The development of a European surveillance system for healthcare-associated infections
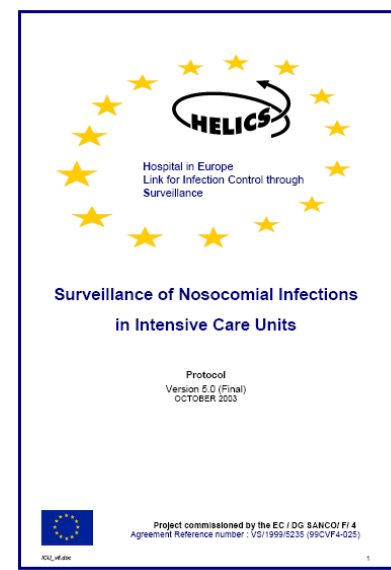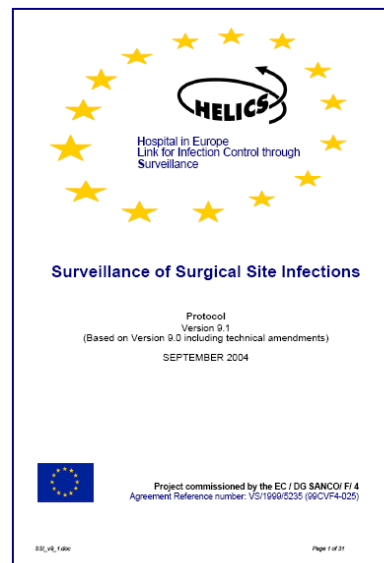
Carl Suetens

Surveillance and Response Support Unit
European Centre for Disease Prevention and Control

Second Global Ministerial Summit on Patient Safety, Bonn, 29-30 March 2017

# History of standardised surveillance of healthcare-associated infections in the EU

- HELICS (Hospitals in Europe Link for infection control through surveillance) = collaboration of national/regional surveillance networks: first initiative in 1994, funding discontinued

- 1998: Decision 2119/98 EC: epidemiological surveillance and control of communicable diseases in Europe -> HELICS II: assess needs

- 2000-2004: HELICS III-IV (EU funded): surveillance of Surgical Site Infections and ICU-acquired infections

Surveillance of Surgical Site Infections

Protocol
Version 9.1
(Based on Version 9.0 including technical amendments)
SEPTEMBER 2004

Project commissioned by the EC / DG SANCO/ F/ 4
Agreement Reference number: VS/1999/5235 (99CVF4-025)

Surveillance of Nosocomial Infections in Intensive Care Units

Protocol
Version 5.0 (Final)
OCTOBER 2003

Project commissioned by the EC / DG SANCO/ F/ 4
Agreement Reference number : VS/1999/5235 (99CVF4-025)
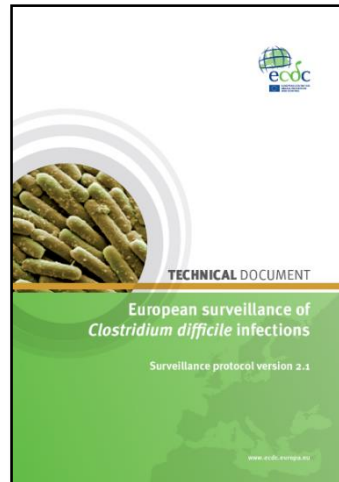
http://ipse.univ-lyon1.fr

- 2005-2008: Continued HELICS surveillance as workpackage of IPSE (Improving Patient Safety in Europe, EU funded)

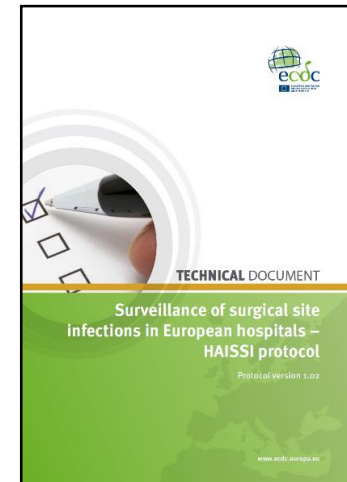- 1/7/2008: transition IPSE & HAI surveillance coordination to ECDC Stockholm

IPSE
Improving Patient Safety in Europe

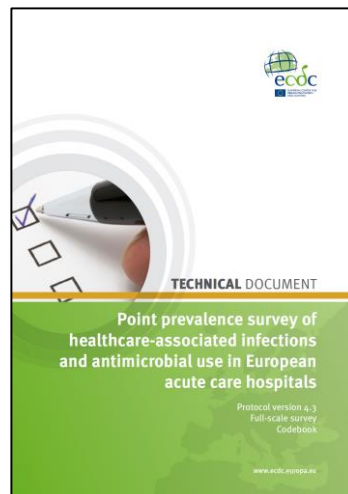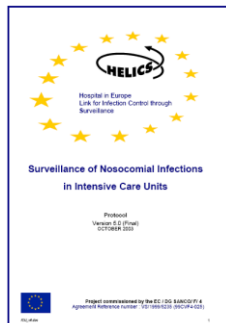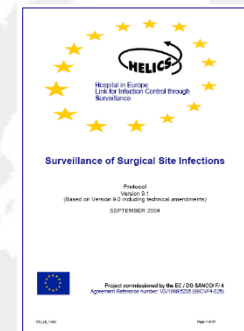# 2016: ECDC HAI-Net network, 5 components
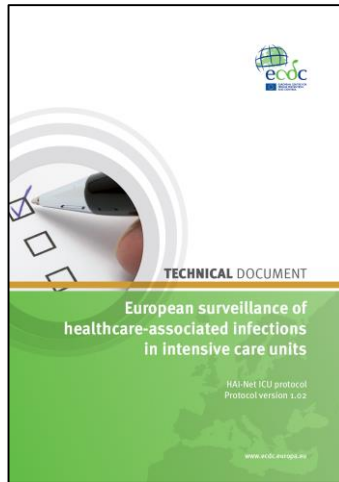
ICU

CDI

SSI

PPS Hospitals

PPS LTCF (HALT)

ICU: surveillance of HAIs in intensive care untis; CDI: surveillance of *Clostridium difficile* infections; SSI: surveillance of surgical site infections; PPS: Point prevalence survey; LTCF: long-term care facilities

Why do we need standardised protocols ?

- HAI surveillance = key component for HAI prevention, especially as part of surveillance network

  ⇨ Use of same methods ⇨ feedback of risk-adjusted indicators for inter-hospital comparisons as measure of own performance

- 2007: ECDC external evaluation of EU-funded IPSE (Improving Patient Safety in Europe) network

  "The European HAI surveillance needs to cover **other types of nosocomial infections** besides surgical site infections and ICU-acquired infections in order to **estimate and monitor the complete HAI disease burden**."

  "Develop common HAI point prevalence survey (PPS) protocol & strategy"

  "Define basic common indicators for evaluation of HAI control and prevention programmes"

EU Council Recommendation of 9 June 2009 on patient safety, incl. the prevention and control of HAIs (2009/C 151/01)

- "Adopt and implement a strategy … for the prevention and control of HAIs…:"

(c) establish or strengthen active surveillance systems by:

(i) at national or regional level:

⇨ organising prevalence surveys at regular intervals, as appropriate;

⇨ surveillance of targeted infection types to establish national reference data, accompanied by process and structure indicators to evaluate the strategy;

⇨ using, where appropriate, surveillance methods and indicators as recommended by ECDC and case definitions as agreed upon at Community level in accordance with the provisions of Decision No 2119/98/EC;

Development of a new HAI surveillance component: steps

1. Review of existing protocols, identify methodological differences
2. Meeting with Member States experts to discuss strategy
3. Meetings and teleconferences with Member States experts to discuss and agree on objectives, protocol, timeline
4. Development of data collection tools (protocol, forms, software)
5. Test the feasibility of the protocol and adapt it accordingly
6. Conduct (outsource) scientific studies for additional evidence
7. Develop training materials, train the trainers
8. Roll out the new protocol, provide helpdesk during national training and data collection
9. Feedback: hospital reports for participating hospitals, national results
10. European report

Example: ECDC PPS of HAIs and antimicrobial use in acute care hospitals

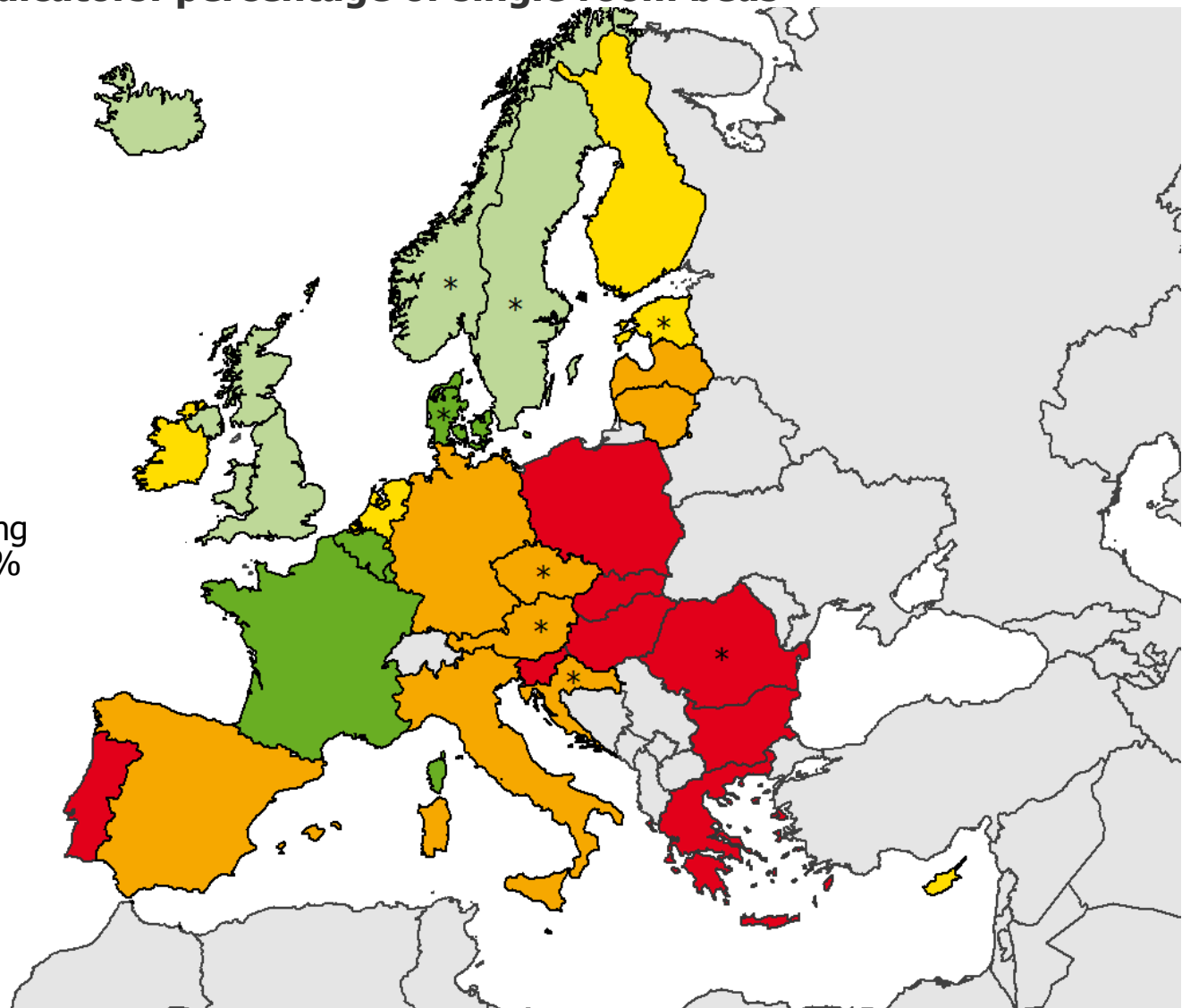**Structure and process indicators: percentage of single room beds**

Single-room beds (%)
- <5
- 5 to <10
- 10 to <20
- 20 to <30
- >=30
- Not included

Single room beds in participating hospitals (%): median = 11.1%

Non-visible countries
- Liechtenstein
- Luxembourg
- Malta

Step 1: review of point prevalence surveys of HAI in Europe, 2008

Bar chart: % patients with HAI

Country, Year	
Sweden, 2003, 2004 2006	
Scotland, 2007	
Greece, 2000	
UK, 1996	
Denmark, 2003, 2008	
Finland, 2005	
Portugal, 2003	
Suisse, 2002	
UK & IE, 2005	
Italy, INF-NOS, 2002	
Netherlands, 2007	
Norway, 2002-2007	
Spain, 1990-2007	
France, 2001	
Belgium, 2007	
France, 2006	
Italy, Lombardy, 2000	
Slovenia, 2001	
Latvia, 2003, (2004)	
Lithuania, 2003,2005,2007	
Germany, 1997	

% patients with HAI

Box plot: % of isolates

- E. COLI
- S. AUREUS
- P. AERUGINOSA
- ENTEROCOCCUS SPP.
- COAG-NEG. STAPH.
- CANDIDA SPP.
- KLEBSIELLA SPP.
- PROTEUS SPP.
- ENTEROBACTER SPP.
- ACINETOBACTER SPP.
- C. DIFFICILE
- SERRATIA SPP.
- MORGANELLA SPP.
- Other

% of isolates

Mean HAI prevalence 7%

→ Mean HAI incidence 5%

4.1M patients with HAI, 37 000 direct deaths
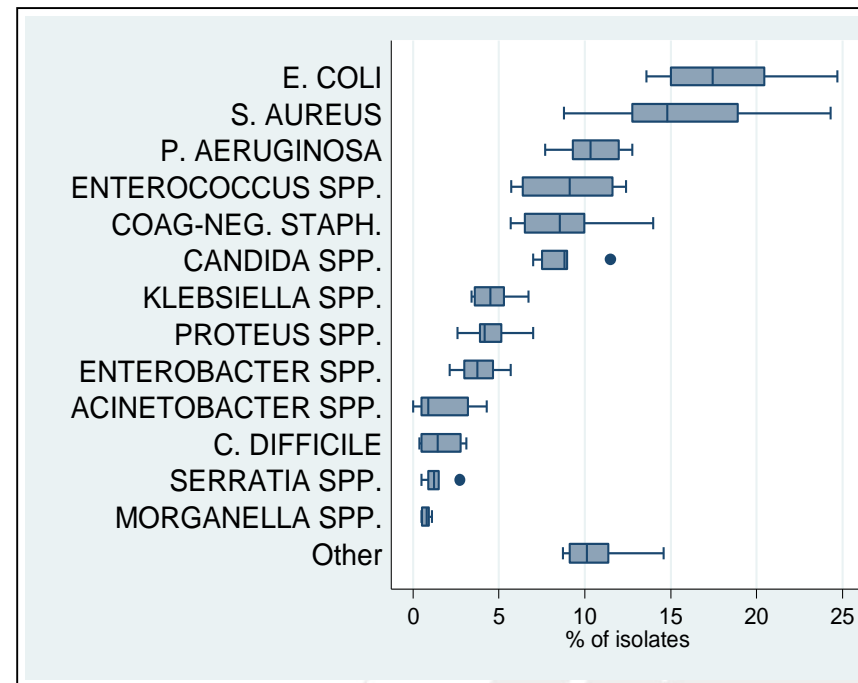
Step 1. Review of methodological differences of national PPSs of HAI in EU countries, 2008

| Methodological difference	%	Countries (1)
Case definitions		
Diagnostic related groups	12%	LV, SE
CDC, modified	12%	FR, NL, (UK)
CDC, unmodified	77%	Other
Imported HAI included	47%	DK,ES,FI,FR,IE,NL,SE,UK
Included infections		
All infections	53%	BE, EL ,IT,LT,LV,NL,PT,SE,SI
Only main infection types (2)	12%	NO, DK
Exclusion of secondary bloodstream infections	24%	UK, IE, FI, DE
Exclusion of asymptomatic bacteriuria	12%	ES, FR
Data collection type / workload		
Aggregated numerator and denominator	12%	NO, DK
Patient-based numerator, aggr. denominator	12%	SE, LV
Patient-based numerator and denominator	77%	Other
Exclusion of specific patients or specialties	18%	FR, NL

(1) *More recent PPSs available from the following countries: SE, DK, PT, NL, NO, ES, LT, PL.*
(2) *Pneumonia, bloodstream infection, urinary tract infection, surgical site infection.*
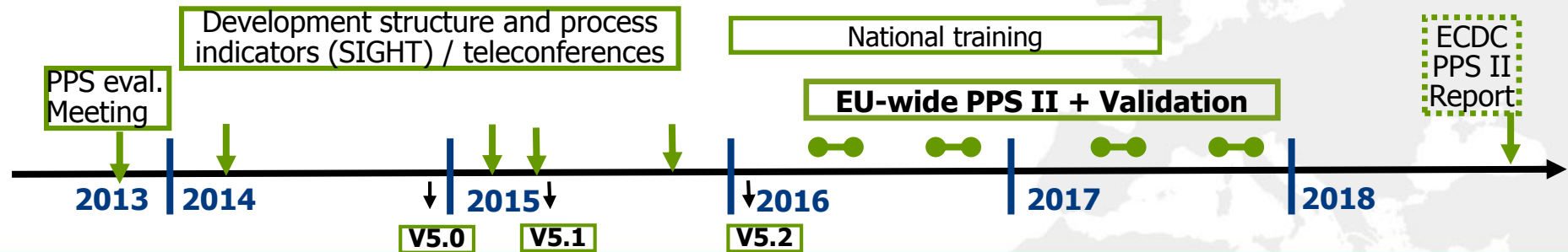
Step 2 and 3. ECDC PPS of healthcare-associated infections and antibiotic use in acute care hospitals: meetings
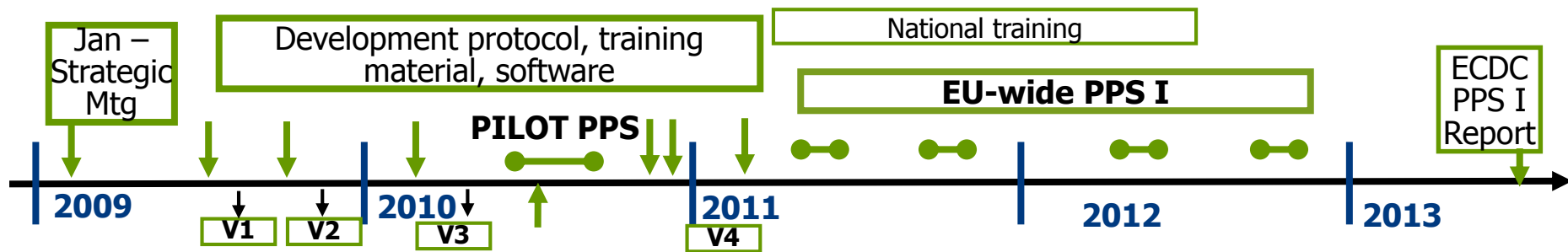
☞ **Step 2**. Strategic joint IPSE/EARSS/ESAC meeting Jan 2009: Integration protocol of former ESAC hospital PPS for antimicrobial use, Study EU vs CDC HAI case definitions

☞ **Step 3**. Meetings and teleconferences with experts:
- PPS I protocol: 7 meetings (↓), PPS II protocol: 5 meetings, 7 teleconferences
- Total 229 experts from 27 EU Member States, 2 EEA/EFTA countries, 7 EU (potential) candidate and 8 neighbourhood countries, CDC Atlanta, WHO regional office Europe, European Commission, ESICM, ESCMID, ESAC project, ECDC

EARSS: European antimicrobial resistance surveillance project; ESAC: European antimicrobial consumption project; CDC: Centres for disease control and prevention, Atlanta, United States; ESICM: European Society of Intensive Care Medicine; ESCMID: European Society of Clinical Microbiology and Infectious Diseases
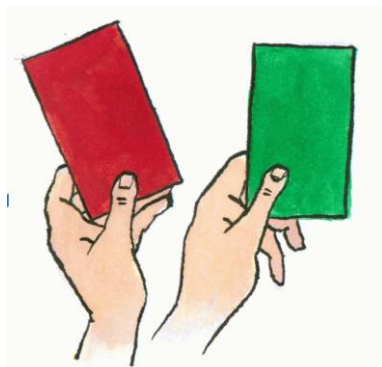
Step 3. Decision process during meetings

- Collect comments by email prior to meeting
- Objectives, timeline (4 waves, every 5 years), options (light, standard): consensus
- Variables, definitions…: discussion, voting if needed
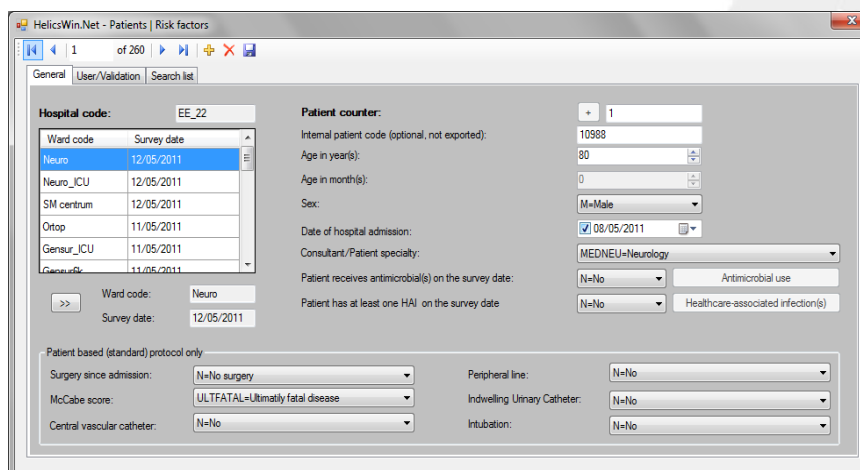
Objectives of ECDC PPS 2016-2017

1. To **estimate** the total **burden** (prevalence) of HAI & antimicrobial use
2. To **describe patients, invasive procedures, infections** (sites, micro-organisms including markers of antimicrobial resistance) and **antimicrobials** prescribed (compounds, indications)
   - By type of patients, specialties or healthcare facilities
   - By EU-country, adjusted or stratified
3. To describe key **structures and processes for the prevention of HAIs and antimicrobial resistance** at the hospital and ward level in EU hospitals

	HAI 1		
Case definition code			
Relevant device (3)	O Yes O No O Unknown		
Present on admission	O Yes O No		
Date of onset (4)	/ /		
Origin of infection	O current hospital O other hospital O other origin/ unk		
HAI associated to current ward	O Yes O No O Unknown		
If BSI: source (5)			

	MO code	AMR		PDR
		AM (6)	SIR	
Microorganism 1				
Microorganism 2				
Microorganism 3				

Step 4. Development of ECDC PPS tools: protocol, forms, free software for hospitals

Step 5. Test the feasibility of the protocol. ECDC Pilot PPS, June-October 2010

The European Centre for Disease Prevention and Control (ECDC) pilot point prevalence survey of healthcare-associated infections and antimicrobial use

P Zarb[1,2], B Coignard[3], J Griskeviciene[4], A Muller[2], V Vankerckhoven[2], K Weist[4], M M Goossens[5], S Vaerenberg[5], S Hopkins[6], B Catry[5], D L Monnet[4], H Goossens[2], C Suetens (carl.suetens@ecdc.europa.eu)[4], National Contact Points for the ECDC pilot point prevalence survey[7], Hospital Contact Points for the ECDC pilot point prevalence survey[7]

No. of patients
<300
[300-499]
[500-999]
>=1000
No data
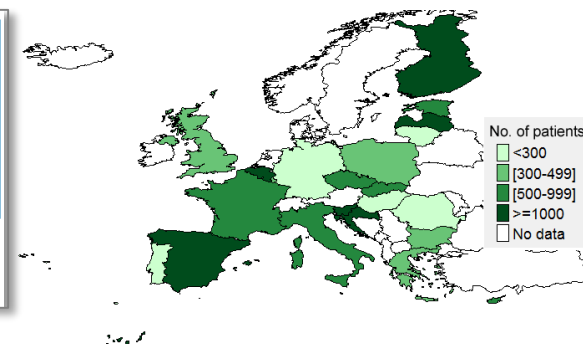
- Pilot ECDC PPS support contract outsourced to University of Antwerp, InVS Paris, IPH Brussels (2010)

- 23 countries, 66 hospitals, 19 888 patients

- HAI: 7.1%, Antimicrobial use: 34.6%

- Protocol workload/100 patients (data collection and data entry)
  - **Light** (unit-based) option (16 hospitals): **2.5 days** (20 hours)
  - **Standard** (patient-based) option (50 hospitals): **4 days** (32 hours)

Zarb P, et al. Euro Surveill. 2012;17(46).

Step 6. Outsource studies for additional evidence

ANTIMICROBIAL RESISTANCE & INFECTION CONTROL

RESEARCH   **Open Access**

Concordance between European and US case definitions of healthcare-associated infections

Sonja Hansen[1*], Dorit Sohr[1], Christine Geffers[1], Pascal Astagneau[2], Alexander Blacky[3], Walter Koller[3], Ingrid Morales[4], Maria Luisa Moro[5], Mercedes Palomar[6], Emese Szilagyi[7], Carl Suetens[8] and Petra Gastmeier[1]

- Concordance study EU vs CDC HAI case definitions (2009 - Charité University Medicine, Berlin)

Hansen S, et al. Antimicrobial Resistance & Infection Control 2012;1:28.

A pilot validation in 10 European Union Member States of a point prevalence survey of healthcare-associated infections and antimicrobial use in acute hospitals in Europe, 2011

J S Reilly[1], L Price (l.price@gcu.ac.uk)[1], J Godwin[1], S Cairns[2], S Hopkins[3], B Cookson[3,4], W Malcolm[2], G Hughes[3], O Lyytikäinen[5], B Coignard[6], S Hansen[7], C Suetens[8], National Participants in the ECDC pilot validation study[9]

- PPS validation pilot study (Glasgow Caledonian University, 2011)

Reilly J, et al. Euro Surveill. 2015; 20(8).

Hospital organisation, management, and structure for prevention of health-care-associated infection: a systematic review and expert consensus

Walter Zingg, Alison Holmes, Markus Dettenkofer, Tim Goetting, Federica Secci, Lauren Clack, Benedetta Allegranzi, Anna-Pelagia Magiorakos, Didier Pittet, for the systematic review and evidence-based guidance on organization of hospital infection control programmes (SIGHT) study group*

Despite control efforts, the burden of health-care-associated infections in Europe is high and leads to around 37000 deaths each year. We did a systematic review to identify crucial elements for the organisation of effective infection-prevention programmes in hospitals and key components for implementation of monitoring. 92 studies

Lancet Infect Dis 2014
Published Online
November 11, 2014

- Systematic review on organisation of hospital infection control programmes (SIGHT study, HUG, 2010)

Zingg W, et al. Lancet Infect Dis. 2015 Feb;15(2)

Step 6/2. Outsource national validation contracts

Observed HAI prevalence (%)
(with 95% confidence interval)

Predicted HAI prevalence (%)
(based on patient case mix)

Mean Se: 71.9%
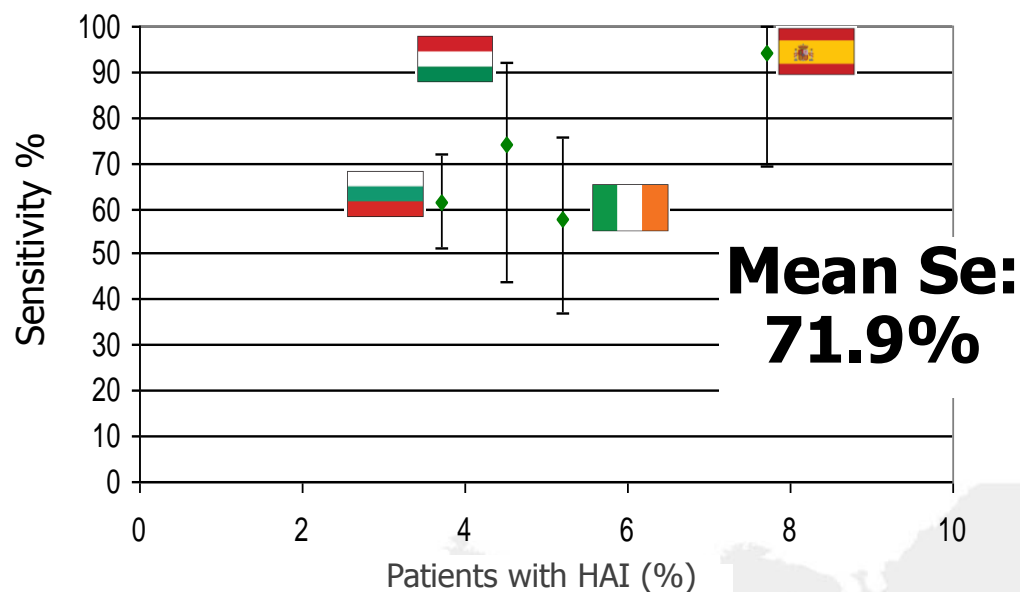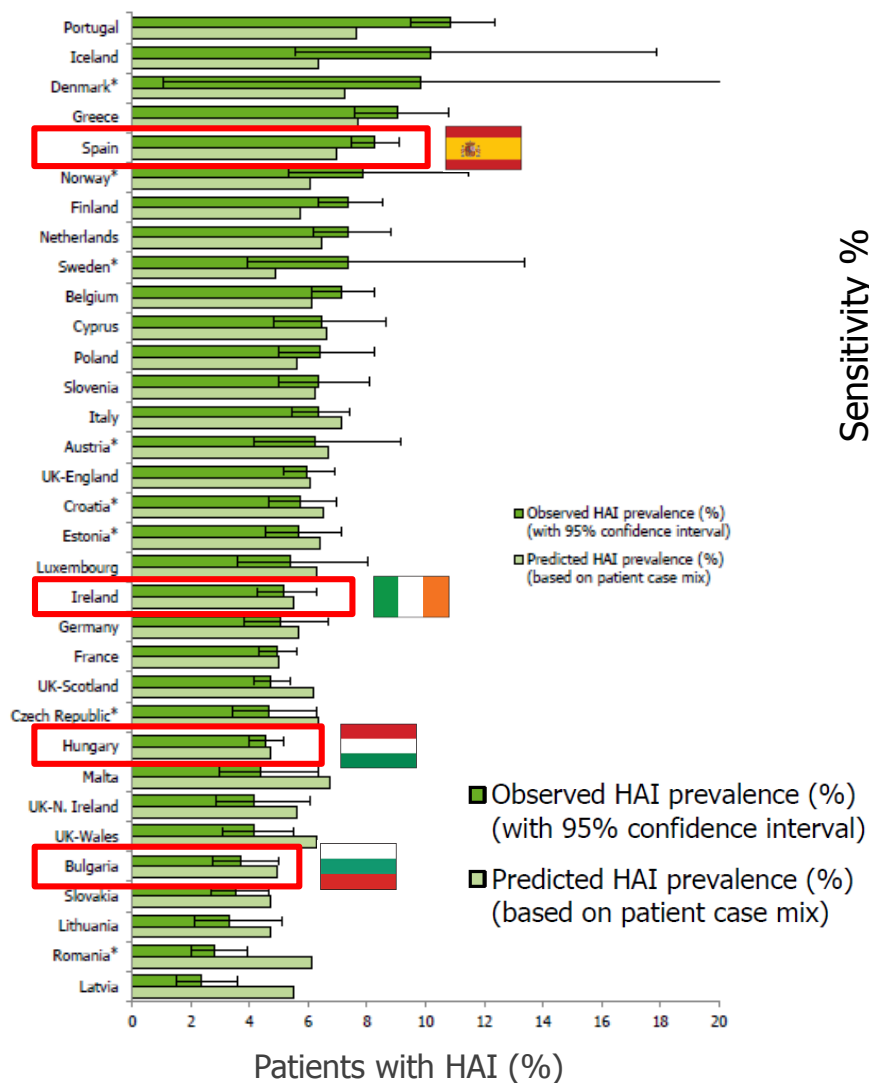
Country	pPPS HAI Pr% (95%CI)		True HAI Pr% (95%CI)	
Bulgaria	**3.7**	(2.8 - 5.0)	**5.9**	(5.0 - 7.1)
Hungary	**4.5**	(4.0 - 5.2)	**5.6**	(3.3 - 8.2)
Ireland	**5.2**	(4.2 - 6.3)	**7.7**	(5.0 - 10.8)
Spain	**7.7**	(7.2 - 8.2)	**7.2**	(5.4 - 9.9)
Mean	*5.3*		*6.6*	

→ **AF33** (Feb 2013)**:** "Include national validation surveys in PPSs"

Step 7. Training

- Training curriculum developed in 2010 (outsourced, coordinated by HPA, London)

- Train-the-trainer course: London, March 2011 (2 participants from each country)

- On average: 3 courses of 7.25 hours organised per country

- 104 participants/country (median 78, range 5-436)

- Estimated number of **hospital staff trained** in PPS methodology: **2800** people

Step 8. Roll out final protocol, helpdesk

- National PPS coordination: median 4 experts, 59 expert-days

Legend:
- Prepare PPS tools/materials, excl. translation
- Recruit/select. hospitals, nat. denom data
- Prepare training, excl. translation
- Translation
- Delivering training course(s)
- Helpdesk
- Data collection in hosp. by national PPS team
- Hospital data entry by national PPS team
- Data management/prepare national database
- Data quality check, feedback to hospitals
- Prepare national data for TESSy and upload
- Other

Pie chart values: 13%, 5%, 12%, 9%, 11%, 9%, 8%, 6%, 11%, 9%, 7%, 1%

- ECDC Questions and answers forum
- Data from 1149 hospitals/30 EU/EEA countries submitted to ECDC (TESSy)

Step 9. Data analysis, feedback results at hospital and national level

- Hospital feedback reports (24 pp) sent by ECDC to national coordinator within 1-2 weeks after data submission to ECDC

- Detailed hospital results versus national and EU results, incl. standardisation

- Possible in local language

Table III. Distribution of healthcare-associated infection sites

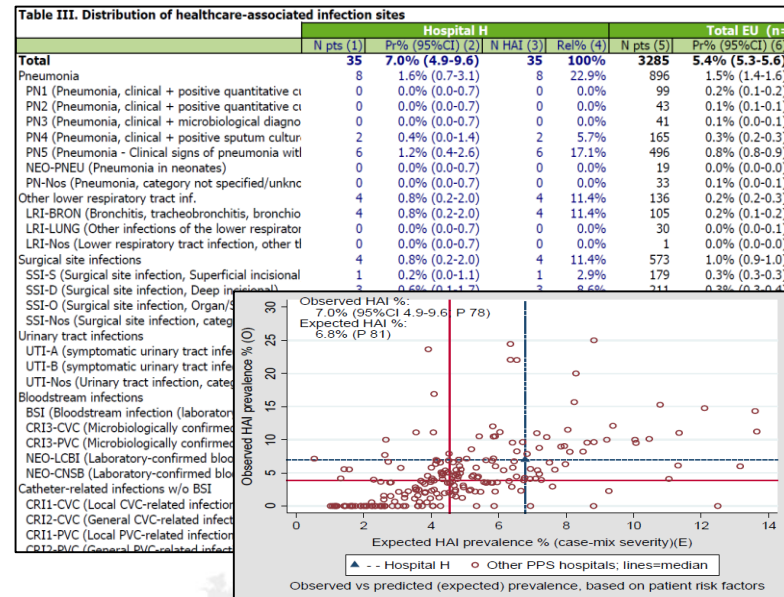|	Hospital H				Total EU (n=	
	N pts (1)	Pr% (95%CI) (2)	N HAI (3)	Rel% (4)	N pts (5)	Pr% (95%CI) (6)
Total	35	7.0% (4.9-9.6)	35	100%	3285	5.4% (5.3-5.6)
Pneumonia	8	1.6% (0.7-3.1)	8	22.9%	896	1.5% (1.4-1.6)
PN1 (Pneumonia, clinical + positive quantitative cu	0	0.0% (0.0-0.7)	0	0.0%	99	0.2% (0.1-0.2)
PN2 (Pneumonia, clinical + positive quantitative cu	0	0.0% (0.0-0.7)	0	0.0%	43	0.1% (0.1-0.1)
PN3 (Pneumonia, clinical + microbiological diagno	0	0.0% (0.0-0.7)	0	0.0%	41	0.1% (0.0-0.1)
PN4 (Pneumonia, clinical + positive sputum cultur	2	0.4% (0.0-1.4)	2	5.7%	165	0.3% (0.2-0.3)
PN5 (Pneumonia - Clinical signs of pneumonia wit	6	1.2% (0.4-2.6)	6	17.1%	496	0.8% (0.8-0.9)
NEO-PNEU (Pneumonia in neonates)	0	0.0% (0.0-0.7)	0	0.0%	19	0.0% (0.0-0.0)
PN-Nos (Pneumonia, category not specified/unkno	0	0.0% (0.0-0.7)	0	0.0%	33	0.1% (0.0-0.1)
Other lower respiratory tract inf.	4	0.8% (0.2-2.0)	4	11.4%	136	0.2% (0.1-0.2)
LRI-BRON (Bronchitis, tracheobronchitis, bronchio	4	0.8% (0.2-2.0)	4	11.4%	105	0.2% (0.1-0.2)
LRI-LUNG (Other infections of the lower respirator	0	0.0% (0.0-0.7)	0	0.0%	30	0.0% (0.0-0.1)
LRI-Nos (Lower respiratory tract infection, other t	0	0.0% (0.0-0.7)	0	0.0%	1	0.0% (0.0-0.0)
Surgical site infections	4	0.8% (0.2-2.0)	4	11.4%	573	1.0% (0.9-1.0)
SSI-S (Surgical site infection, Superficial incisional	1	0.2% (0.0-1.1)	1	2.9%	179	0.3% (0.3-0.3)
SSI-D (Surgical site infection, Deep incisional						
SSI-O (Surgical site infection, Organ/S			3	8.6%	211	0.3% (0.3-0.4)
SSI-Nos (Surgical site infection, categ						
Urinary tract infections						
UTI-A (symptomatic urinary tract infe						
UTI-B (symptomatic urinary tract infe						
UTI-Nos (Urinary tract infection, categ						
Bloodstream infections						
BSI (Bloodstream infection (laborator						
CRI3-CVC (Microbiologically confirmed						
CRI3-PVC (Microbiologically confirmed						
NEO-LCBI (Laboratory-confirmed bloo						
NEO-CNSB (Laboratory-confirmed bloo						
Catheter-related infections w/o BSI						
CRI1-CVC (Local CVC-related infection						
CRI2-CVC (General CVC-related infect						
CRI1-PVC (Local PVC-related infection						

Observed HAI %: 7.0% (95%CI 4.9-9.6) P 78
Expected HAI %: 6.8% (P 81)

Observed vs predicted (expected) prevalence, based on patient risk factors

▲ - - Hospital H   ○ Other PPS hospitals; lines=median

	Hospital H	N hosp EU	EU mean/%	P25	P50	P75
III. IPC Programmes						
III.1. IPC team						
Number of FTE infection control nurses	4	271	1.5	0.75	1	2
N FTE infection control nurses/250 beds	1.06	271	1.9	0.86	1.16	2
Number of FTE infection control doctors	0.5	265	0.5	0.1	0.25	1
N FTE infection control doctors/250 beds	0.13	265	0.8	0.1	0.32	1
III.2. IPC plan and report						
Annual IPC plan approved by CEO	1	269	79.2			
Annual IPC report approved by CEO	1	265	80.4			
III.3. Microbiology/diagnostic performance						
Number of blood culture sets/year	5970	258	2111.0	86	727	2567
Number of blood culture sets/1000 pt-days	28.7	257	19.7	4	12.6	24
Number of stool tests for CDI/year	707	249	381.0	8	110	396
Number of stool tests for CDI/1000 pt-days	3.4	248	3.6	0.3	1.6	4
Microbiology support during weekends						
Microbiology on Saturdays, clinical tests	1	259	90.0			
Microbiology on Saturdays, screening tests	1	249	82.3			
Microbiology on Sundays, clinical tests	1	244	77.9			
Microbiology on Sundays, screening tests	1	233	69.5			

Point prevalence survey of healthcare-associated infection and antimicrobial use in acute care hospitals

Hospital H

PPS data from 04/05/2016 to 25/05/2016

Patient-based (standard) protocol
Reference: EU PPS data from 11/04/2016 to 02/12/2016 (Status on 10/03/2017)

ECDC-PPS Hospital re...

Badanie punktowe zakazen zwiazanych z opieka zdrowotna i stosowania antybiotykow w szpitalach ostrodyzurowych

Szpital PL-PL061-2016-05-18

Dane PPS od 18/05/2016 do 29/06/2016

Protokol standardowy
Reference: PL Dane PPS od 04/05/2016 do 25/08/2016 (Status on 29/11/2016)

ECDC-PPS Hospital report

Step 10. ECDC PPS report

ECDC point prevalence survey: healthcare-associated infections still a major public health problem, one in 18 patients in European hospitals affected

04 Jul 2013

The first Europe-wide point prevalence survey on healthcare-associated infections and antimicrobial use estimates that on any given day, about 80 000 patients – or one in 18 patients – in European hospitals have at least one healthcare-associated infection.

Conducted in more than 1 000 hospitals in 30 European countries, the survey provides the most comprehensive database on healthcare-associated infections and antimicrobial use in European acute care hospitals to date. The data are published as a report and also available online as an interactive database.

Patients on antimicrobials (%)
- <30
- 30 to <35
- 35 to <40
- 40 to <45
- >=45
- Not included
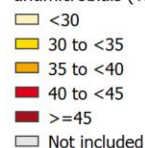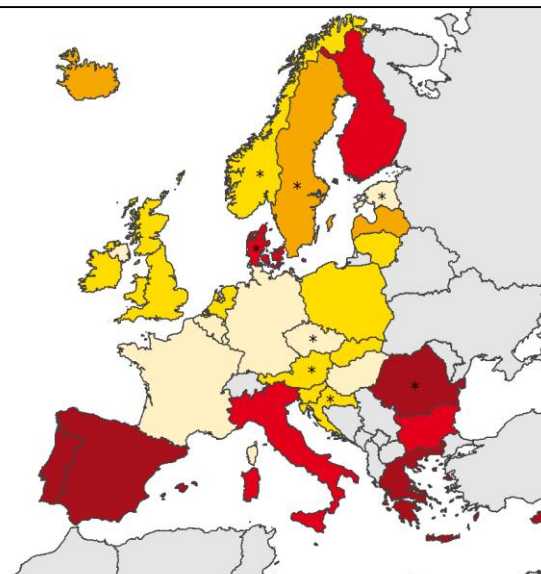
Non-visible countries
- Liechtenstein
- Luxembourg
- Malta

Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals 2011-2012

Questions and answers: Point prevalence survey of healthcare-associated infections and antimicrobial use in European hospitals 2011–2012

Summary: Point prevalence survey of healthcare-associated infections and antimicrobial use in European acute care hospitals 2011-2012

Press release: Each day, one in 18 patients in European hospitals has a healthcare-associated infection: ECDC estimates

Interactive database: HAI-Net PPS interactive database

Infographic:
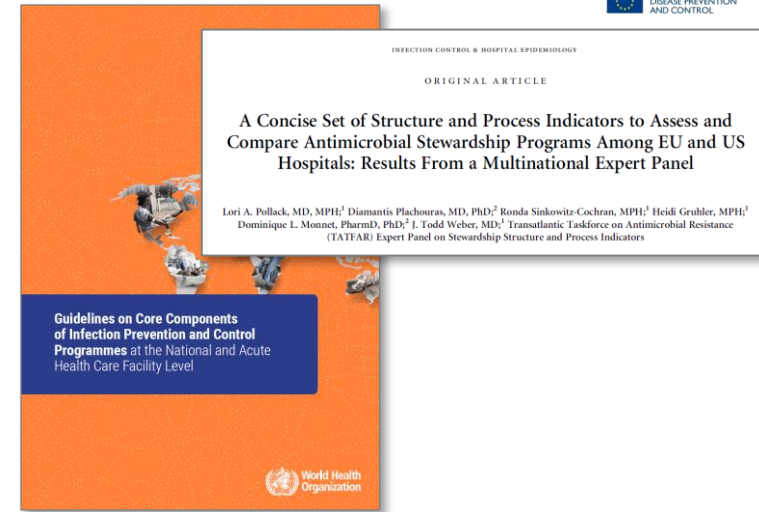
PPS   Hospitals   HAI   AU   AMR

Development of a new HAI surveillance component: 10 steps

1. Review of existing protocols, identify methodological differences
2. Meeting with Member States experts to discuss strategy
3. Meetings and teleconferences with Member States experts to discuss and agree on objectives, protocol, timeline
4. Development of data collection tools (protocol, forms, software)
5. Test the feasibility of the protocol and adapt it accordingly
6. Conduct (outsource) scientific studies for additional evidence
7. Develop training materials, train the trainers
8. Roll out the new protocol, provide helpdesk during national training and data collection
9. Feedback: hospital reports for participating hospitals, national results
10. European report

Process 11: recruitment of countries, 2ⁿᵈ ECDC PPS

- Interest for participating countries and hospitals: compare HAI and antimicrobial use, WHO core IPC components, TATFAR antimicrobial stewardship indicators, identify priorities e.g. for surveillance

- Strong recommendation (EU Commission and ECDC Advisory Forum)

- EU legislation:
  – Decision 1082/2013/EU of European Parliament and the Council
  – Council Recommendation 2009/C 151/01 (Patient safety incl. HAIs)

- Currently: 28 EU/EEA countries, 5 EU (potential) candidate countries

INFECTION CONTROL & HOSPITAL EPIDEMIOLOGY

ORIGINAL ARTICLE

A Concise Set of Structure and Process Indicators to Assess and Compare Antimicrobial Stewardship Programs Among EU and US Hospitals: Results From a Multinational Expert Panel

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Guidelines on Core Components of Infection Prevention and Control Programmes at the National and Acute Health Care Facility Level

World Health Organization

2nd ECDC PPS participation
- 2016
- 2017
- Unknown
- No participation

Non-visible countries
- Liechtenstein
- Luxembourg
- Malta
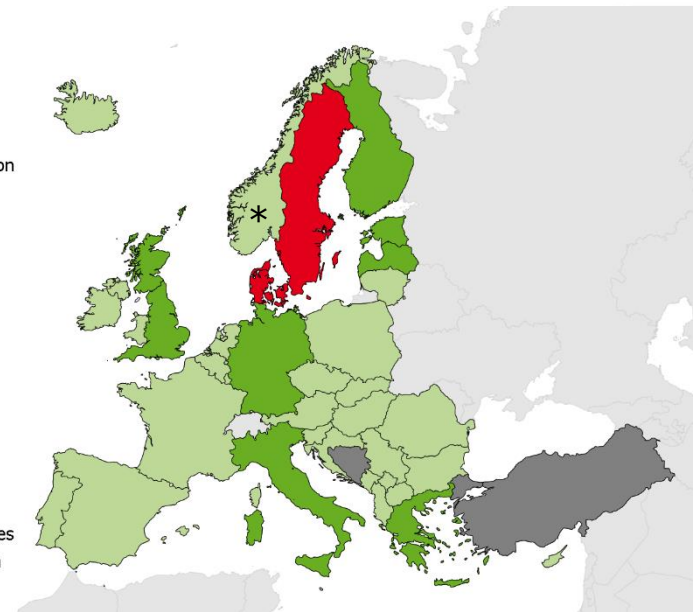
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PPS training

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Pilot PPS validation

J Reilly, S Cairns, J Godwin,
L Price (CGU and HPS Glasgow),
P Gastmeier, S Hansen,
B Coignard, O Lyytikainen,

> ➤ 200+ experts from EU/EEA Member States, WHO/Europe, ESICM, ESCMID, ESAC, CDC, ...
>
> ➤ National PPS coordination teams and participating hospitals!!!

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Thank you!

EUROPEAN ANTIBIOTIC AWARENESS DAY

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