

IL SEQUENZIAMENTO NGS NEL LABORATORIO DI MICROBIOLOGIA: VALIDAZIONE, IMPLEMENTAZIONE ED UTILITÀ CLINICA

11 **NOVE**
MBRE
2023
ore
9.00

SESSIONE IV
LE SORVEGLIANZE MICROBIOLOGICHE E
LA RETE ITALIANA SEQUENZIAMENTI

La rete NGS

Annibale Raglio



Salone di Rappresentanza
AON SS. Antonio e Biagio e Cesare Arrigo
Via Venezia 16, Alessandria

Non ho conflitti di interesse

Argomenti

- Network Analysis
Analisi della rete
Analisi dei movimenti

+

- Applicazione NGS
anche Sanger 16 18 S
RNA

Confronto con Groningen, Olanda

- **Politica Search and Destroy per MRSA dal 1960**
 - In Italia documento CCM-Emilia Romagna del 2012 applicato da 30/80 Ospedali che hanno risposto (Studio PROSA, SIMPIOS)
- Ospedale di Groningen (150.000 abitanti):
 - **1300** letti, **50.000** ricoveri anno
 - **12.000 operatori**
 - **150 operatori** nel Dipartimento di Microbiologia e Controllo Infezioni
 - 10 infermiere epidemiologhe
 - **Ogni Reparto ha stanze singole** per degenza in attesa esiti screening MDR
- Hanno attivato:
 - **WGS per tipizzazione geni resistenza ceppi MDR**
 - **Analisi di rete informatizzata per monitorare movimenti dei pazienti tra UO e tra Ospedali**



UMCG Groningen



HPG23 Bergamo 130.000 abitanti
1.100 letti, **40.000** ricoveri,
5.000 operatori, **42** Microbiologia e CIO

Eyes for the invisible

The regional healthcare networks

Da Donker ECCMID 2017

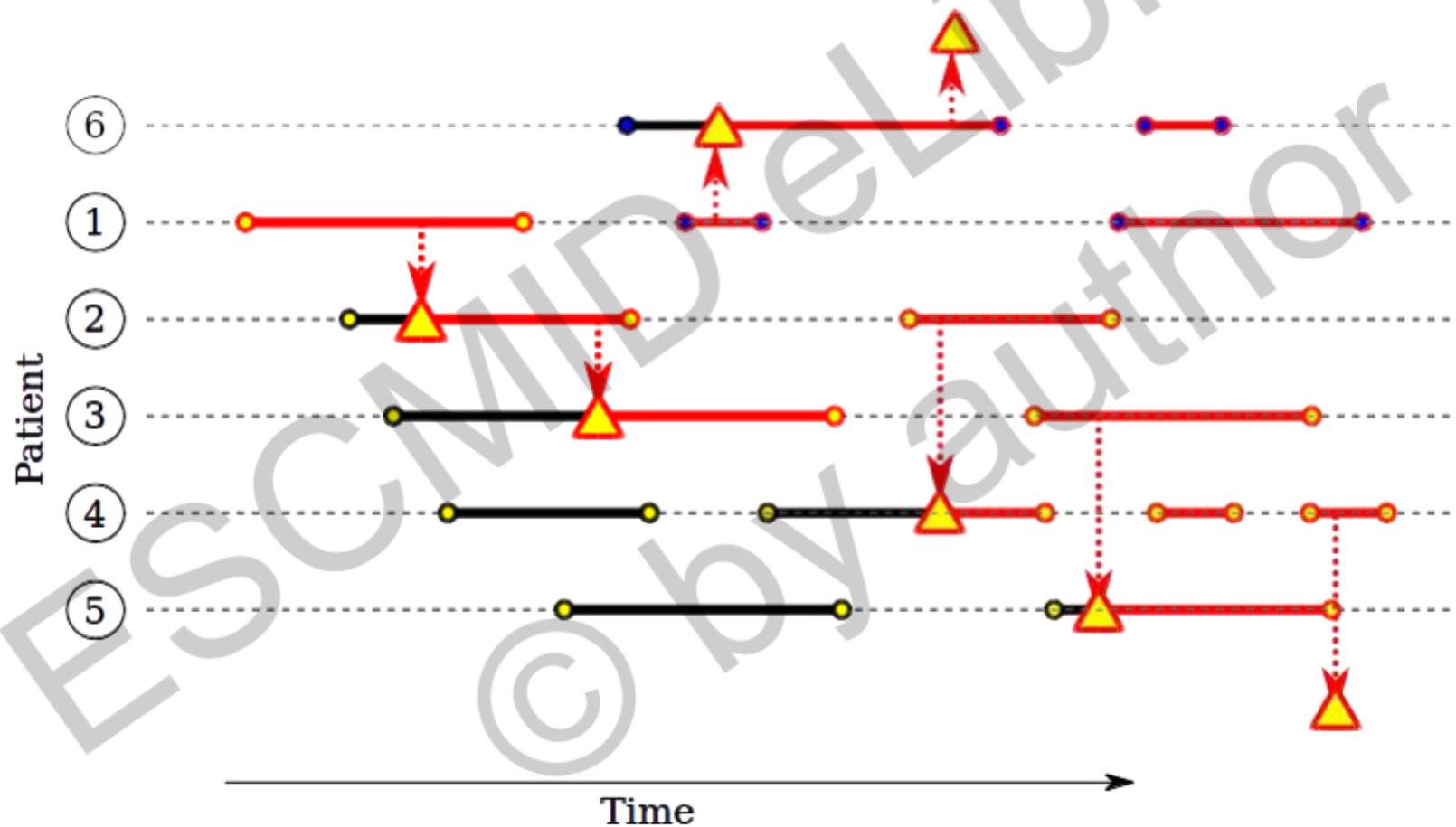
How we all would want to control the spread of antimicrobial resistance (AMR)



Da Donker ECCMID 2017

- Hospitals as ideal breeding ground
 - Susceptible population
 - High antibiotic use
- Current control efforts
 - Focused on single institution
 - Focused on single hospital stay
 - Analyse hospital-bound outbreaks

Single outbreak, in a single hospital



ELABORAZIONE DATI SORVEGLIANZA MRSA, I Trimestre, Gennaio-Marzo 2023

Tabella 1. Studio colonizzazione con tampone nasale, faringeo e inguinale

CdC - UO	A Totale pazienti esaminati N°	B Totale pazienti positivi N°	C Pazienti positivi all'ingresso N°	D Pazienti positivi durante la degenza N°
Medicina Interna	288	15	15	--
Cardiologia - Unità Coronarica	257	12	10	2
Terapia Intensiva Adulti	163	5	3	2
Ortopedia	184	9	7	2
Neurologia	54	--	--	--
Pediatria	155	2	2	--
Sub-Totale	1101	43 (3.9%)	37 (C/A=3.4%, C/B=86%)	6 (D/A=0.5% D/B= 14%)
Urologia	174	2	--	2
Totale	1275	45 (3.5 %)	37 (2.9%, 82%)	8 (0.6%, 18%)
Altre US	49	6	3 (Riab,Ch1,Pne)	3 (2Riab, Cassano)

Difficoltà

Estrazione dati LIS

Analisi 48-72 h

Dati Clinici e altro

Tabella 2. S. aureus da Emocoltura: MRSA vs MSSA

CdC - UO	MRSA (n° casi)	MSSA (n° casi)
Medicina Interna	--	2
Cardiologia - Unità Coronarica	--	--
TI Adulti	--	--
Ortopedia	--	1
Neurologia	--	-
Pediatria	--	2
Urologia	--	5
Totale	--	10
Altre US	(7) 2* (1Cassano)	(10) 3 (PS) (1Cassano)

1PS, 1Med,Onco,2Riab *MedGastro

Tabella 3. S. aureus da campioni clinici (escluse le colonizzazioni e le emocolture): MRSA vs MSSA

CdC - UO	MRSA (n° casi)	MSSA (n° casi)
Medicina Interna	3Pus, 2Ur	1Pus
Cardiologia - Unità Coronarica	--	1Resp
TI Adulti	1Ur	1Resp
Ortopedia	3Resp	6Resp 1Pus
Neurologia	--	--
Pediatria	2Resp	4Resp 1Ferita
Urologia		
Totale	11	15

Resp: campione respiratorio, Ur: urine

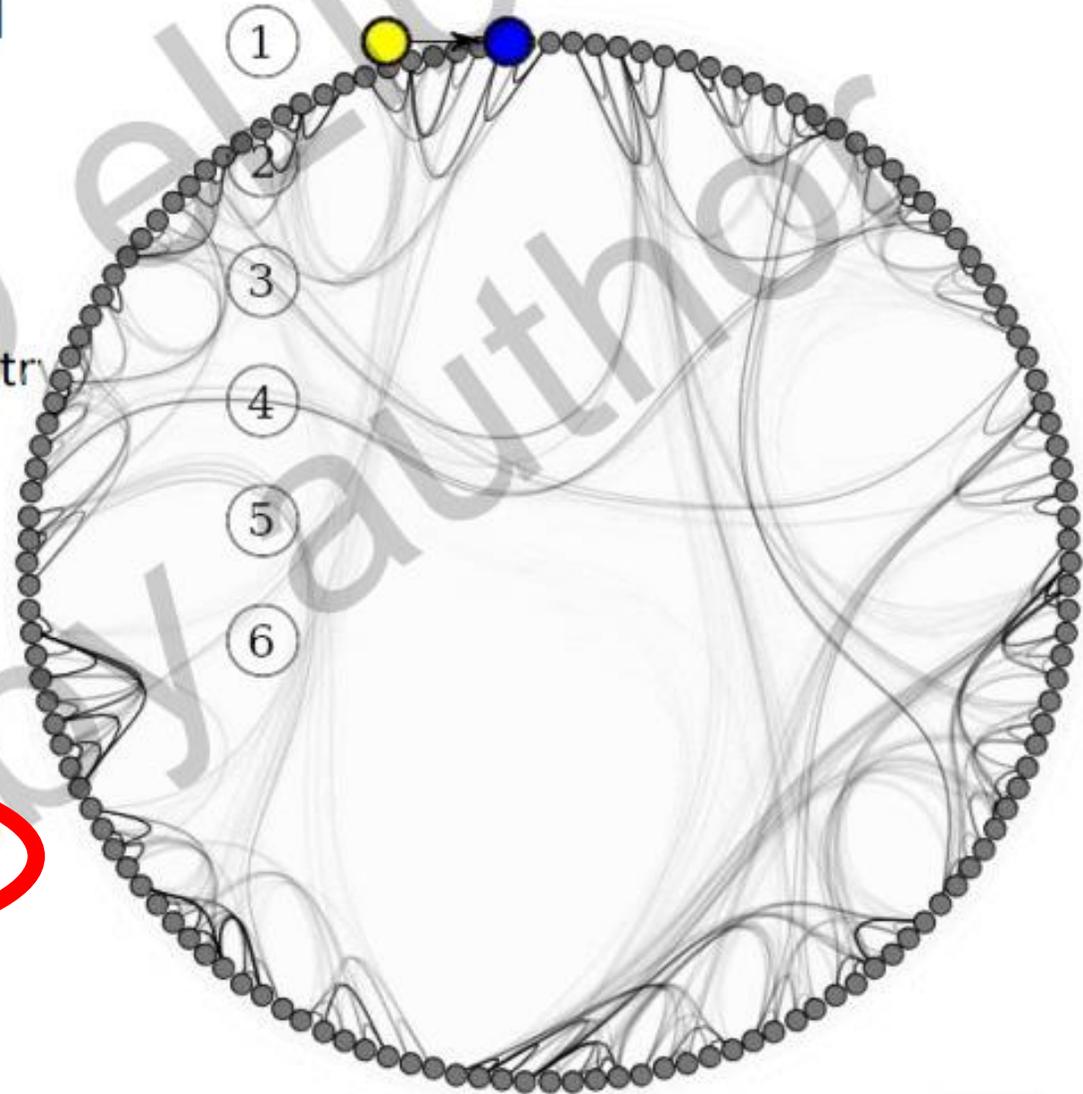
Construct from Electronic Medical Records

England: NHS-Hospital Episode Statistics (HES)

Netherlands: National Medical Registry (LMR)

Record all patient movements between hospitals

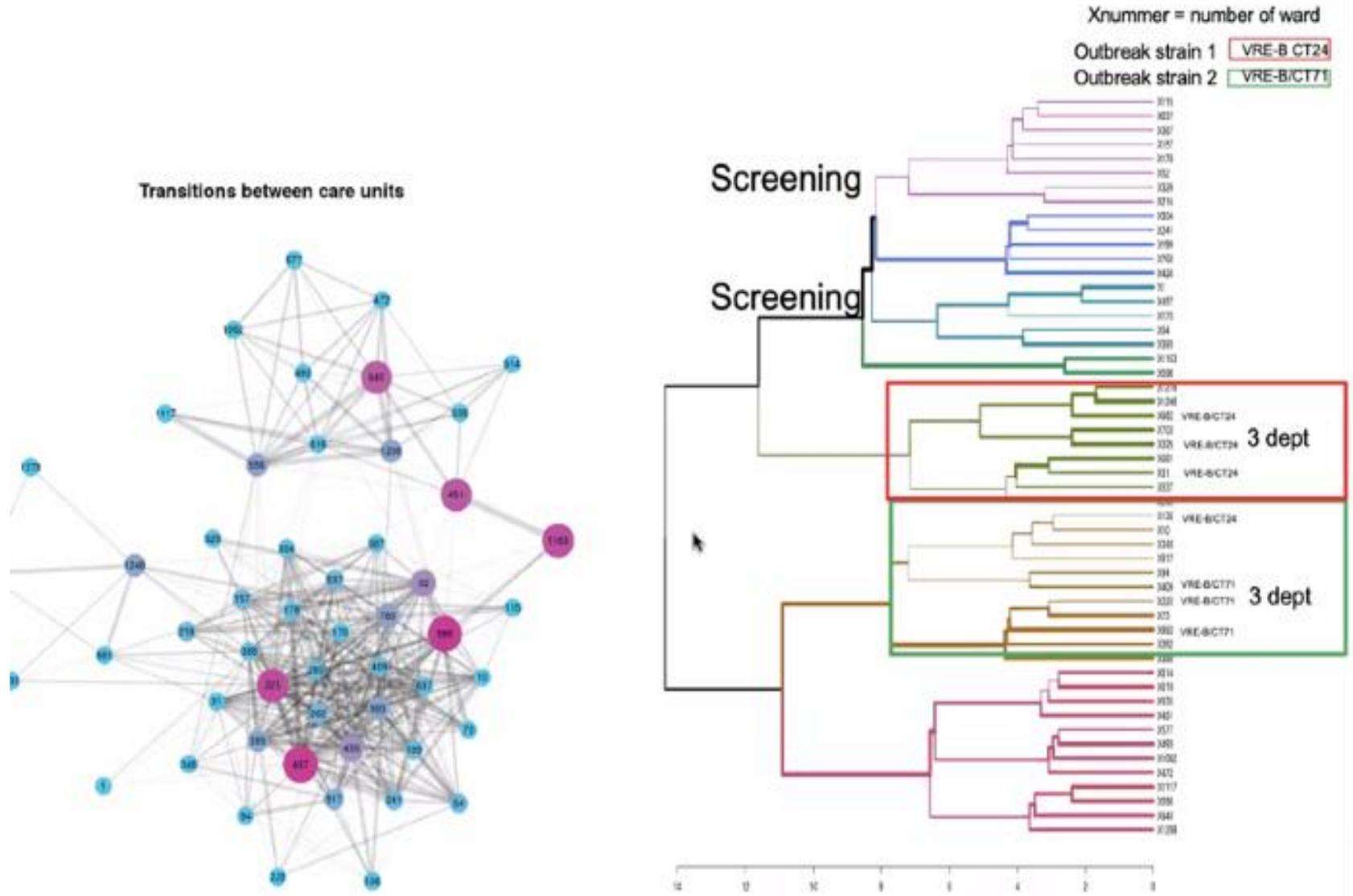
Shows the easiest routes for AMR to travel through the patient flow

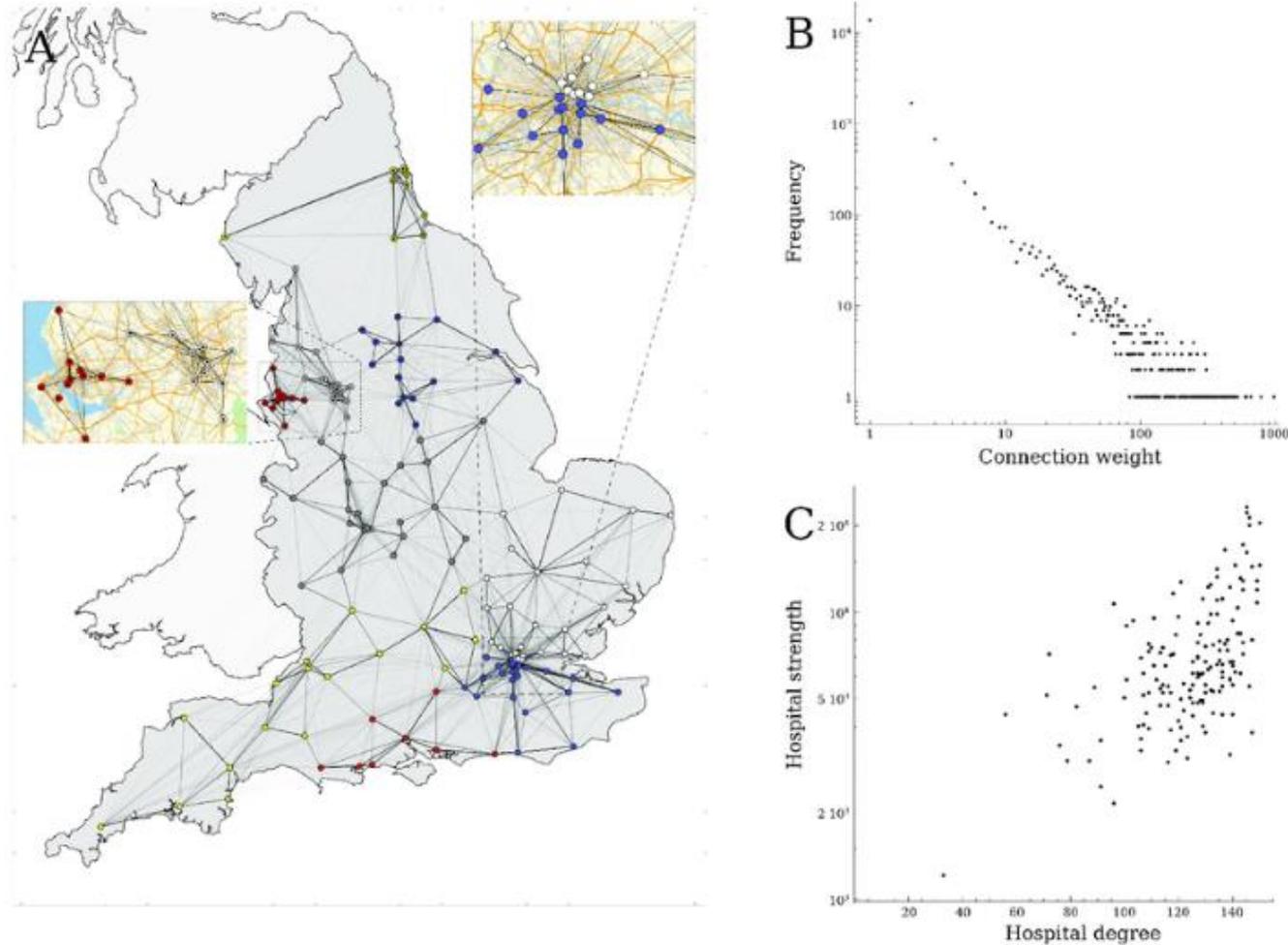


Sequenziamento completo del Genoma (WGS/NGS)

- Applicato per le mutazioni dell'HIV ora anche per SARS-CoV2
- Utile per i geni resistenza degli MDR
- Utile per studio similitudine dei batteri per focolai, cross-trasmissioni
- Utile per la diagnosi di infezioni da materiale protesico
- Costo 100- 150 Euro a test
- Serve personale esperto
- Necessario organizzare la sua applicazione
 - A livello provinciale o regionale o nazionale
 - Rete dei Laboratori di Microbiologia

Cluster analysis of two concomitant VRE-outbreaks in the UMCG





Measuring distance through dense weighted networks: The case of hospital-associated pathogens

The patient movement network in England. A) Strong connections (darker lines) between hospitals (circles) are regionally bound, and form a strong community structure (circle colours). B) The distribution of connection weights shows that most connections between hospitals are weak (i.e. few shared patient between hospitals). C) The degree of a hospital (the number of hospitals it is connected to by shared patients) is related to the total number of patients it exchanges with other hospitals (hospital strength).



Leer
Osthauderfehn/OldenburgerGroningen
14.01.2012

Die Kinderrettung ist eine Herzenssache

Im Einsatz für Kindererkrankt (von links): Tanya-Haber, Prof. Dr. Tank Ebers, Dr. Reinoud Molé, Karsten Essel, Prof. Dr. Rolf Bergel sowie die Eltern Herbert und Claudia Grotkoc mit Sohn Timon.

VON ANNA ZACHARIAS

Simon aus Osthauderfehn ist nach seiner Operation in den Niederlanden wieder wohl auf. Die Groninger Universitätsklinik und das Klinikum Oldenburg arbeiten zusammen. Der bürokratische Aufwand wurde verringert.

GN Grafchafter Nachrichten

Lokales - Sport - Anzeigen - Aboservice - Lesershop

Lokales > Journal
Journal | 15.09.2006

Groninger Notärzte fliegen nach Borkum
Krankenhaus Useldink nimmt jährlich 20000 Patienten auf. Notarzt Team unterstützt Rettungsdienste.



Data: Tjibbe Donker (UMCG- RIVM)
Matthias Pulz (NLGA)
Network analysis: Mariano Cicolini

Differences that matter



nvmm.nl



Distance patient:CM

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
CM /1000 beds	37 (3,6)	17 (1,0)
ID/ 1000 beds	16 (1,7)	4 (0,2)
Hospitals with own CM/ID	95%	3%

Data: Jan Müller, EurSafety Health-net, UMCG

“Tele Microbiology”

No regional coherent knowledge on epidemiology of Resistance

No concerted action

Search&follow strategy

1. Form a prevention region



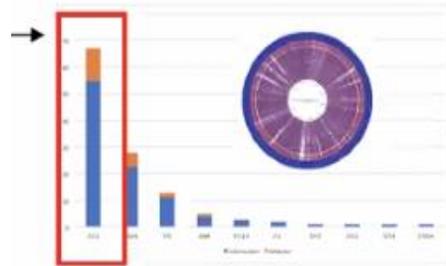
2. Decision
"Roll-back" MDRO



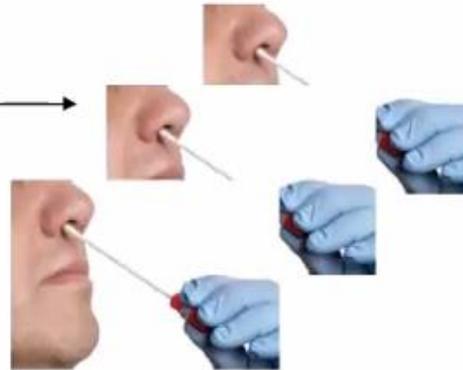
3. Perform a regional prevalence screening



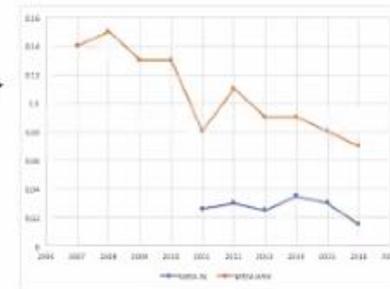
4. Choose a *Target-Type*
and design your
primers



5. Search&follow
in whole region



6. Contain spread



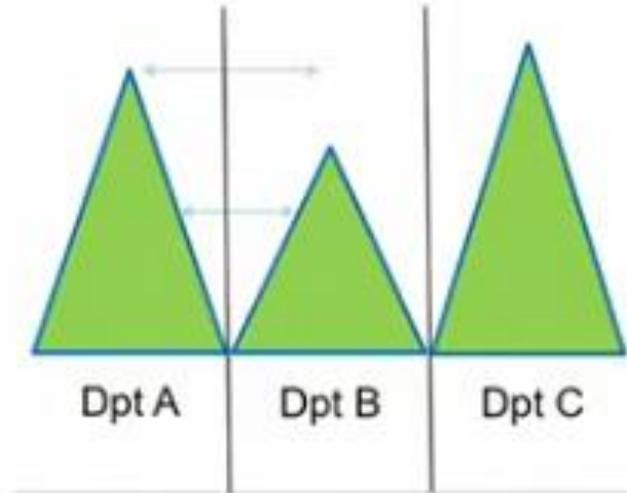
4.



Alexander W. Friedrich
Germany

Hierarchies create borders

- ...between countries
- ...between professions
- ...between departments
- ...between...



Alexander W. Friedrich
Germany

Multidisciplinarity is not an optional

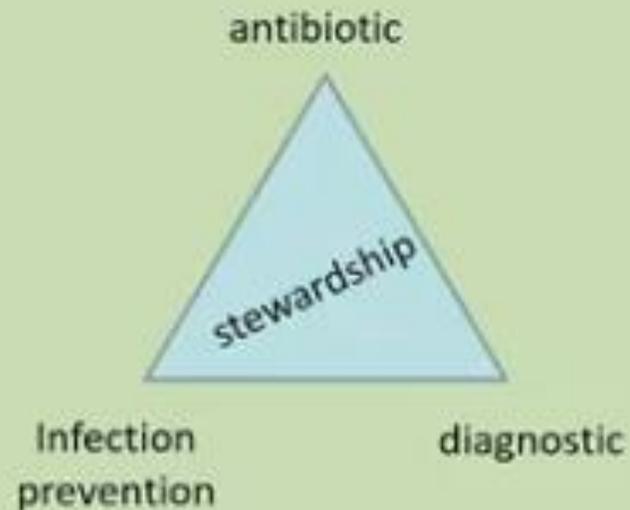
- No patient in acute care hospital should be treated by one single specialisms only
- Deep and broad
- Sharing work, reduction of autonomy, inter-dependence
- Needs trust and meta-competence



Alexander W. Friedrich
Germany

Meta-competence

To know, how it should be from one profession pointview, is just not enough



“Every professional can offer an answer to others”

It's all about humblesness

European competence

To know, how it works in one country, is just not enough



“Every country can offer an answer to others”

It's all about curiosity



Alexander W. Friedrich
Germany

Table 6 Global tripartite AMR country self-assessment survey (TrACSS). Overall coordination and surveillance of AMR in the European Region, 2022

ECDC
Antimicrobial
resistance
surveillance in
Europe 2023 –
2021 data

Country	1. WHO AMR focal point appointed by the ministry of health agency	2. Multisectoral and One Health collaboration/coordination	3. AMR action plan developed	4. National surveillance system for AMR in humans	5. Submitted data to a regional network for AMR surveillance, for the year 2021	6. Participated in a regional EQA scheme, for the year 2021/2	7. Enrolled in GLASS	8. IPC in human healthcare	9. Optimising antimicrobial use in human health
Colour code	<ul style="list-style-type: none"> Yes No 	<ul style="list-style-type: none"> Excellent Very good Good Fair Poor 	<ul style="list-style-type: none"> Yes No/In progress 	<ul style="list-style-type: none"> Excellent Very good Good Fair Poor 	<ul style="list-style-type: none"> Yes No 	<ul style="list-style-type: none"> Yes No 	<ul style="list-style-type: none"> Yes No 	<ul style="list-style-type: none"> Excellent Very good Good Fair Poor 	<ul style="list-style-type: none"> Excellent Very good Good Fair Poor
EU/EEA									
Austria	Yes	Excellent	Yes	Excellent	Yes	Yes	Yes	Excellent	Very good
Belgium	Yes	Excellent	Yes	Very good	Yes	Yes	Yes	Excellent	Very good
Bulgaria	ND	Fair	Yes	Fair	Yes	Yes	No	Fair	Fair
Croatia	Yes	Fair	Yes	Excellent	Yes	Yes	Yes	Excellent	Good
Cyprus	Yes	Fair	Yes	Very good	Yes	Yes	Yes	Good	Poor
Czechia	Yes	Fair	Yes	Very good	Yes	Yes	Yes	Good	Fair
Denmark	Yes	Very good	Yes	Excellent	Yes	Yes	Yes	Very good	Very good
Estonia	Yes	Fair	No/In progress	Very good	Yes	Yes	Yes	Good	Very good
Finland	Yes	Very good	Yes	Very good	Yes	Yes	Yes	Excellent	Very good
France	Yes	Excellent	Yes	Excellent	Yes	No	Yes	Excellent	Very good
Germany	Yes	Excellent	Yes	Very good	Yes	Yes	Yes	Excellent	Very good
Greece	Yes	Excellent	Yes	Excellent	Yes	Yes	Yes	Excellent	Excellent
Hungary	Yes	Very good	Yes	Very good	Yes	Yes	No	Very good	Fair
Iceland	Yes	Very good	No/In progress	Excellent	Yes	Yes	No	Good	Good
Ireland	Yes	Very good	Yes	Good	Yes	No	Yes	Excellent	Very good
Italy	Yes	Fair	Yes	Very good	Yes	Yes	Yes	Poor	Fair

