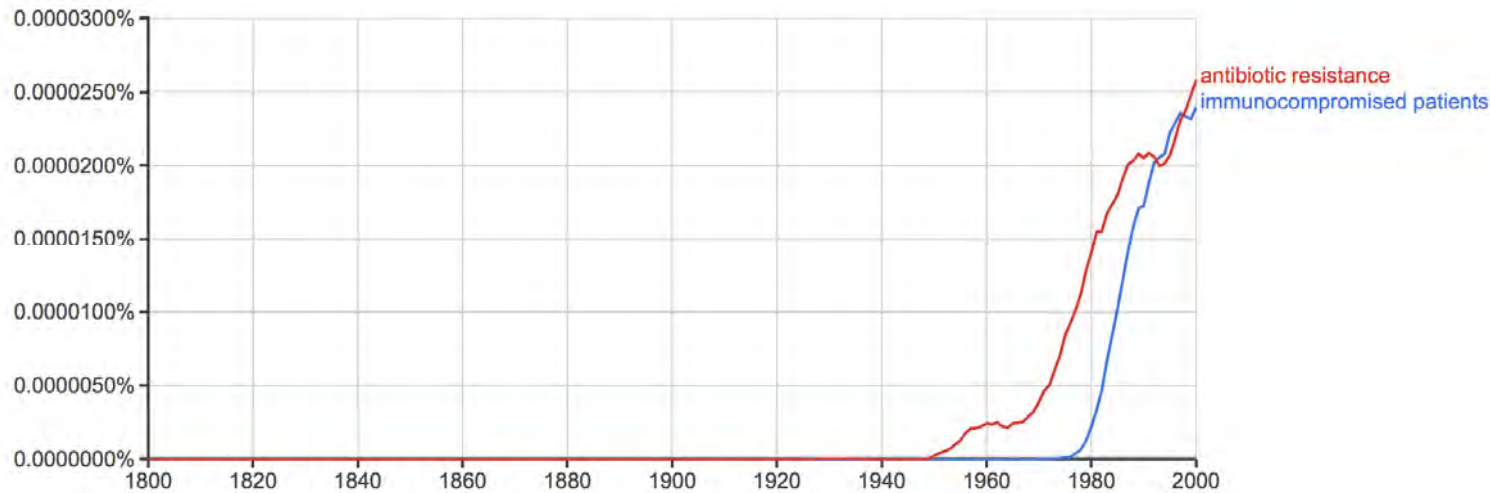


The next 40 minutes...

- The challenge
- Structural dimension
- Regional approach
- Interventional IC



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Major challenge

**Prevent infections and
maintain optimal treatment!
(prevent resistance)**

AMR is about sustainability in healthcare

- **Curative approach**

New antibiotics

- smart antibiotics
- targeted therapy

New thera-gnostics

(metagenomic, micro-imaging)

Repairing for
single patient

- **Preventive approach**

prevent infection

Keep antibiotics working

“Preva-gnostics”

Protecting
patient (groups)

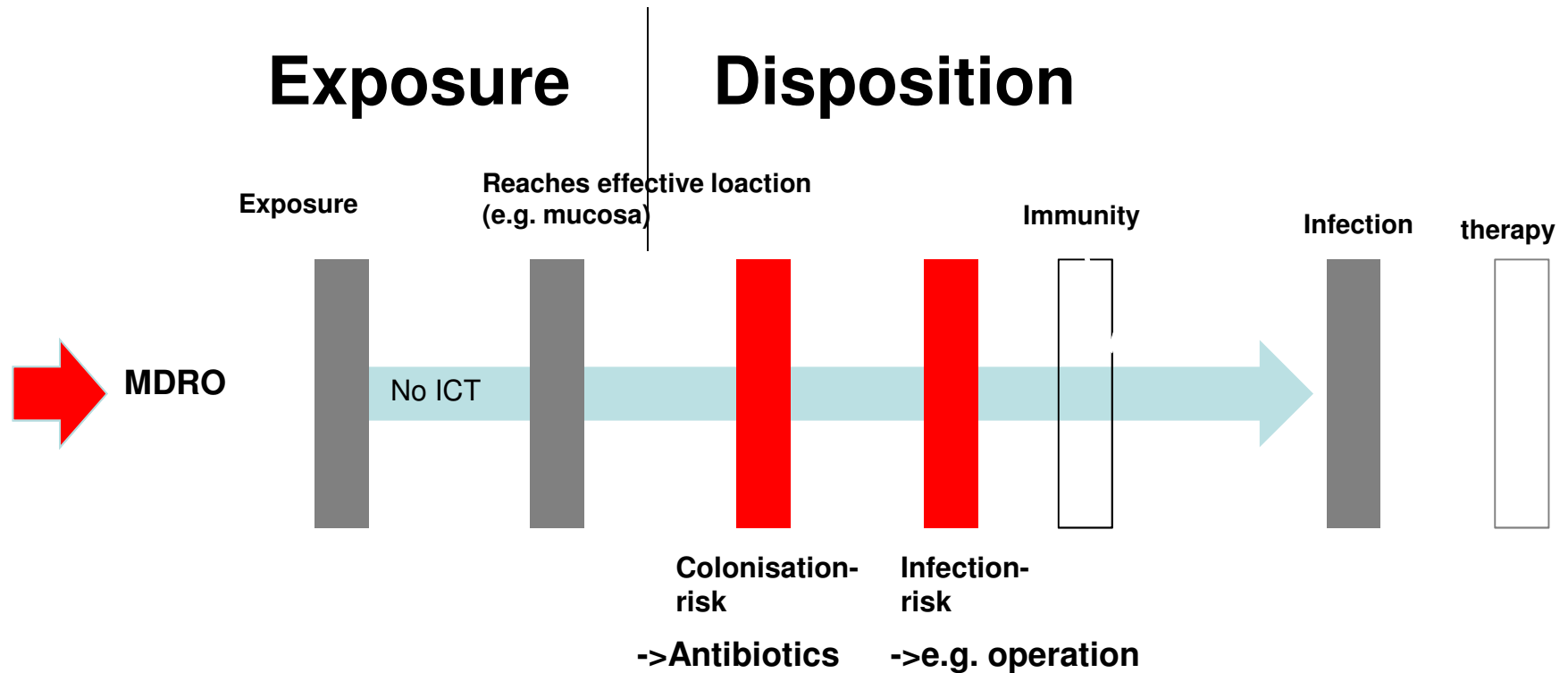
It's all about prevention

- **Prevention of infection**
 - optimal treatment of underlying disease (well trained clinicians!)
 - strict indication for medical treatment (aggressive waiting)
- **1^o Prevention of transmission**
 - Aseptic procedures/Disinfection
 - infection prevention measures
- **2^o Prevention of transmission**
 - Early identification of carriers
 - molecular typing/outbreak control
- **1^o Prevention of resistance**
 - optimal antibiotic therapy
 - reduction of selective pressure



VRE-outbreak UMCG January 2017

MDRO-infections are a little bit different



MDRO:

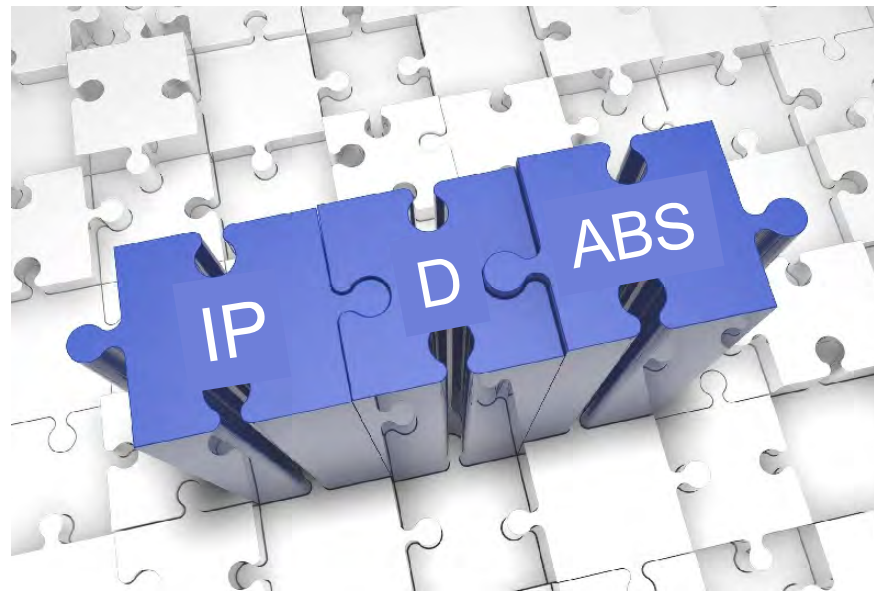
no incubation time

no carrier time

endogenous infection, exogenous transmission

Questions on infections/infectious diseases

1. Did you prevent colonization and infection today?
2. Do I have an infection/ID and which one?
3. What might be the optimal therapy?



Structural Innovations changing diagnostics today

- Network medicine and value-based medicine

Porter M. NEJM 2010

- Prevention economic model: pay for safety

- Disruptive Innovations and barriers for innovation

Report of the review of NHS pathology services in England. 20

- Companion diagnostics (as in oncology)

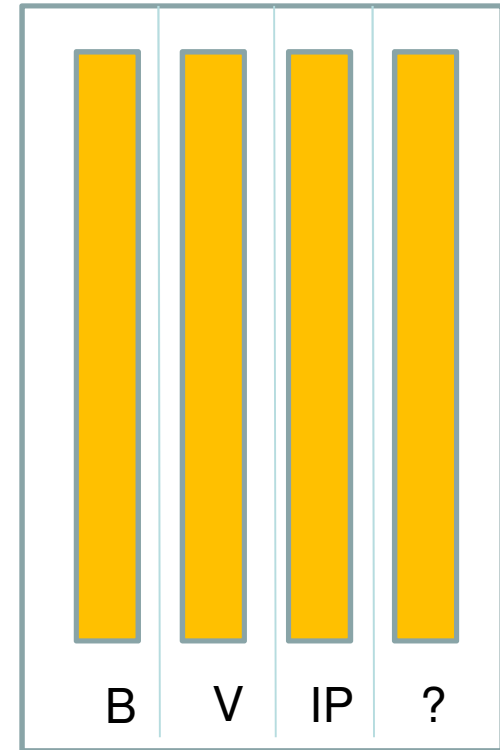
- Personalized and tailor made microbiology
(Next-Gen, Metagenomics, PET-Tracer-Imaging)

The division in diagnostics and clinical care Is a risk for quality of care



...from method-centered diagnostics...

- Bacteriology
- Virology, Serology
- Mycology, Parasitology...
- Infection prevention
- Research



- Not patient, but subspecialty seems central
- Often we take blood from patients several times, because of different labs..

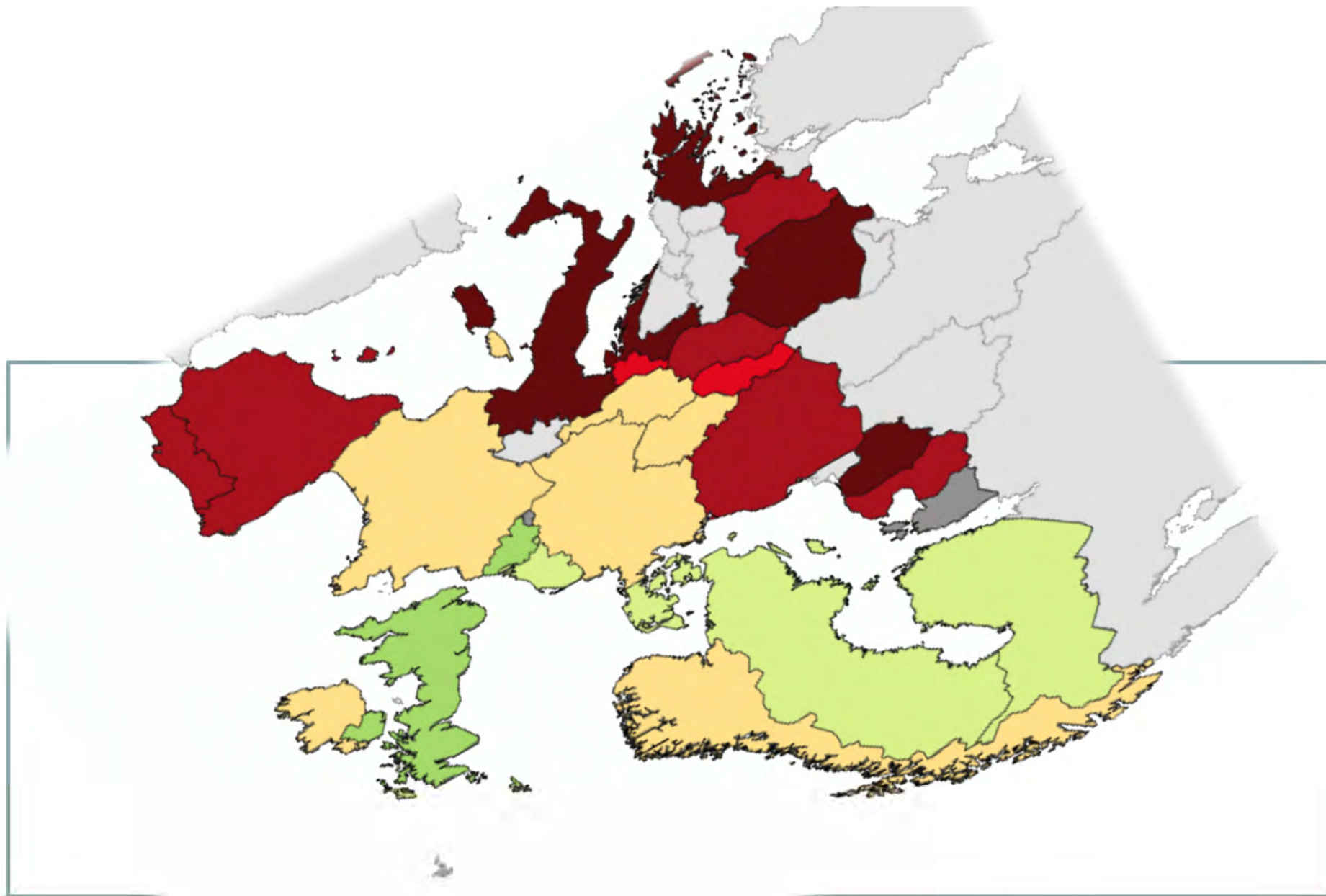
...30 minutes ahead...

- The challenge
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Imaging you are living in a ground-floor apartment of a house and it erupts a fire on the roof. What will you do?

- A. Close the door of your apartment, the fire will not reach you
- B. Close watersupply for the appartments at the roof
- C. Call help, protect your apartment and help the others

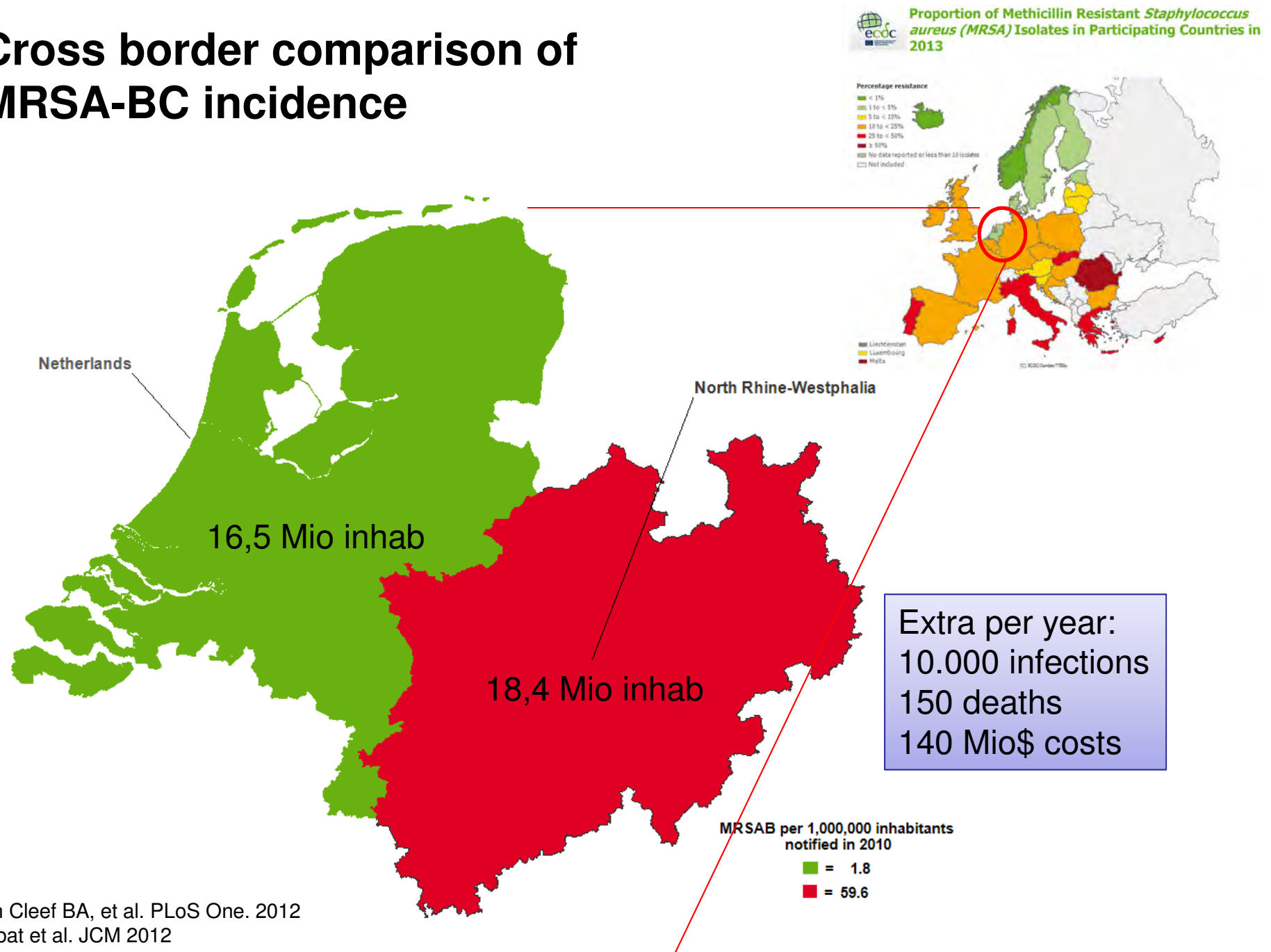




AMR in Europe

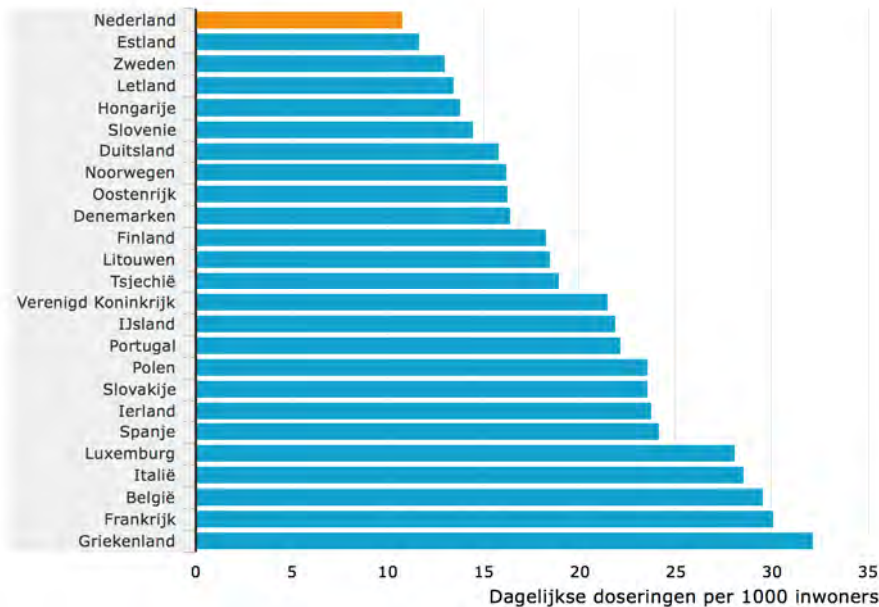
CRAb in BC, EARS-n

Cross border comparison of MRSA-BC incidence



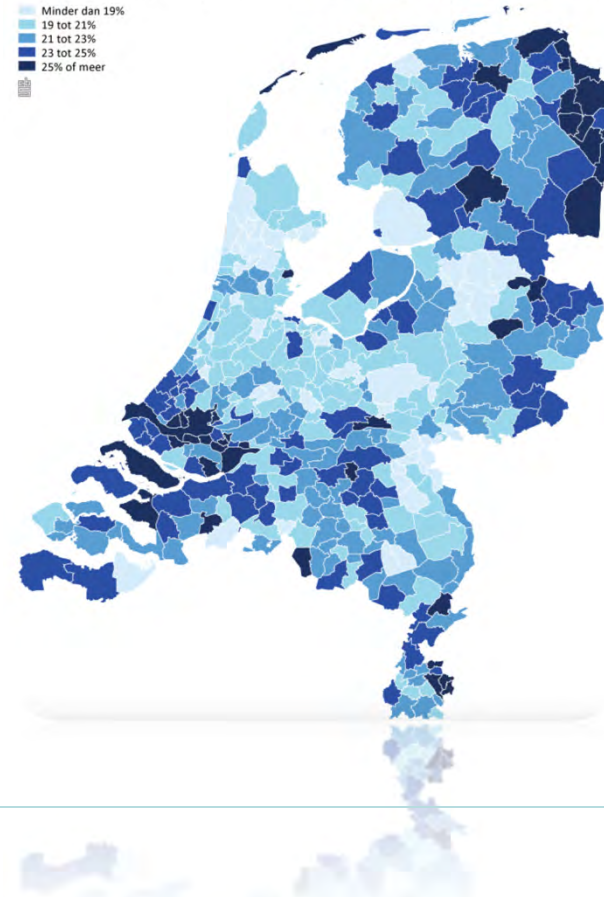
Differences in the use of antibiotics

Verstreckte antibiotica in Europa, 2013



Bron: OESO

Percentage van de bevolking dat antibiotica verstrekt kreeg, 2013 (gecorrigeerd voor leeft.,




[International Journal of Public Health](#)

October 2010, Volume 55, [Issue 5](#), pp 469–478

Socioeconomic determinants of outpatient antibiotic use in Europe

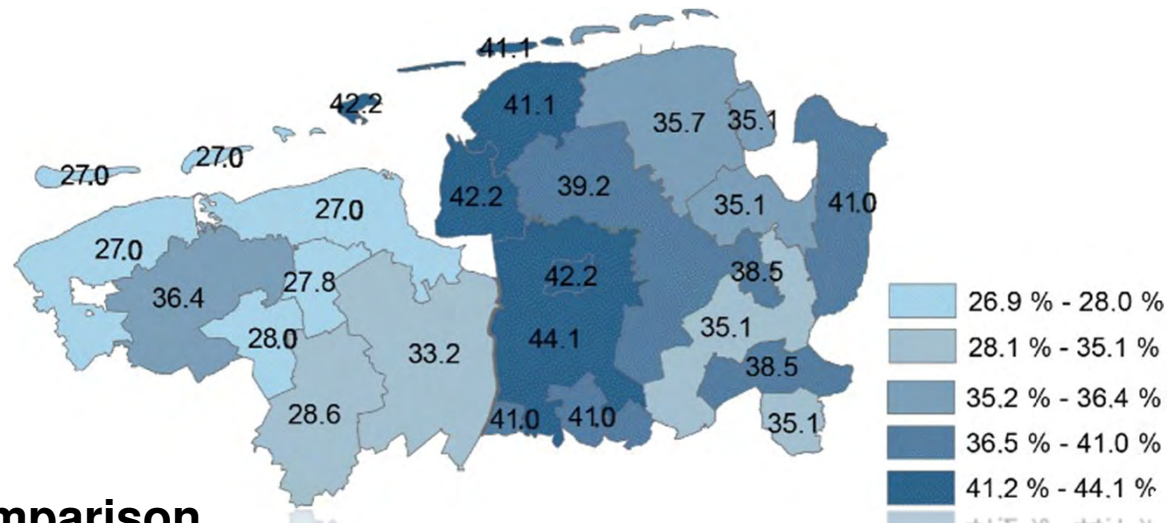
Authors

[Authors and affiliations](#)

Giuliano Masiero , Massimo Filippini, Matus Ferech, Herman Goossens

Significant determinants of antibiotic consumption:

- The population income
- demographic structure
- density of general practitioners and their remuneration method



Crossborder comparison of children receiving antibiotics in primary care

Dutch euregio: 29.8 % [29.3–30.3]

German euregio: 38.9 % [38.2–39.6]

Age 3-6: NL: 37% DE: 55%

Gender: girls receive more Ab in both countries

Variation within the euregions

27.0% to 44.1%

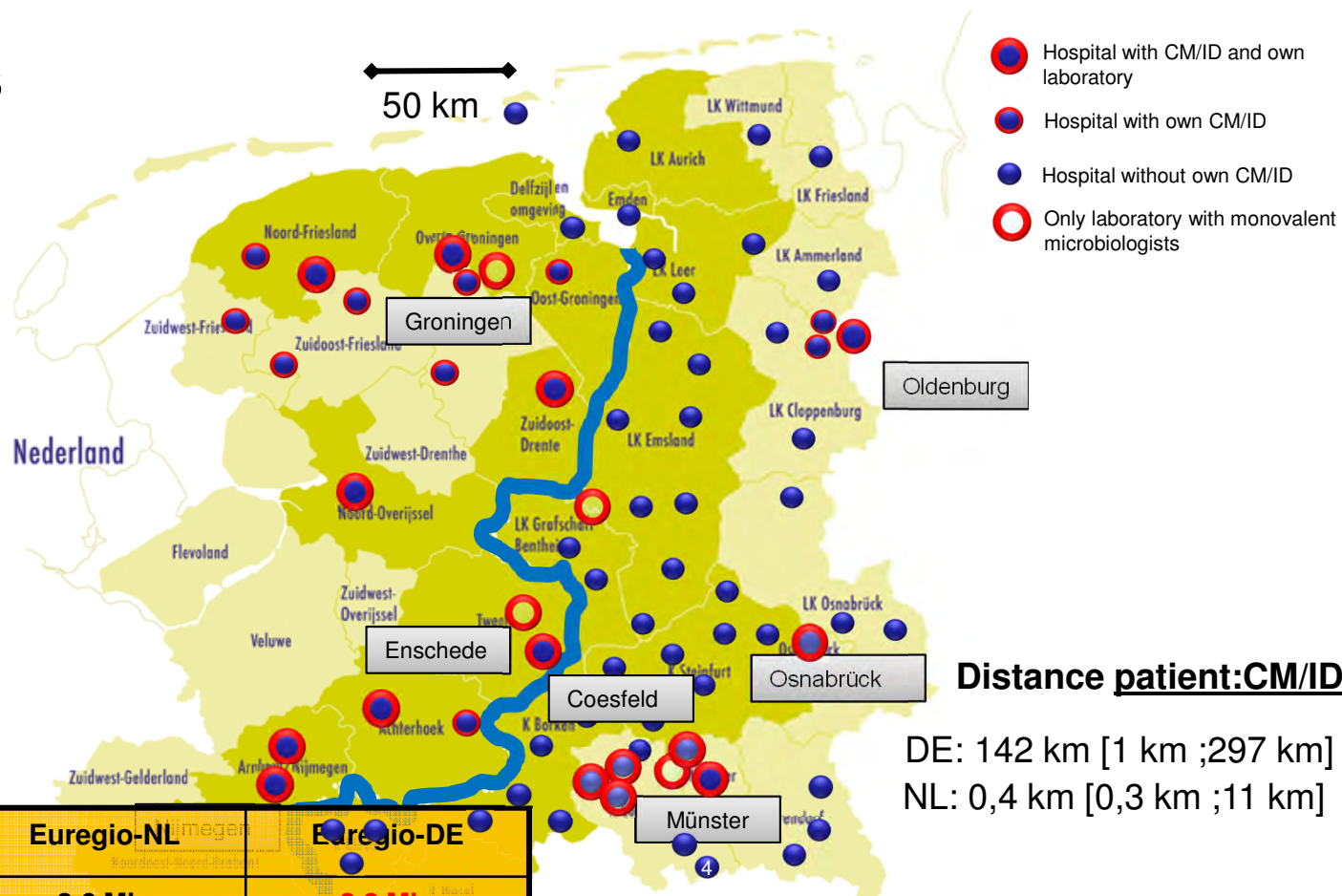
2nd-gen. cephalosporins:

25% of German children's prescriptions

0,1% of Dutch children's prescriptions



Border regions are interesting

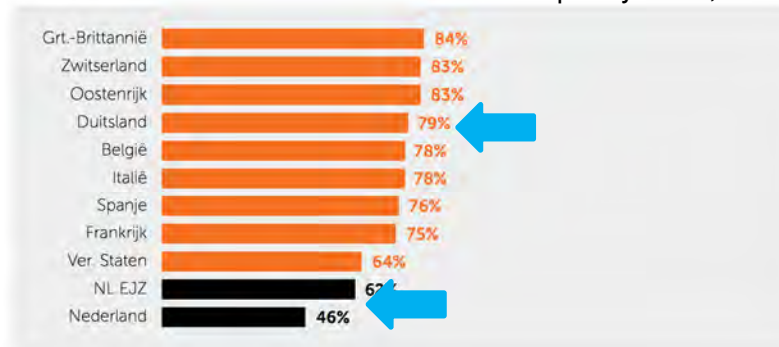


Distance patient:CM/ID

DE: 142 km [1 km ;297 km]
NL: 0,4 km [0,3 km ;11 km]

Parameters	Euregio-NL	Euregio-DE
Inhabitants	3,6 Mio	2,8 Mio
Acute care hospitals (beds)	22 (10813)	69 (17839)
Beds per 1000 inh	3,3	6,1
GP's/ 1000 inh	0,44	1,5
HCW:patient ratio (on ICU)	1 : 1,5	1 : 3,2
CM-ID /1000 beds	40 (3,8)	17 (1,0)
Hospitals with own CM/ID	95%	6%

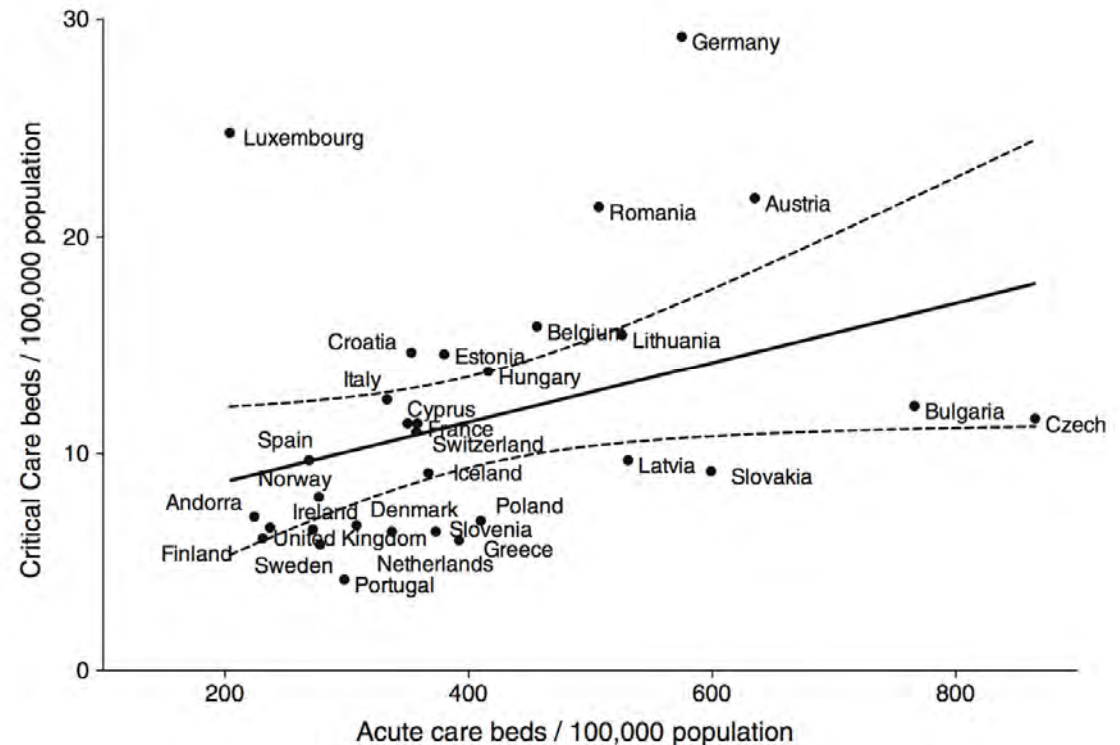
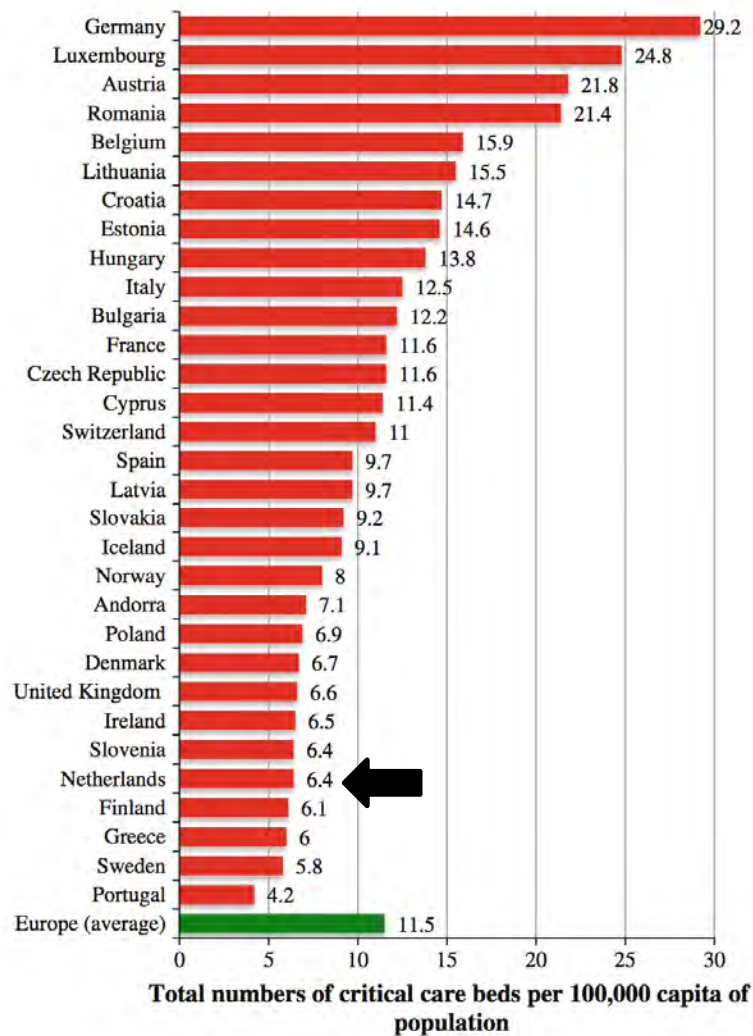
Bed occupancy rates, 2013



Bron: OECD Health Data

A. Rhodes
P. Ferdinande
H. Flaatten
B. Guidet
P. G. Metnitz
R. P. Moreno

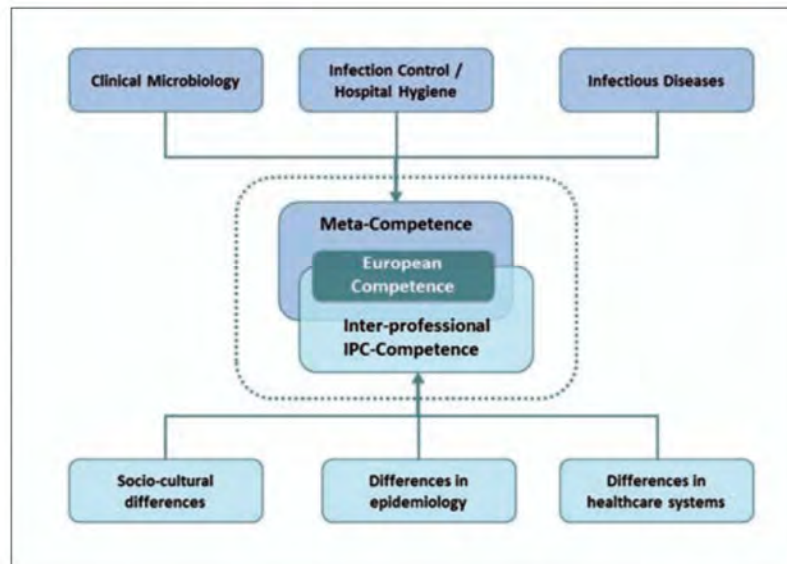
The variability of critical care bed numbers in Europe



Basic and advanced modules

	Date	Type of module	City Country	Module coordinators
EUCIC basic module	25 Feb–2 Mar 2018	Basic	Groningen Netherlands	Alex W. Friedrich
Surveillance and early warning systems of healthcare-associated infections	4–6 Jul 2018	Advanced	Paris France	Pascal Astagneau
Epidemiology and data analysis	24–27 Oct 2018	Advanced	Utrecht Netherlands	Jan Kluytmans
Dynamics of disease transmission	14–16 Jan 2019	Advanced	Freiburg Germany	Hajo Grundmann Sandra Reuter Nico T. Mutters
Antimicrobial stewardship	13–15 Mar 2019	Advanced	Ljubljana Slovenia	Tatjana Lejko Zupanc Didier Pittet
Implementation science	May 2019	Advanced	Geneva Switzerland	Walter Zingg
Technical hygiene	13–14 Sep 2019	Advanced	Vienna Austria	Elisabeth Presterl

Overview of key aspects of EUCIC's new training programme

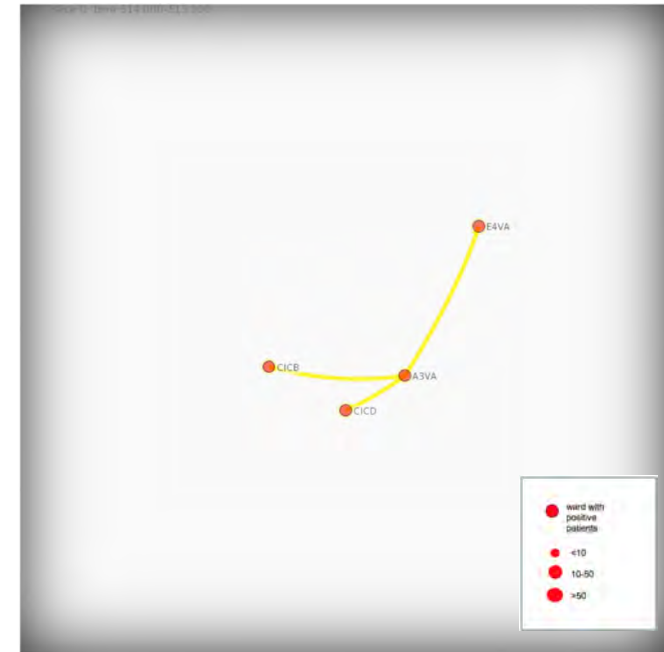
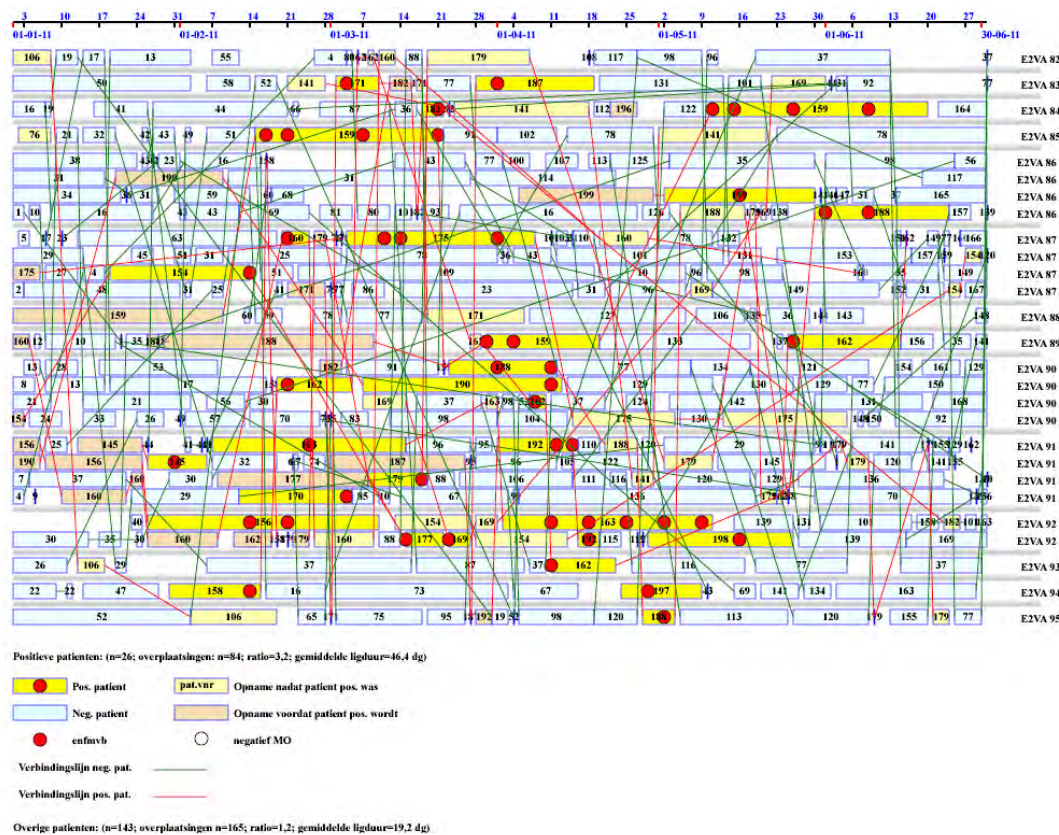


The EUCIC Infection Prevention and Control Certificate

European Training Programme

still 20 minutes to go...

- The challenge
- Structural dimension
- Regional approach
- Interventional IC



Outbreaks are power-law driven networks...

Network Analysis of Patient Transfer



Reduction of the nosocomial meticillin-resistant *Staphylococcus aureus* incidence density by a region-wide search and follow-strategy in forty German hospitals of the EUREGIO, 2009 to 2011

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Jurke A, Köck R, Becker K, Thole S, Hendrix R, Rossen J, Daniels-Haardt I, Friedrich AW. Reduction of the nosocomial meticillin-resistant *Staphylococcus aureus* incidence density by a region-wide search and follow-strategy in forty German hospitals of the EUREGIO, 2009 to 2011. *Euro Surveill*. 2013;18(30):pii=20579. Available online: <http://www.eurosurveillance.org/ViewArticle.aspx?articleid=20579>

Article submitted on 19 October 2012 / published on 5 September 2013



International Journal of Medical Microbiology

Available online 13 March 2013

In Press, Corrected Proof — Note to users



Infection prevention in a connected world: The case for a regional approach

Open Access Article

Mariano Ciccolini^a, Tjibbe Donker^a, Robin Köck^b, Martin Mielke^c, Ron Hendrix^d, Annette Jurke^a, Janette Rahamat-Langendoen^a, Karsten Becker^f, Hubert G.M. Niesters^a, Hajo Grundmann^a, Alexander W. Friedrich^a.

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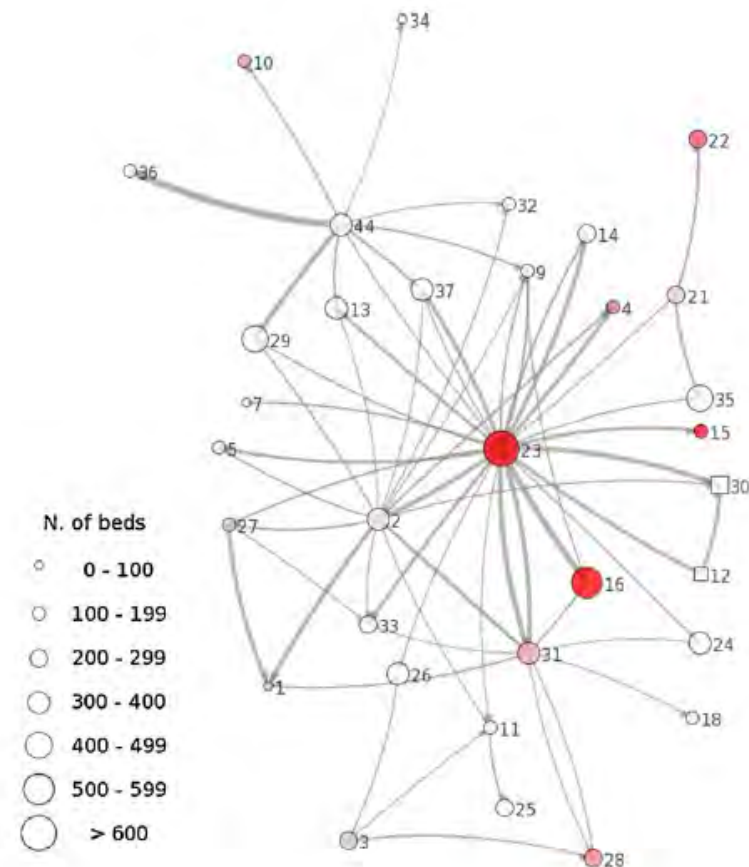
^b Institute of Hygiene, University Hospital Münster, Münster, Germany

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“Regional healthcare communities”

- Patients are shared within definable healthcare communities
- Not size, but centrality decides on impact
- Regional intervention can reduce rate also in low-IC performing hospitals
- “Hubs” of the community have higher responsibility

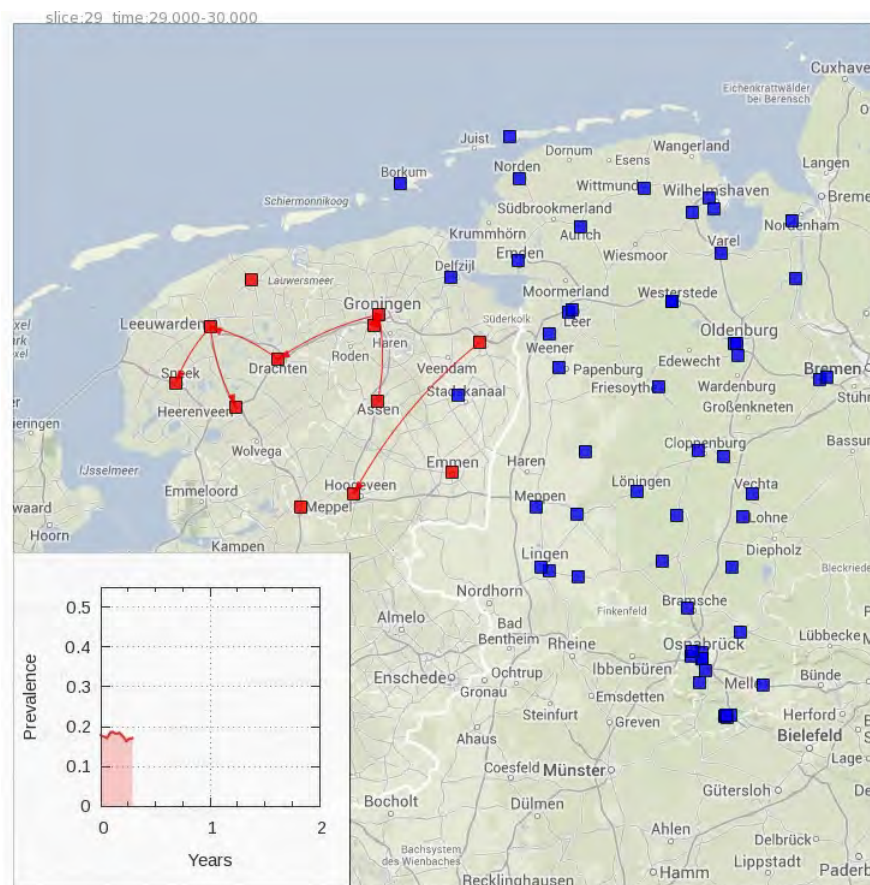
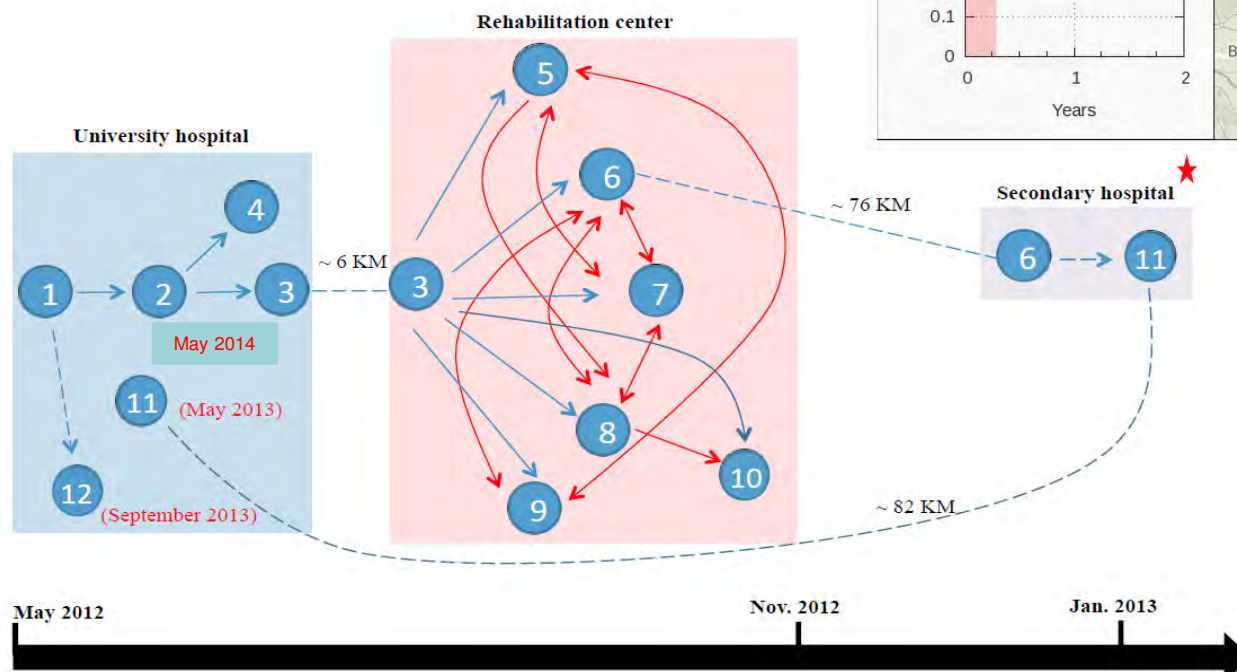
SCIENTIFIC REPORTS

OPEN

Use of whole-genome sequencing to trace, control and characterize the regional expansion of extended-spectrum β -lactamase producing ST15 *Klebsiella pneumoniae*

Received: 03 November 2015
Accepted: 13 January 2016
Published: 11 February 2016

Kai Zhou^{1,2}, Mariette Lokate¹, Ruud H. Deurenberg¹, Marga Tepper², Jan P. Arends¹, Erwin G. C. Raangs¹, Jerome Lo-Ten-Foe¹, Hajo Grundmann¹, John W. A. Rossen^{1,*} & Alexander W. Friedrich^{1,*}



Prevention regions against AMR

- in 2016: Creation of **10 official AMR-Prevention Regions**
- Legal **responsibility**: Not county, but Regional **Acute Care Networks**
- **Medical** responsibility: Clin.Microbiologist/Hygiene/ID&Public health
- **Inter**-mural network-forming (Hospitals, AC, LTCF a.o.)
- **Budget** (150 Mio Euro for 10 Years)



National/Regional AMR-Goals

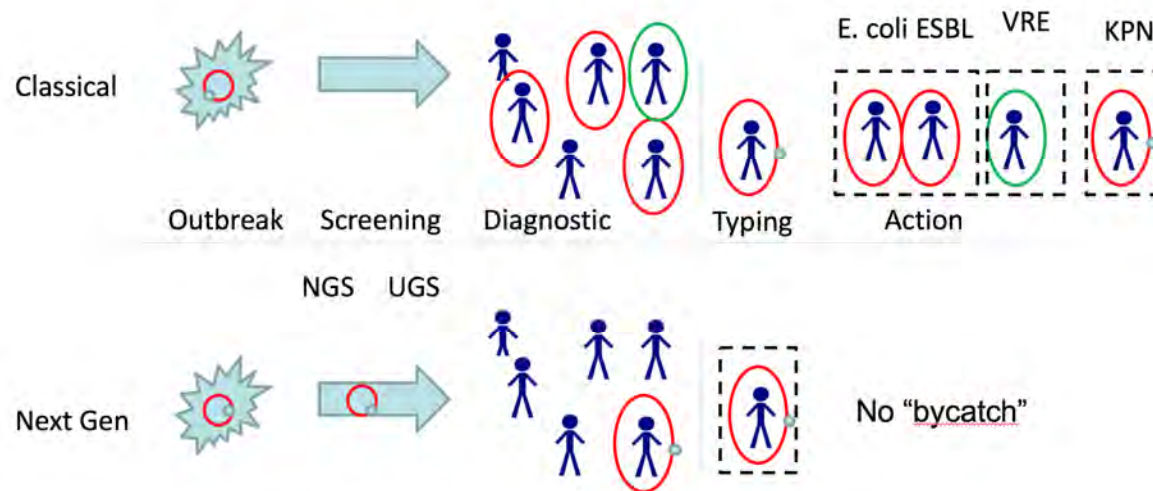
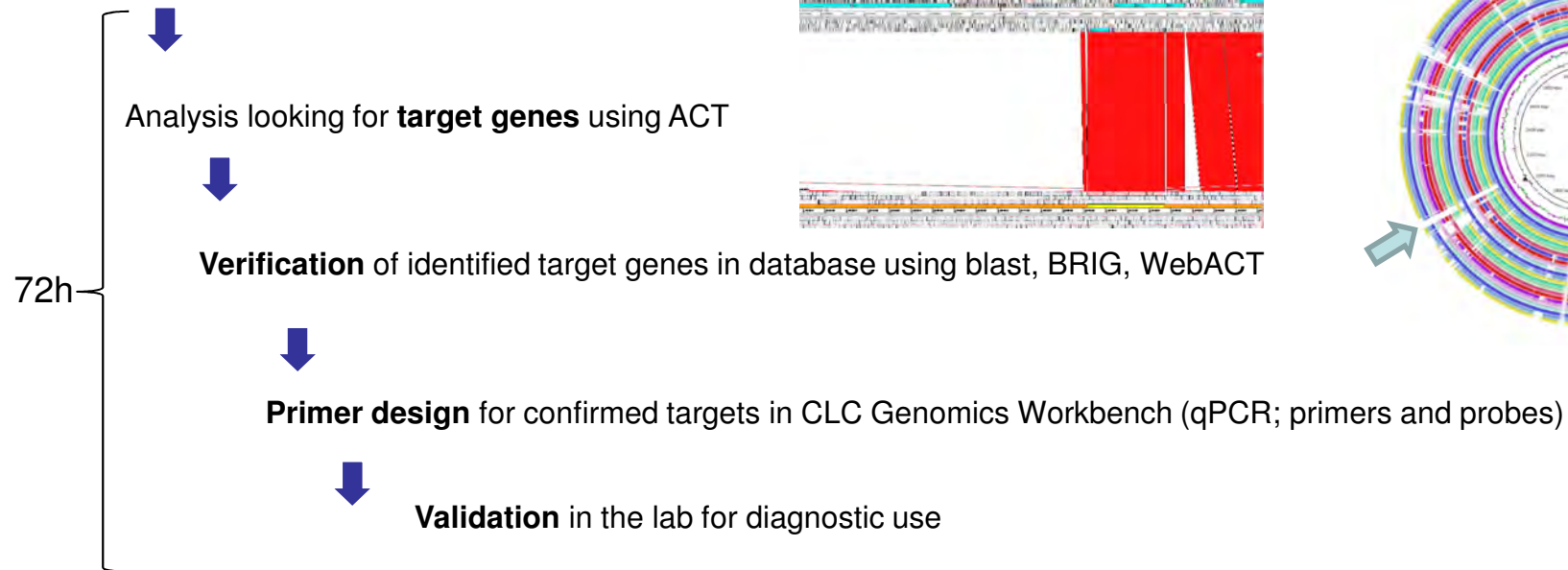
1. Prevent spreading of **MDRO** (“**CRE-free**”)
2. Regional **risk assessment**
3. **Interdisciplinary** and crossborder **collaboration**
4. Regional **teaching and audits**
5. Regional **Control of outbreaks**
6. **Molecular typing** for regional action

...last 10 minutes...

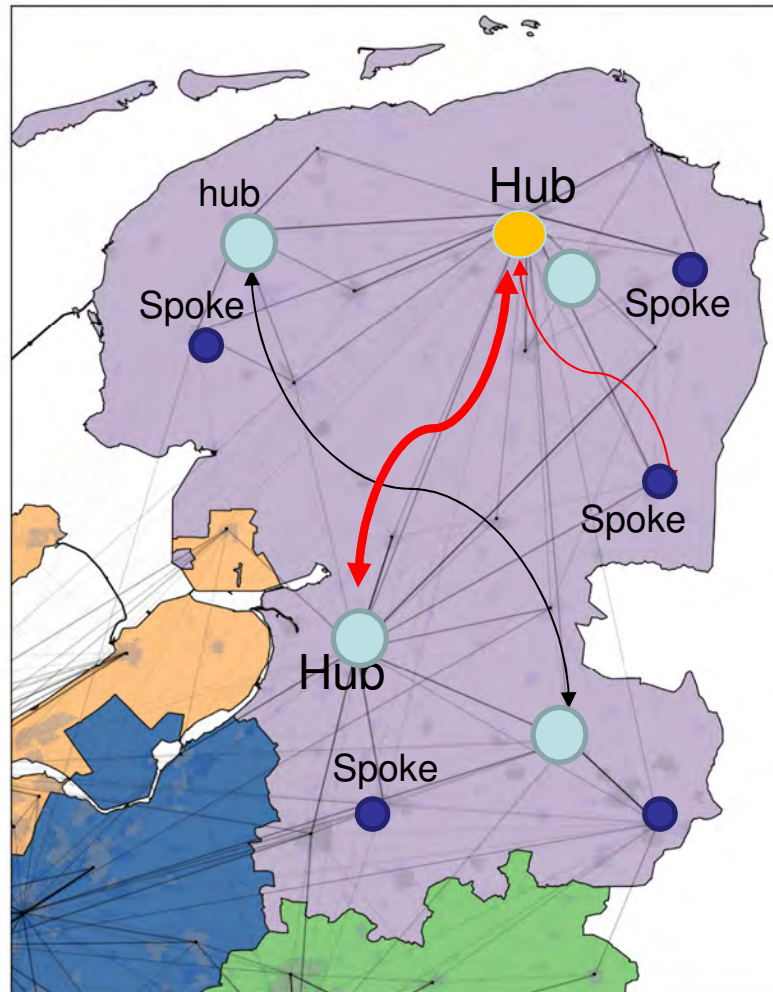
- The challenge
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Tailor-made diagnostics: First type and then screen

Comparative genomics generated by WebACT



Regional Hub&Spoke-Diagnostic



Academic Hub

- most complex diagnostics
- Research/innovation
- Training (coordination)



Regional Hub

- logistic centers
- High-throughput-diagnostic



Regional Spoke-lab

- Gatekeepers
- Appropriate diagnostic



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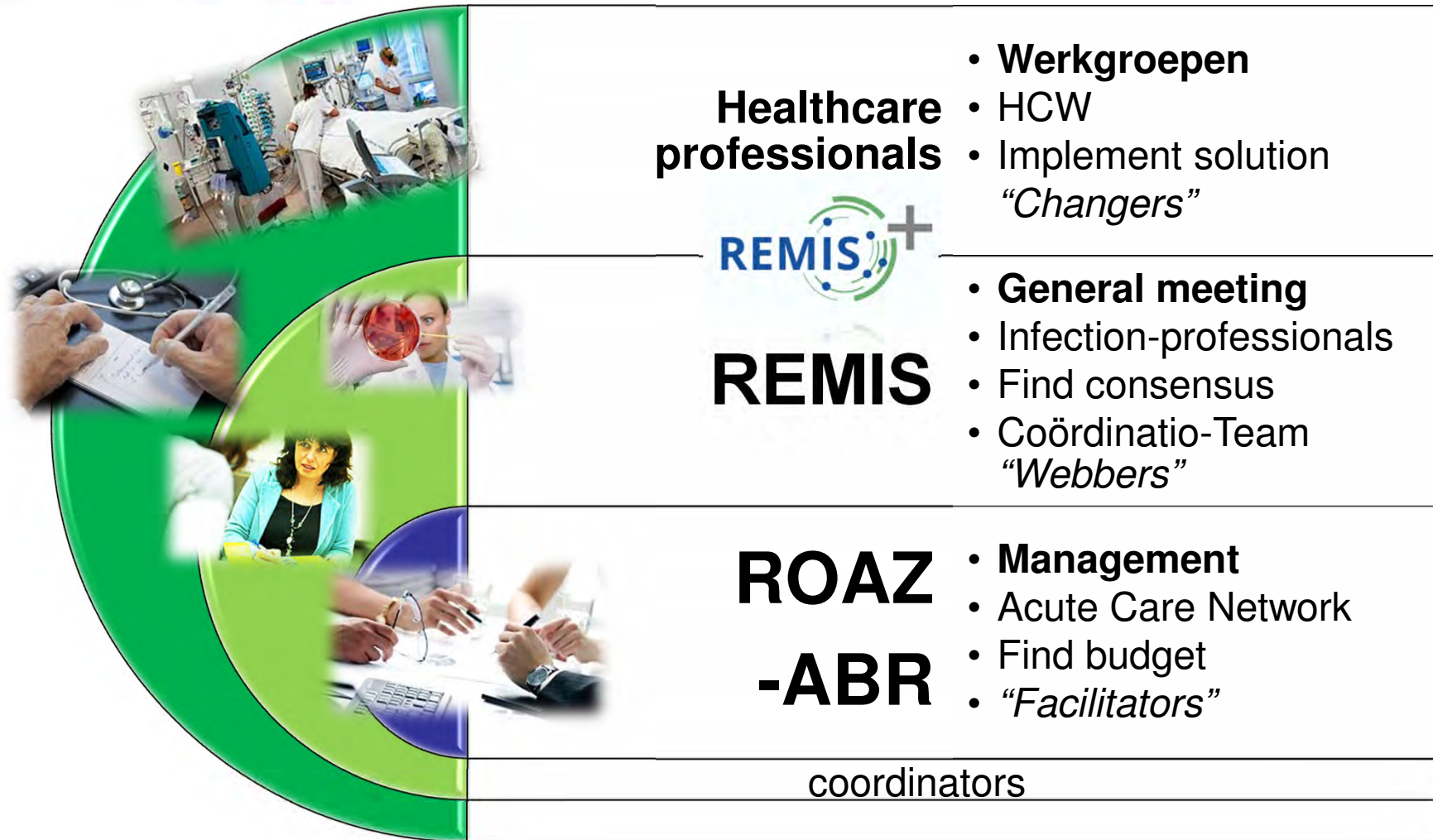
Hub&Spoke:

Beastall, G. The Modernisation of Pathology and Laboratory Medicine in the UK: Networking into the Future. 2008 Clin Biochem Review.

Moynihan, B et al. 2010. Delivering regional thrombolysis via a hub-and-spoke model. 2010 J R Soc Med.



Organic network structure



From competence to meta-competence

Therapy Antimicrobial Stewardship

Diagnostic Stewardship



Infection Prevention Stewardship

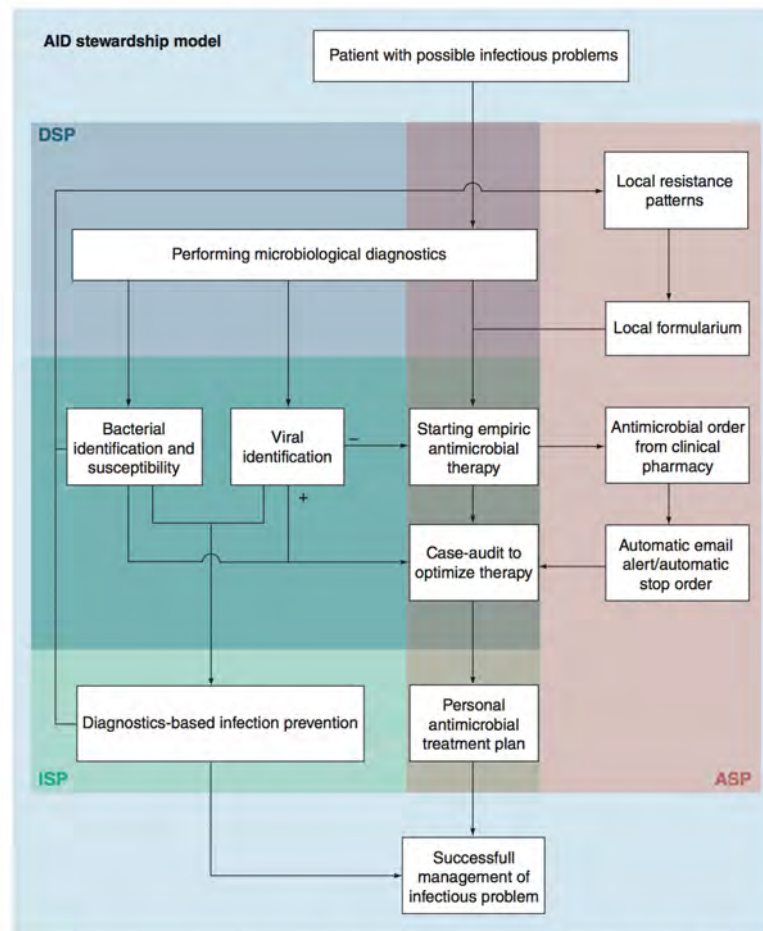


Figure 2. Master scheme antimicrobial, infection prevention and diagnostic stewardship model. Flow chart that depicts the path of care of a patient from top to bottom, surrounded by (several of) the building blocks of the three different, but supplemental, stewardship programs and how they are intertwined. Notice the overlap, thereby showing the necessity of all three stewardship programs and integrative nature of the model.

Diagnostic Stewardship includes:

- ✓ Clinical expertise
- ✓ Gatekeeper function
- ✓ Rapid & Responsive
- ✓ Selective reporting
- ✓ Lab gives answers and no test results



Integrated Stewardship Model Comprising Antimicrobial, Infection Prevention, and Diagnostic Stewardship (AID Stewardship)

J. H. Dik, R. Poelman, A. W. Friedrich, H. G. M. Niesters, J. W. A. Rossen,
B. Sinha

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Groningen, the Netherlands

KEYWORDS antimicrobial stewardship, antimicrobial resistance, diagnostic stewardship, integrated stewardship

Interventional Infection Prevention&Control



Courtesy: NVMM.nl

- CM/ID/ICP

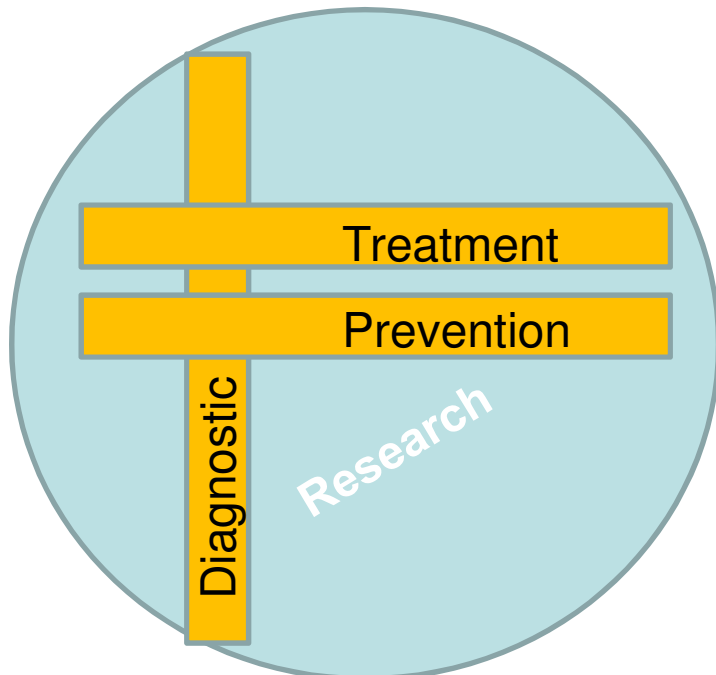
- Infection Prevention
- Daily Bedside consult/ Multidisciplinary board
- Eyes for the invisible (his/her own lab)
- Gatekeeper for diagnostic specimens

A. Lab-oriented – “Astronomer”

B. Clinic-oriented – “Astronauts”

C. Link nurses/docs (HCW with “a heart” for infections)

D. Infection-committee (3 sub-committees)



Department of MMBI at the UMCG



Multidisciplinary patient-Board at the UMCG

Take home...



- **Resistance is a threat** to modern medicine
- **Look at factors behind the medical ones**
- **Regional reality and responsibility**
- **Do you have a common goal?**
- **Is your IP interventional** or just reactive?
- **Across borders of institutions and specialist fields**



