World Health Organization

Healthcare acquired infections: latest knowledge and global perspective

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HAI prevalence in USA - 2011

- 183 hospitals in 10 States, 11,282 patients
- **HAI PREVALENCE: 4.0%** (95% CI, 3.7-4.4)
- **648,000 patients with 721,800 HAIs** in U.S. acute care

infections (sensitivity, 95 to 100%), EIP teams reviewed records for active health care–associated infections only for those patients who were receiving antimicrobial agents for the treatment of active infections or for no documented reason.

Magill SS et al. NEJM 2014; 370:13

Relative incidence of specific types of HAI in the US

Major site of Infection	Estimated Number of Infections
Healthcare-Associated Infection (all HAI)	1,737,125
Surgical Site Infection (SSI)	290,485
Central Line Associated Bloodstream Infections (CLABSI)*	92,011
Ventilator-associated Pneumonia (VAP)**	52,543
Catheter associated Urinary tract Infection (CAUTI)***	449,334
Clostridium difficile-associated disease (CDI)[17]	178,000

Scott RD. http://www.cdc.gov/ncidod/dhqp/pdf/Scott_CostPaper.pdf.

Costs of specific types of HAI in the US

	# of infections	Range of $ estimates based on 2007 CPI for all urban consumers	Range of $ estimates based on 2007 CPI for Inpatient hospital services	Range of estimate using CPI for all urban consumers (billions)	Range of estimate using CPI for Inpatient hospital services (billions)
SSI	290,485	$11,087 - $29,443	$11,874 - $34,670	$3.22 - $8.55	$3.45 - $10.07
CLABSI	92,011	$ 6,461 - $25,849	$ 7,288- $29,156	$0.59 - $2.38	$0.67 - $2.68
VAP	52,543	$14,806 - $27,520	$19,633 - $28,508	$0.78 - $1.45	$1.03 - $1.50
CAUTI	449,334	$ 749 - $ 832	$ 862 - $ 1,007	$0.34 - $0.37	$0.39 - $0.45
CDI	178,000	$ 5,682 - $ 8,090	$ 6,408 - $ 9,124	$1.01 - $1.44	$1.14 - $1.62

Scott RD. http://www.cdc.gov/ncidod/dhqp/pdf/Scott_CostPaper.pdf.

NATIONAL ACUTE CARE HOSPITALS

HEALTHCARE ASSOCIATED INFECTIONS PROGRESS

Healthcare-associated infections (HAIs) are infections patients can get while receiving medical treatment in a healthcare facility. Working toward the elimination of HAIs is a CDC priority. The standardized infection ratio (SIR) is a summary statistic that can be used to track HAI prevention progress over time; lower SIRs are better. The infection data are reported to CDC's National Healthcare Safety Network (NHSN). HAI data for nearly all U.S. hospitals are published on the Hospital Compare website. This report is based on 2014 data, published in 2016.

- 2008 or 2009 data compared to 2014
- 2011 compared to 2014 for MRSA and C. diff

CLABSIs

↓ 50% LOWER COMPARED TO NAT'L BASELINE*

CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS

When a tube is placed in a large vein and not put in correctly or kept clean, it can become a way for germs to enter the body and cause deadly infections in the blood.

- U.S. hospitals reported a significant decrease in CLABSIs between 2013 and 2014.
- 10% Among the 2,442 hospitals in U.S. with enough data to calculate an SIR, 10% had an SIR significantly higher (worse) than 0.50, the value of the national SIR.

CAUTIs

0% NO CHANGE COMPARED TO NAT'L BASELINE

CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

When a urinary catheter is not put in correctly, not kept clean, or left in a patient for too long, germs can travel through the catheter and infect the bladder and kidneys.

- U.S. hospitals reported a significant decrease in CAUTIs between 2013 and 2014.
- 12% Among the 2,880 U.S. hospitals with enough data to calculate an SIR, 12% had an SIR significantly higher (worse) than 1.00, the value of the national SIR.

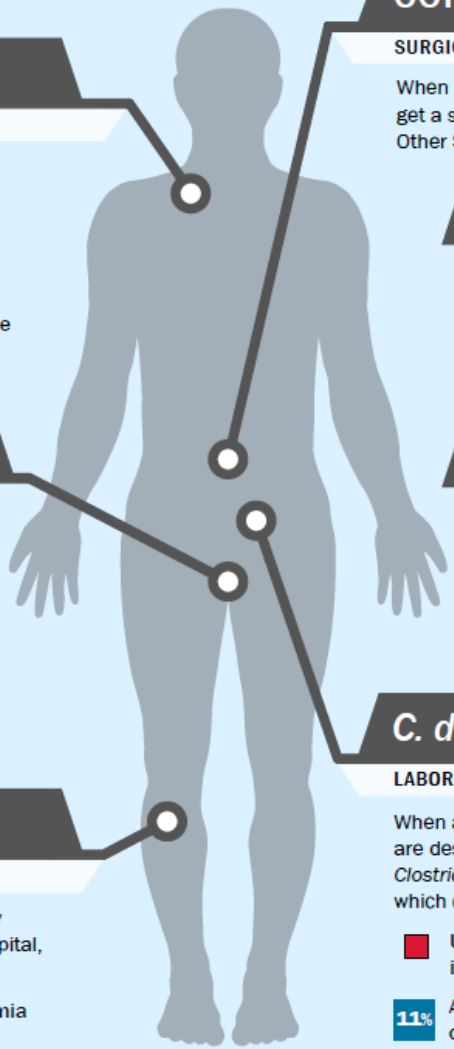
MRSA Bacteremia

↓ 13% LOWER COMPARED TO NAT'L BASELINE*

LABORATORY IDENTIFIED HOSPITAL-ONSET BLOODSTREAM INFECTIONS

Methicillin-resistant *Staphylococcus aureus* (MRSA) is bacteria usually spread by contaminated hands. In a healthcare setting, such as a hospital, MRSA can cause serious bloodstream infections.

- U.S. hospitals reported a significant decrease in MRSA bacteremia between 2013 and 2014.
- 8% Among the 2,042 U.S. hospitals with enough data to calculate an SIR, 8% had an SIR significantly higher (worse) than 0.87, the value of the national SIR.



SSIs

SURGICAL SITE INFECTIONS

See pages 3-5 for additional procedures

When germs get into an area where surgery is or was performed, patients can get a surgical site infection. Sometimes these infections involve only the skin. Other SSIs can involve tissues under the skin, organs, or implanted material.

SSI: Abdominal Hysterectomy

↓ 17% LOWER COMPARED TO NAT'L BASELINE*

- U.S. hospitals reported no significant change in SSIs related to abdominal hysterectomy surgery between 2013 and 2014.
- 6% Among the 794 U.S. hospitals with enough data to calculate an SIR, 6% had an SIR significantly higher (worse) than 0.83, the value of the national SIR.

SSI: Colon Surgery

↓ 2% LOWER COMPARED TO NAT'L BASELINE*

- U.S. hospitals reported a significant increase in SSIs related to colon surgery between 2013 and 2014.
- 8% Among the 2,051 U.S. hospitals with enough data to calculate an SIR, 8% had an SIR significantly higher (worse) than 0.98, the value of the national SIR.

C. difficile Infections

↓ 8% LOWER COMPARED TO NAT'L BASELINE*

LABORATORY IDENTIFIED HOSPITAL-ONSET *C. DIFFICILE* INFECTIONS

When a person takes antibiotics, good bacteria that protect against infection are destroyed for several months. During this time, patients can get sick from *Clostridium difficile* (*C. difficile*), bacteria that cause potentially deadly diarrhea, which can be spread in healthcare settings.

- U.S. hospitals reported a significant increase in *C. difficile* infections between 2013 and 2014.
- 11% Among the 3,554 U.S. hospitals with enough data to calculate an SIR, 11% had an SIR significantly higher (worse) than 0.92, the value of the national SIR.

*Statistically significant

HEALTHCARE ASSOCIATED INFECTIONS PROGRESS

NATIONAL

LONG-TERM ACUTE CARE HOSPITALS AND INPATIENT REHABILITATION FACILITIES

Healthcare-associated infections (HAIs) are infections patients can get while receiving medical treatment in a healthcare facility. Working toward the elimination of HAIs is a CDC priority. The standardized infection ratio (SIR) is a summary statistic that can be used to track HAI prevention progress over time; lower SIRs are better. The infection data are reported to CDC's National Healthcare Safety Network (NHSN). This report is based on 2014 data, published in 2016.

LONG-TERM ACUTE CARE HOSPITALS (LTACHs)

Acute care hospitals that provide treatment for patients who are generally very sick and stay, on average, more than 25 days. Services include comprehensive rehabilitation, respiratory therapy, head trauma treatment, and pain management. Most patients are transferred from an intensive or critical care unit.

CLABSIs

↓ 9% LOWER COMPARED TO NAT'L BASELINE*

CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTIONS

When a tube is placed in a large vein and not put in correctly or kept clean, it can become a way for germs to enter the body and cause deadly infections in the blood.

13% Among the 478 U.S. LTACHs with enough data to calculate an SIR, 13% had an SIR significantly higher (worse) than 0.91, the value of the national SIR.

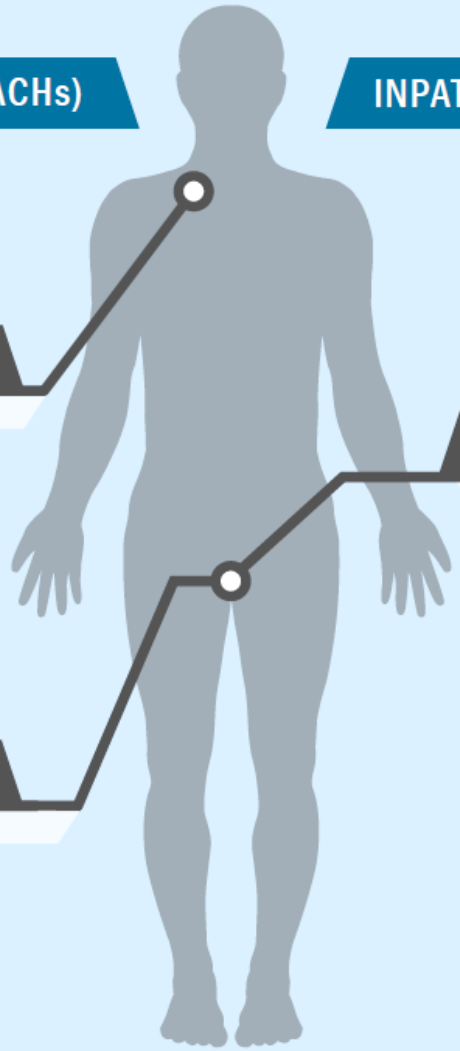
CAUTIs

↓ 11% LOWER COMPARED TO NAT'L BASELINE*

CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

When a urinary catheter is not put in correctly, not kept clean, or left in a patient for too long, germs can travel through the catheter and infect the bladder and kidneys.

17% Among the 482 U.S. LTACHs with enough data to calculate an SIR, 17% had an SIR significantly higher (worse) than 0.89, the value of the national SIR.



INPATIENT REHABILITATION FACILITIES (IRFs)

Hospitals, or part of a hospital, that provide intensive rehabilitation services using an interdisciplinary team approach. Admission to an IRF is appropriate for patients with complex nursing, medical management, and rehabilitative needs. Data are reported from free-standing IRFs and rehabilitation locations within other hospitals.

CAUTIs

↓ 14% LOWER COMPARED TO NAT'L BASELINE*

CATHETER-ASSOCIATED URINARY TRACT INFECTIONS

When a urinary catheter is not put in correctly, not kept clean, or left in a patient for too long, germs can travel through the catheter and infect the bladder and kidneys.

8% Among the 567 U.S. IRFs with enough data to calculate an SIR, 8% had an SIR significantly higher (worse) than 0.86, the value of the national SIR.

* Statistically significant

HAI Pathogens and AMR patterns NNIS 2009–2010

Pathogen, antimicrobial[a]	CLABSI			CAUTI			VAP			SSI		
	No. of isolates reported	No. (%) of isolates tested	Resistance, %	No. of isolates reported	No. (%) of isolates tested	Resistance, %	No. of isolates reported	No. (%) of isolates tested	Resistance, %	No. of isolates reported	No. (%) of isolates tested	Resistance, %
Staphylococcus aureus	3,735			442			2,043			6,415		
OX/METH		3,611 (96.7)	54.6		438 (99.1)	58.7		1,974 (96.6)	48.4		6,304 (98.3)	43.7
Enterococcus spp.												
E. faecium	2,118			654			25			517		
VAN		2,069 (97.7)	82.6		639 (97.7)	82.5		23 (92)	82.6		509 (98.5)	62.3
E. faecalis	2,680			1,519			45			1,240		
VAN		2,578 (96.2)	9.5		1,446 (95.2)	8.4		41 (91.1)	9.8		1,187 (95.7)	6.2
Klebsiella (*pneumoniae/oxytoca*)	2,407			2,365			854			844		
ESC4		2,109 (87.6)	28.8		1,998 (84.5)	26.9		747 (87.5)	23.8		710 (84.1)	13.2
Carbapenems		1,858 (77.2)	12.8		1,520 (64.3)	12.5		617 (72.2)	11.2		582 (69.0)	7.9
MDR1		1,932 (80.3)	16.8		1,650 (69.8)	16.1		658 (77.0)	13.4		621 (73.6)	6.8
Escherichia coli	1,206			5,660			504			1,981		
ESC4		1,067 (88.5)	19.0		4,656 (82.3)	12.3		429 (85.1)	16.3		1,627 (82.1)	10.9
FQ3		1,137 (94.3)	41.8		5,513 (97.4)	31.2		466 (92.5)	35.2		1,876 (94.7)	25.3
Carbapenems		931 (77.2)	1.9		3,579 (63.2)	2.3		344 (68.3)	3.5		1,330 (67.1)	2.0
MDR1		992 (82.3)	3.7		3,929 (69.4)	2.0		365 (72.4)	3.3		1,390 (70.2)	1.6
Enterobacter spp.	1,365			880			727			849		
ESC4		1,309 (95.9)	37.4		818 (93.0)	38.5		690 (94.9)	30.1		816 (96.1)	27.7
Carbapenems		1,041 (76.3)	4.0		614 (69.8)	4.6		530 (72.9)	3.6		594 (70.0)	2.4
MDR1		1,123 (82.3)	3.7		667 (75.8)	4.8		579 (79.6)	1.4		648 (76.3)	1.7
Pseudomonas aeruginosa	1,166			2,381			1,408			1,156		
AMINOS		819 (70.2)	10.0		1,495 (62.8)	10.9		920 (65.3)	11.3		664 (57.4)	6.0
ESC2		1,120 (96.1)	26.1		2,294 (96.3)	25.2		1,355 (96.2)	28.4		1,097 (94.9)	10.2
FQ2		1,114 (95.5)	30.5		2,337 (98.2)	33.5		1,378 (97.9)	32.7		1,111 (96.1)	16.9
Carbapenems		982 (84.2)	26.1		1,883 (79.1)	21.3		1,162 (82.5)	30.2		872 (75.4)	11.0
PIP/PIPTAZ		809 (69.4)	17.4		1,792 (75.3)	16.6		1,059 (75.2)	19.1		818 (70.8)	6.8
MDR2		1,096 (94)	15.4		2,250 (94.5)	14.0		1,342 (95.3)	17.7		1,053 (91.1)	5.3
Acinetobacter baumannii	629			185			557			119		
Carbapenems		522 (83)	62.6		128 (69.2)	74.2		449 (80.6)	61.2		102 (85.7)	37.3
MDR3		617 (98.1)	67.6		183 (98.9)	77.6		552 (99.1)	63.4		114 (95.8)	43.9

Sievert DM, et al. ICHE; 2013;34:1-14

Among national acute care hospitals, the report found:

50 percent decrease in CLABSI between 2008 and 2014

No change in overall CAUTI between 2009 and 2014 However, there was progress in non-ICU settings between 2009 and 2014, progress in all settings between 2013 and 2014, and even more progress in all settings towards the end of 2014

17 percent decrease in SSI related to the 10 select procedures tracked in previous reports 17 percent decrease in abdominal hysterectomy SSI between 2008 and 2014

2 percent decrease in colon surgery SSI between 2008 and 2014

8 percent decrease in C difficile infections between 2011 and 2014

13 percent decrease in MRSA bacteremia between 2011 and 2014

HAI burden in USA - 2002

- Incidence: **5–6%; 1,7 million** affected patients
  - Urinary Tract Infection: 36%; 561,667 episodes, 13,088 deaths
  - Surgical Site Infection: 20%; 274,098 episodes (1.98%)
  - Catheter Related Bloodstream Infections: 11%; 250,000 episodes,
    28,000 deaths
  - Ventilator Associated Pneumonia: 11%; 5.4/1000 ventilator-days

- Attributable mortality: **3.6%**, approximately **99,000 deaths**
- Annual economic impact: about **US$ 4,5 billion**

Klevens RM, et al. Public Health Reports 2007

HAI prevalence and burden in Europe

Prevalence: 5.7% (95%CI, 4.5–7.4%)

- **3 529 778** (95% CI, 1 941 962-8 250 382) HAI episodes per year
- **87 539** HAI episodes at any given day
  - Respiratory tract infection: 23.4% (pneumonia: 19.4%; LRTI: 4.1%)
  - **Surgical Site Infection: 19.6%; 17 399 episodes per day (1.22%)**
  - Urinary Tract Infection: 19%
  - Gastro-intestinal infections: 7.7%
  - Bloodstream Infections: 10.7%

(ECDC, Point Prev Report 2011-12)

- **16 million** extra days of hospital stay
- **37 000** attributable deaths (and contribution to an additional 110 000)
- **Annual economic impact:** about **EUR 7 billion** per year (including direct costs only)

(ECDC, Comm Dis Report 2008)

ECDC Point Prevalence Study 2011-12
HAI affected patients

(ECDC, Point Prev Report 2011-12)

HAI type	Weighted HAI prev. %	(95% CI)	N of HAIs on one day	(95% CI)	% of total HAIs (a)	(95% CI)
Pneumonia/Lower respiratory tract	1.38	(1.01-2.03)	19 691	(14 402-28 898)	22.5	(16.5-33.0)
Urinary tract infections	1.36	(0.97-1.97)	19 399	(13 881-28 155)	22.2	(15.9-32.2)
Surgical site infections	1.22	(0.89-1.86)	17 399	(12 755-26 491)	19.9	(14.6-30.3)
Bloodstream infections	0.61	(0.40-1.31)	8 648	(5 717-18 689)	9.9	(6.5-21.3)
Gastro-intestinal tract infections	0.52	(0.32-0.98)	7 413	(4 582-13 967)	8.5	(5.2-16.0)
Systemic infections	0.30	(0.16-1.19)	4 227	(2 274-16 959)	4.8	(2.6-19.4)
Skin and soft tissue infections	0.21	(0.12-0.42)	2 951	(1 699-6 038)	3.4	(1.9-6.9)
Other HAI types	0.55	(0.35-1.12)	7 811	(4 963-15 921)	8.9	(5.7-18.2)
Total HAIs [(a)]	-		**87 539**	**(60 273-155 118)**	**100.0**	

ECDC Point Prevalence Study 2011-12
HAI incidence in Europe

(ECDC, Point Prev Report 2011-12)

HAI type	LN-INT	P50 (LN-INT)	HAI inc.%	(95% CI)	N HAIs /year	(95% CI)	% of total HAIs	(95% CI)
Pneumonia/LRT	8.9	6.7	0.95	(0.58-1.66)	860 938	(522 771-1 500 038)	24.4	(14.8-42.5)
Urinary tract	8.0	6.3	0.98	(0.58-1.72)	888 106	(527 129-1 554 275)	25.2	(14.9-44.0)
Surgical site	15.0	9.3	0.60	(0.33-1.17)	543 149	(298 167-1 062 673)	15.4	(8.4-30.1)
Bloodstream	11.3	8.7	0.35	(0.19-0.93)	312 822	(171 262-844 423)	8.9	(4.9-23.9)
Gastro-intestinal	13.3	9.3	0.29	(0.14-0.66)	258 327	(127 121-593 452)	7.3	(3.6-16.8)
Systemic	7.5	5.7	0.26	(0.11-1.82)	236 387	(100 646-1 647 657)	6.7	(2.9-46.7)
Skin/soft tissue	12.8	9.0	0.11	(0.05-0.31)	103 146	(43 564-277 627)	2.9	(1.2-7.9)
Other HAI types	13.2	7.9	0.36	(0.17-0.85)	326 903	(151 302-770 238)	9.3	(4.3-21.8)
Total HAIs [(a)]					**3 529 778**	**(1 941 962-8 250 382)**		

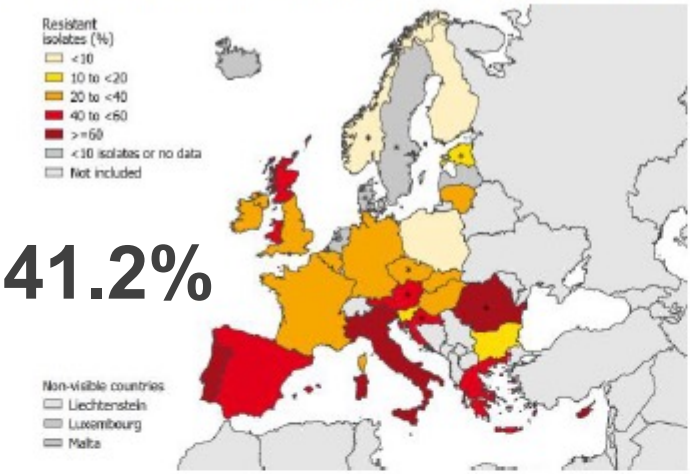
HAI prevalence: 6%

87,539 affected patients every day

Estimated incidence per year: 3,2 M (1,9-5,2) affected patients

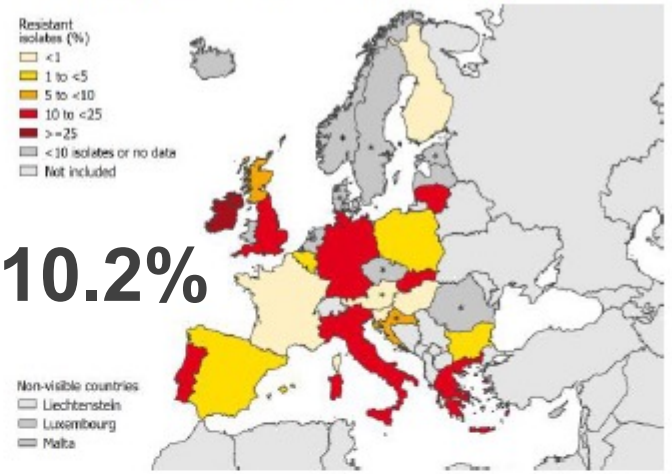
Resistance patterns in HA-pathogens in Europe

a. Meticillin-resistant *Staphylococcus aureus* (MRSA)



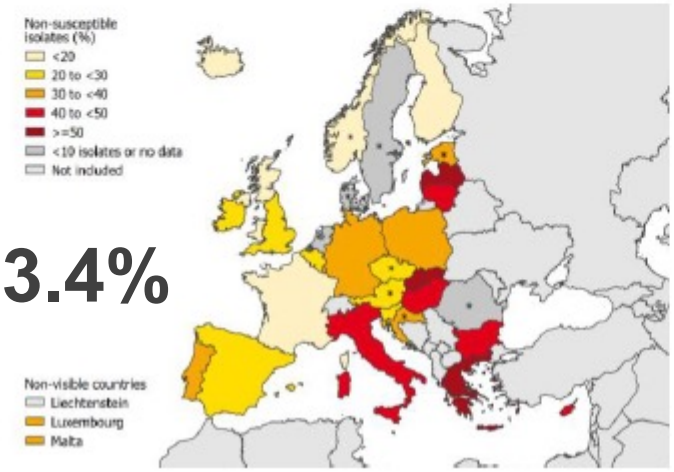
41.2%

b. Vancomycin-resistant *Enterococcus species* (VRE)



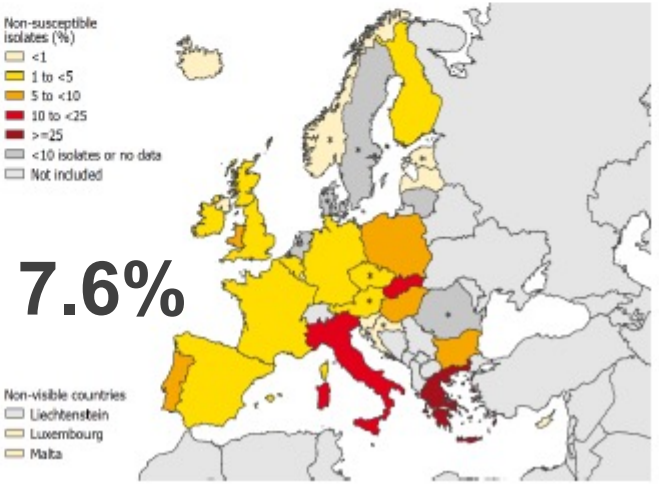
10.2%

c. Third-generation cephalosporin-non-susceptible *Enterobacteriaceae*



33.4%

d. Carbapenem-non-susceptible *Enterobacteriaceae*



7.6%

SSI burden in low-/middle-income countries

Allegranzi B et al. Lancet 2011;377:228-41

Articles

Burden of endemic health-care-associated infection in developing countries: systematic review and meta-anal

Benedetta Allegranzi, Sepideh Bagheri Nejad, Christophe Combescure, Wilco Graafmans, Homa Attar, Liam Donaldson, Didier Pittet

Summary

Background Health-care-associated infection is the most frequent result of unsafe patient care worldwi data are available from the developing world. We aimed to assess the epidemiology of endemic health-care infection in developing countries.

Methods We searched electronic databases and reference lists of relevant papers for articles published Studies containing full or partial data from developing countries related to infection prev incidence—including overall health-care-associated infection and major infection sites, and their micr cause—were selected. We classified studies as low-quality or high-quality according to predefined crt were pooled for analysis.

Findings Of 271 selected articles, 220 were included in the final analysis. Limited data were retrieved regions and many countries were not represented. 118 (54%) studies were low quality. In general, infection reported in high-quality studies were greater than those from low-quality studies. Prevalence of health-care infection (pooled prevalence in high-quality studies, 15·5 per 100 patients [95% CI 12·6–18·9]) was much proportions reported from Europe and the USA. Pooled overall health-care-associated infection densi Intensive-care units was 47·9 per 1000 patient-days (95% CI 36·7–59·1), at least three times as high a reported from the USA. Surgical-site infection was the leading infection in hospitals (pooled cumulative 5·6 per 100 surgical procedures), strikingly higher than proportions recorded in developed countries. Gra bacilli represented the most common nosocomial isolates. Apart from meticillin resistance, noted in 158 o *Staphylococcus aureus* isolates (in eight studies), very few articles reported antimicrobial resistance.

Interpretation The burden of health-care-associated infection in developing countries is high. Our finding need to improve surveillance and infection-control practices.

Funding World Health Organization.

Introduction

Health-care-associated infections are deemed the most frequent adverse event threatening patients' safety worldwide.[1,2] However, reliable estimates of the global burden are hampered by a paucity of data adequately describing endemic infections at national and regional levels, particularly in resource-limited settings.[3] In countries where less than 5% of the gross national product is spent on health care, and workforce density is less than five per 1000 population,[3] other emerging health problems and diseases take priority.[4] The epidemiological gap leading to the absence of reliable estimates of the global burden is mainly because surveillance of health-care-associated infection expends time and resources and needs expertise in study design, data collection, analysis, and interpretation. Very few countries of low and middle income have national surveillance systems for health-care-associated infections. Data from the International Nosocomial Infection Control Consortium,[5] and findings of two systematic reviews on hospital-acquired neonatal infections[6] and ventilator-associated pneumonia,[7] suggested not only that risks of health-care-associated infection are significantly higher in developing countries but also that the effect on patients and systems is severe and greatly underestimated.

The aim of this systematic review and me ts to assess the burden of endemic health-care- infection in developing countries by co available data from published studies on epi We also aim to investigate constraints surveillance of health-care-associated inf resource-limited settings and identify p for improvement.

Methods

Search strategy and selection criteria

We undertook a literature search and revie according to a protocol designed before data We aimed to identify studies on the epidem health-care-associated infection in developing with a particular focus on the most frequen infections—urinary-tract infection, surgical-site bloodstream infection, hospital-acquired pneu ventilator-associated pneumonia. We searche for reports published between January, December, 2008, with no language restriction. comprehensive list of terms (panel 1), includ

www.thelancet.com Published online December 16, 2010 DOI:10.1016/S0140-6736(10)61458-4

World Health Organization | Patient Safety

Published on 5 May 2011

http://www.who.int/gpsc/en/

Report on the Burden of Endemic Health Care-Associated Infection Worldwide

Clean Care is Safer Care

World Health Organization

Patient Safety

A World Alliance for Safer Health Care

Systematic reviews

th-care-associated infection in Africa: a systematic review

h Bagheri Nejad,[a] Benedetta Allegranzi,[a] Shamsuzzoha B Syed,[b] Benjamin Ellis[c] & Didier Pittet[c]

ive To assess the epidemiology of endemic health-care-associated infection (HAI) in Africa.

ds Three databases (PubMed, the Cochrane Library, and the WHO regional medical database for Africa) were searched to identify published from 1995 to 2009 on the epidemiology of HAI in African countries. No language restriction was applied. Available t books of leading international infection control conferences were also searched from 2004 to 2009.

gs The eligibility criteria for inclusion in the review were met by 19 articles, only 2 of which met the criterion of high quality. Four t abstracts were retrieved from the international conference literature. The hospital-wide prevalence of HAI varied between 2.5% .8%; in surgical wards, the cumulative incidence ranged from 5.7% to 45.8%. The largest number of studies focused on surgical action, whose cumulative incidence ranged from 2.5% to 30.9%. Data on causative pathogens were available from a few studies d highlighted the importance of Gram-negative rods, particularly in surgical site infection and ventilator-associated pneumonia.

usion Limited information is available on the endemic burden of HAI in Africa, but our review reveals that its frequency is much than in developed countries. There is an urgent need to identify and implement feasible and sustainable approaches to strengthen vention, surveillance and control in Africa.

Abstracts in العربية, 中文, Français, Русский and Español at the end of each article.

luction

care-associated infection (HAI) is a major global safety for both patients and health-care professionals.[1–3] HAI is as an infection occurring in a patient during the process in a hospital or other health-care facility that was not t or incubating at the time of admission. This includes ns acquired in the hospital and any other setting where receive health care and may appear even after discharge. o includes occupational infections among facility staff.[1] ifections, often caused by multiresistant pathogens, take toll on patients and their families by causing illness, d hospital stay, potential disability, excess costs and es death.[4–6]

burden of HAI is already substantial in developed coun- ere it affects from 5% to 15% of hospitalized patients in wards and as many as 50% or more of patients in intensive ts (ICUs).[7,8] In developing countries, the magnitude of olem remains underestimated or even unknown largely HAI diagnosis is complex and surveillance activities to terventions require expertise and resources.[9] Surveillance exist in some developed countries and provide regular on national trends of endemic HAI,[9] such as the National are Safety Network of the United States of America or man hospital infection surveillance system. This is not in most developing countries[10] because of social and are system deficiencies that are aggravated by economic s. Additionally, overcrowding and understaffing in hos- sult in inadequate infection control practices and a lack

This review provides a general overview of the endemic burden of HAI in Africa based on the information available in the scientific literature. It also identifies information gaps, examines differences in HAI epidemiology between developed and developing countries and highlights the possible role of the World Health Organization (WHO) in preventing HAI.

Methods

Search strategy and selection criteria

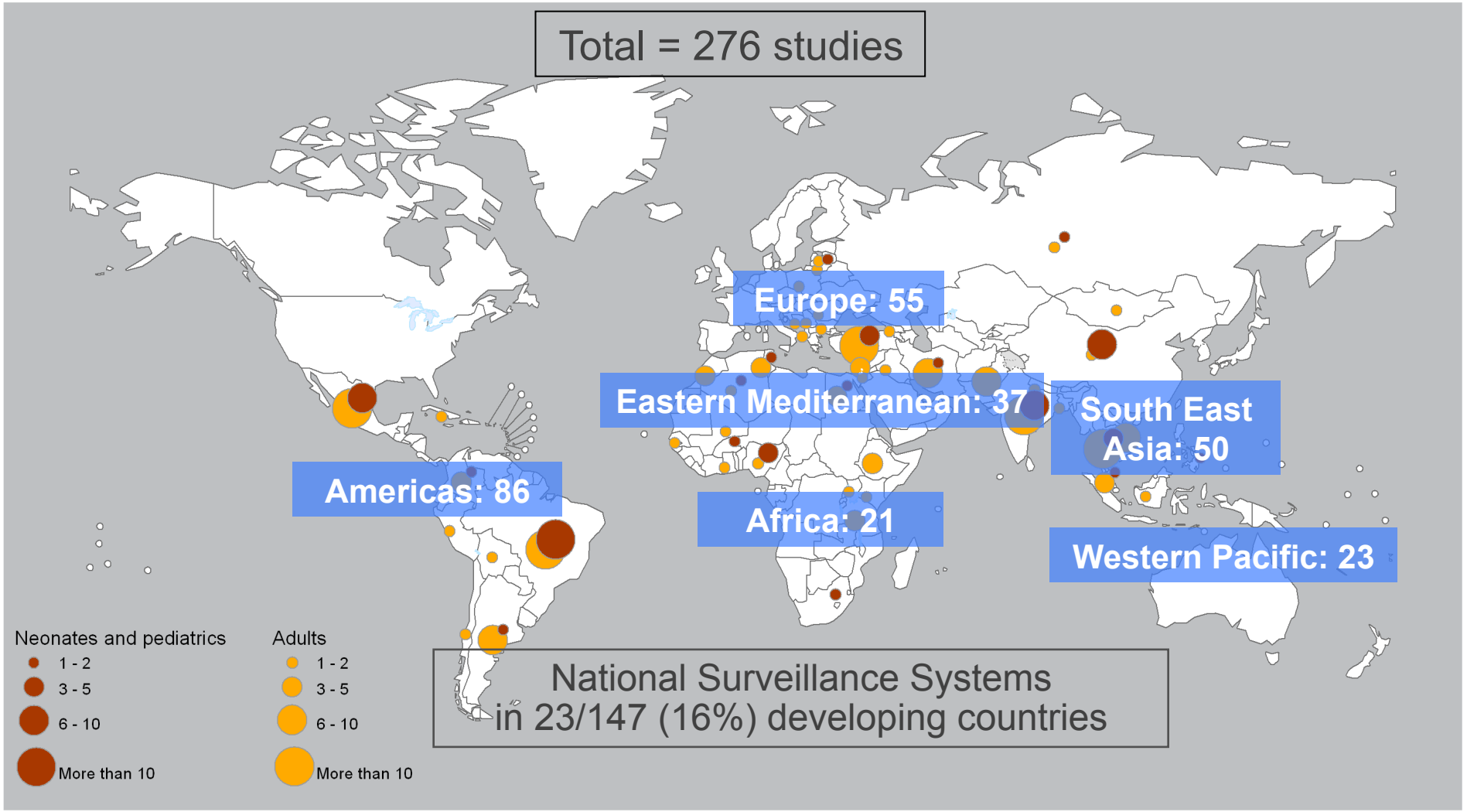
A literature search was performed from January 1995 to December 2009 with no language restriction to retrieve publications on the epidemiology of the most common HAIs in African countries: health-care-associated urinary tract infection (HA-UTI), surgical site infection (SSI), hospital-acquired pneumonia/ventilator-associated pneumonia and health-care-associated bloodstream infection. PubMed was searched using a combination of the following keywords, including "cross-infection" as the MeSH term: "nosocomial infection", "hospital-acquired", "incidence", "prevalence" and "rate" together with the individual country names. The Cochrane Library was searched for any relevant review papers. Reference lists of retrieved articles were hand searched for additional studies.

A separate search was run in the WHO regional medical database for Africa, African Index Medicus, using a shorter list of essential keywords and with no time restriction. The abstract books of the following international conferences were also searched from 2004 to 2009: Interscience Conference on Antimicrobial Agents and Chemotherapy (ICAAC), Annual Congress of the Society for Healthcare Epidemiology of America (SHEA), Euro-

Bagheri Nejad S, et al. WHO Bull 2011;89:757-765

(Submitted: 11 March 2011 – Revised version received: 5 July 2011 – Accepted: 8 July 2011 – Published online: 20 July 2011)

Figure 4.1: Number of studies* reporting health care-associated infection in low- and middle-income countries, 1995-2010



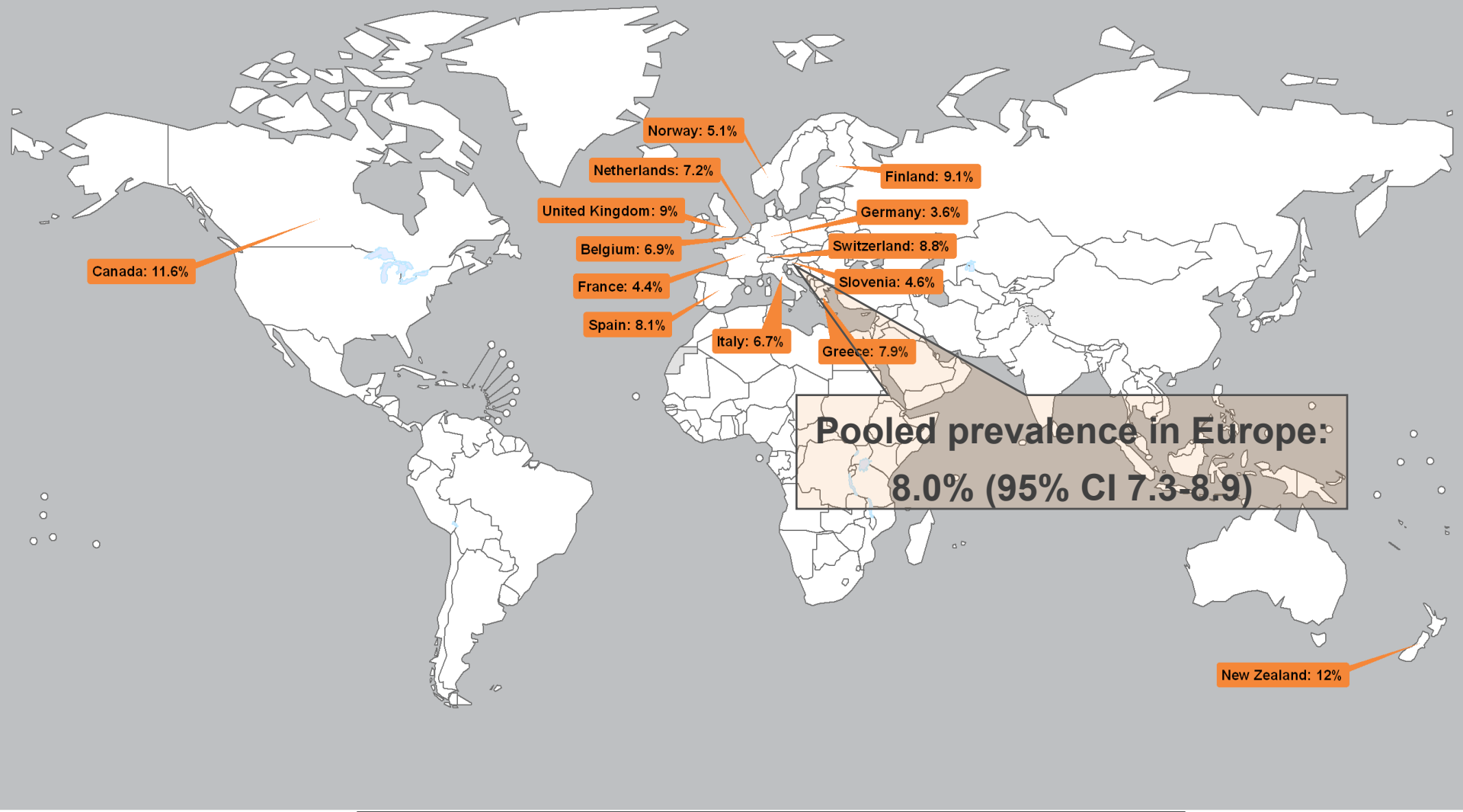
Data Source: World Health Organization
Map Production: Public Health Information and Geographic Information Systems (GIS)
World Health Organization

World Health Organization

* Studies with any scope (i.e. conducted at the unit, facility, multicenter, or national level) are included

WHO Report on the Burden of Endemic Health Care-associated Infection Worldwide

Prevalence of health care-associated infection in high-income countries, 1995-2010

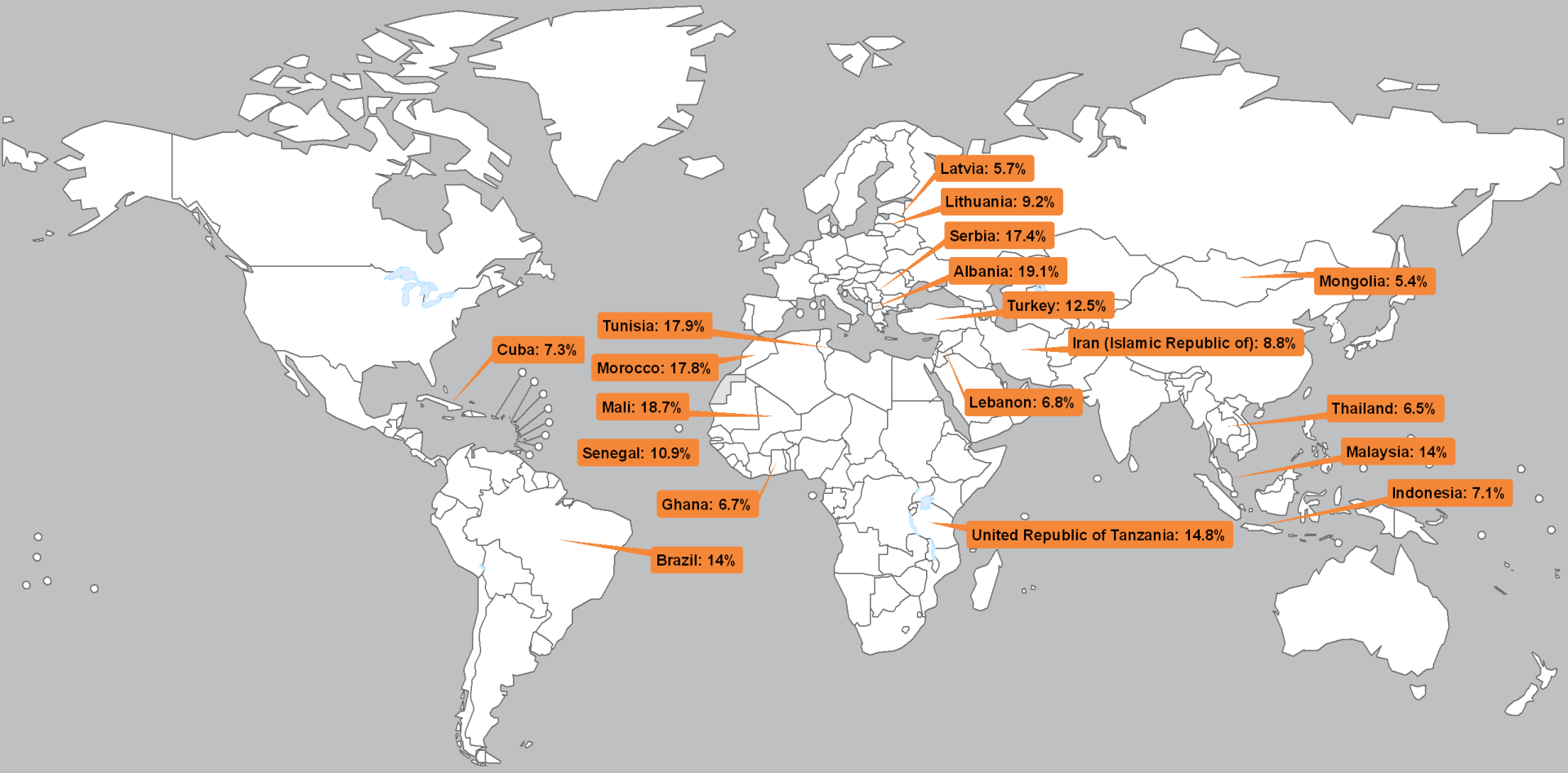


Range: 3.5-12%
Pooled prevalence: 7.6% (95% CI 6.9-8.5)

*For countries with more than one study, the most recent figures are included

WHO Report on the Burden of Endemic Health Care-associated Infection Worldwide

Prevalence of health care-associated infection in low-/middle-income countries, 1995-2010

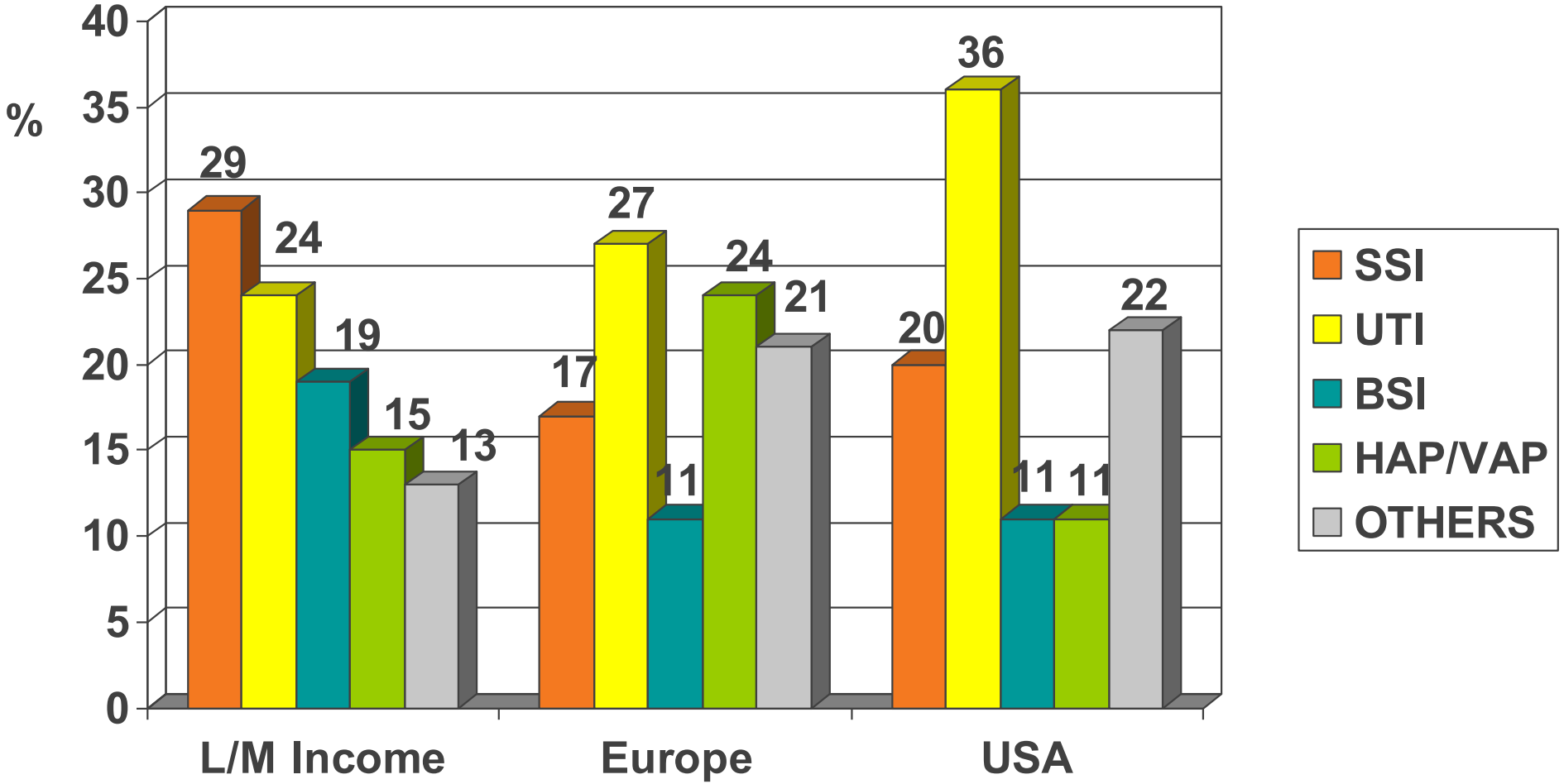


Studies of high quality: 56%

Range: 5.7-19.1%
Pooled prevalence: 10.1% (95% CI 8.4-12.2)
In high-quality papers: 15.5% (95% CI 12.6-18.9)

WHO Report on the Burden of Endemic Health Care-associated Infection Worldwide

Type of hospital-acquired infection



Overall healthcare- and device-associated infection incidence in high risk patients, 1995-2010 – meta-analysis

High-income countries

- Overall HAI: 17.0/1000 pt-days
- CR-BSI: 3.5/1000 cath-days
- CR-UTI: 4.1/1000 cath-days
- VAP: 7.9/1000 vent-days

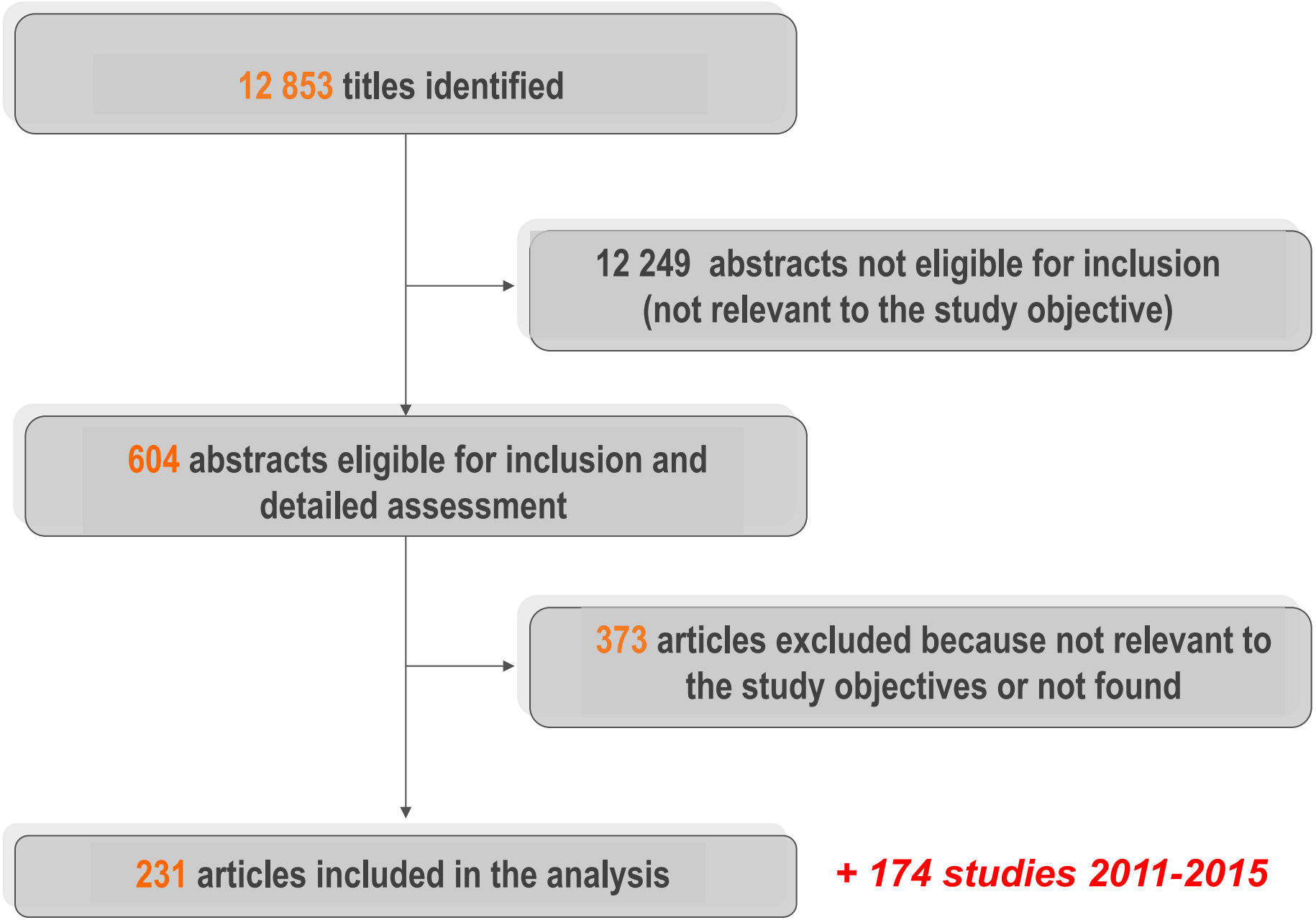
Low- and middle-income countries

- Overall HAI: 47.9/1000 pt-days
- CR-BSI: 12.2/1000 cath-days
- CR-UTI: 8.8/1000 cath-days
- VAP: 23.9/1000 vent-days

- **at least X 2-3**
- **up to 13 times higher in some countries**

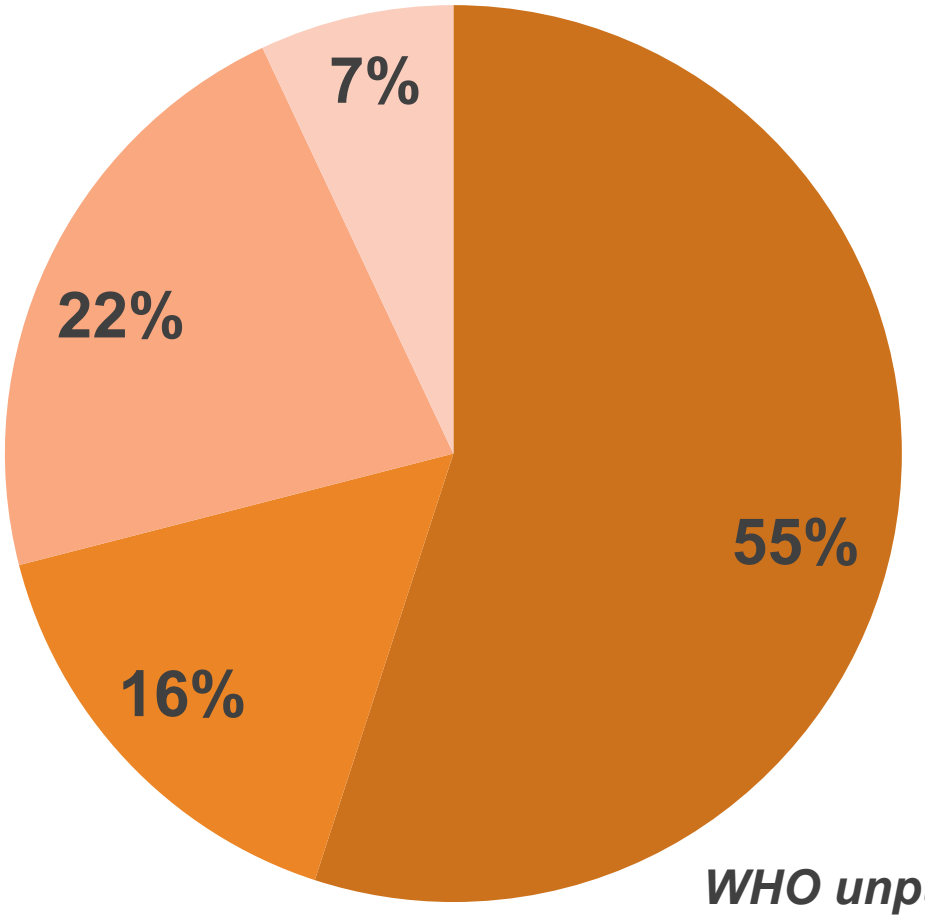
WHO Report on the Burden of Endemic Health Care-associated Infection Worldwide

Systematic review on SSI epidemiology in LMIC (1995-2015)
PRELIMINARY RESULTS



+ 174 studies 2011-2015

Type of study



WHO unpublished data

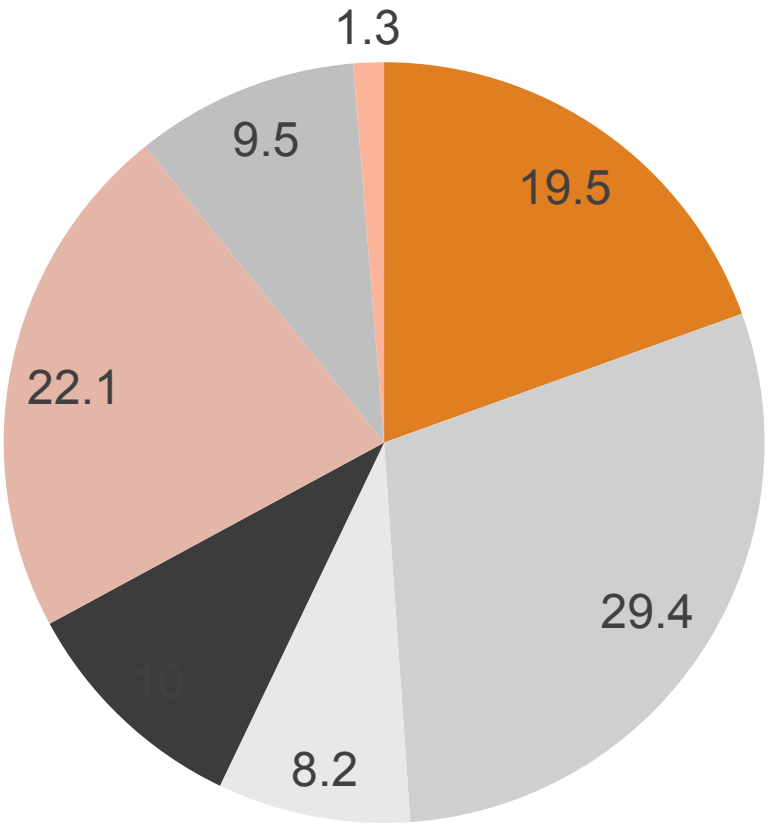
Quality

- High: 38%
- Low: 65%

Country income

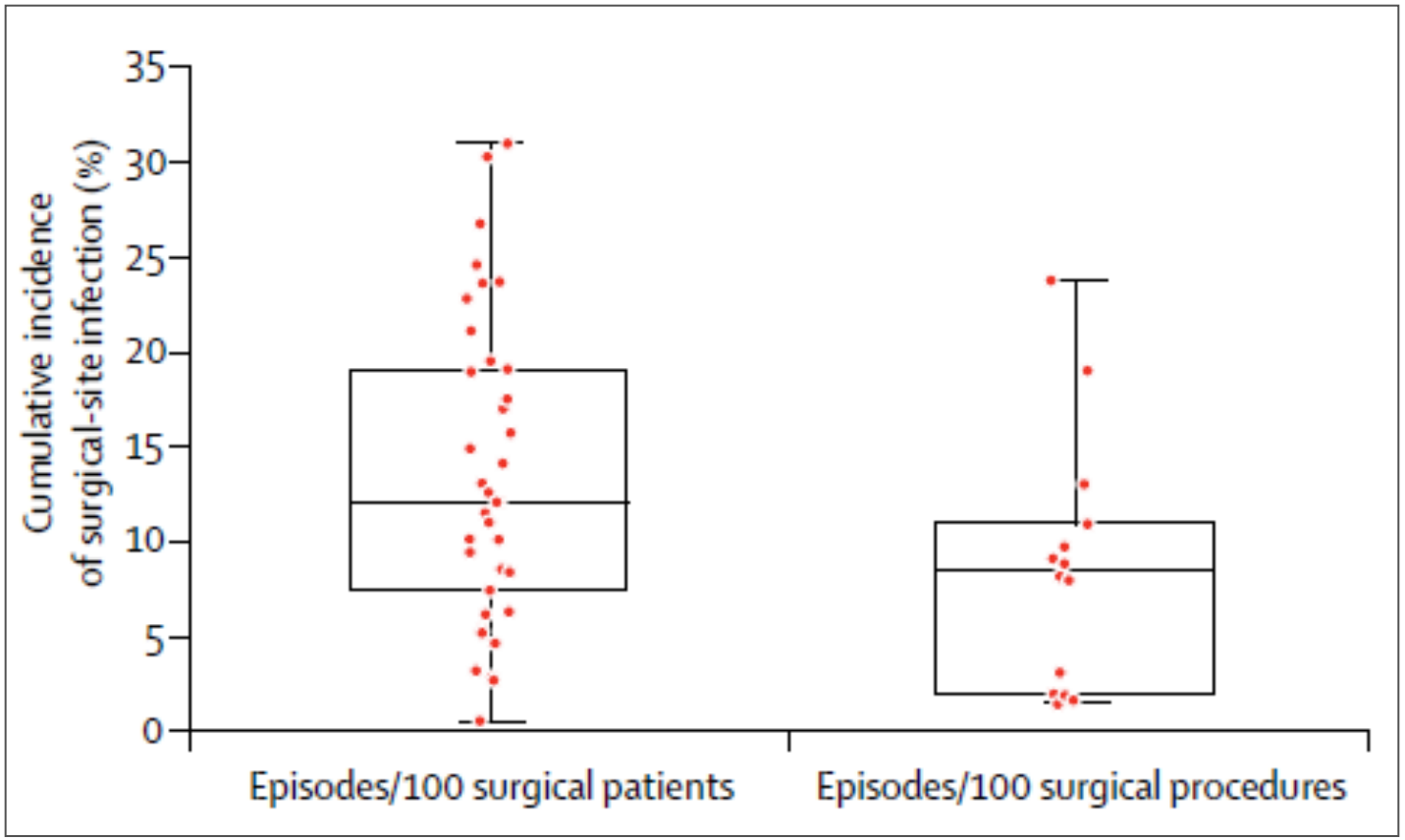
- Middle: 81%
- Low: 18%
- Mixed: 1%

Studies (%) per region



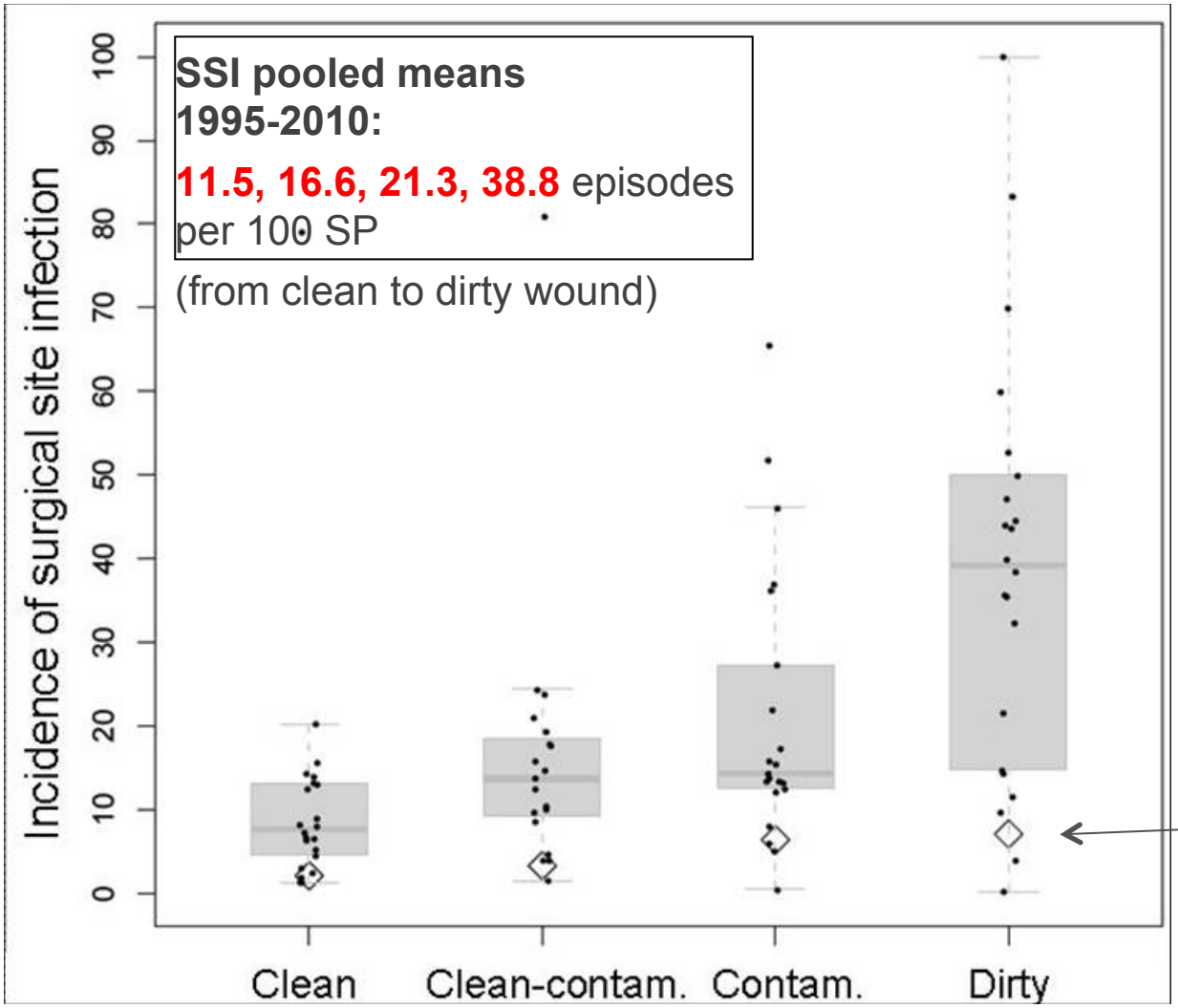
- Africa
- Americas
- Eastern mediterranean
- Europe
- South-east Asia
- West Pacific
- Multiple

Incidence of surgical site infections (107 studies)



Pooled cumulative incidence: **11.2%** per 100 surg pts (95% CI, 9.7 to 12.8)
6.1 per 100 surg procedures (95% CI 5.0-7.2)
I^2 **= 99%**

SSI risk in developing countries according to wound classification (1995-2015)



SSI pooled means:

6.6, 12.1, 20.6, 31.6 episodes per 100 SP (from clean to dirty wound)

◊ NNIS reports

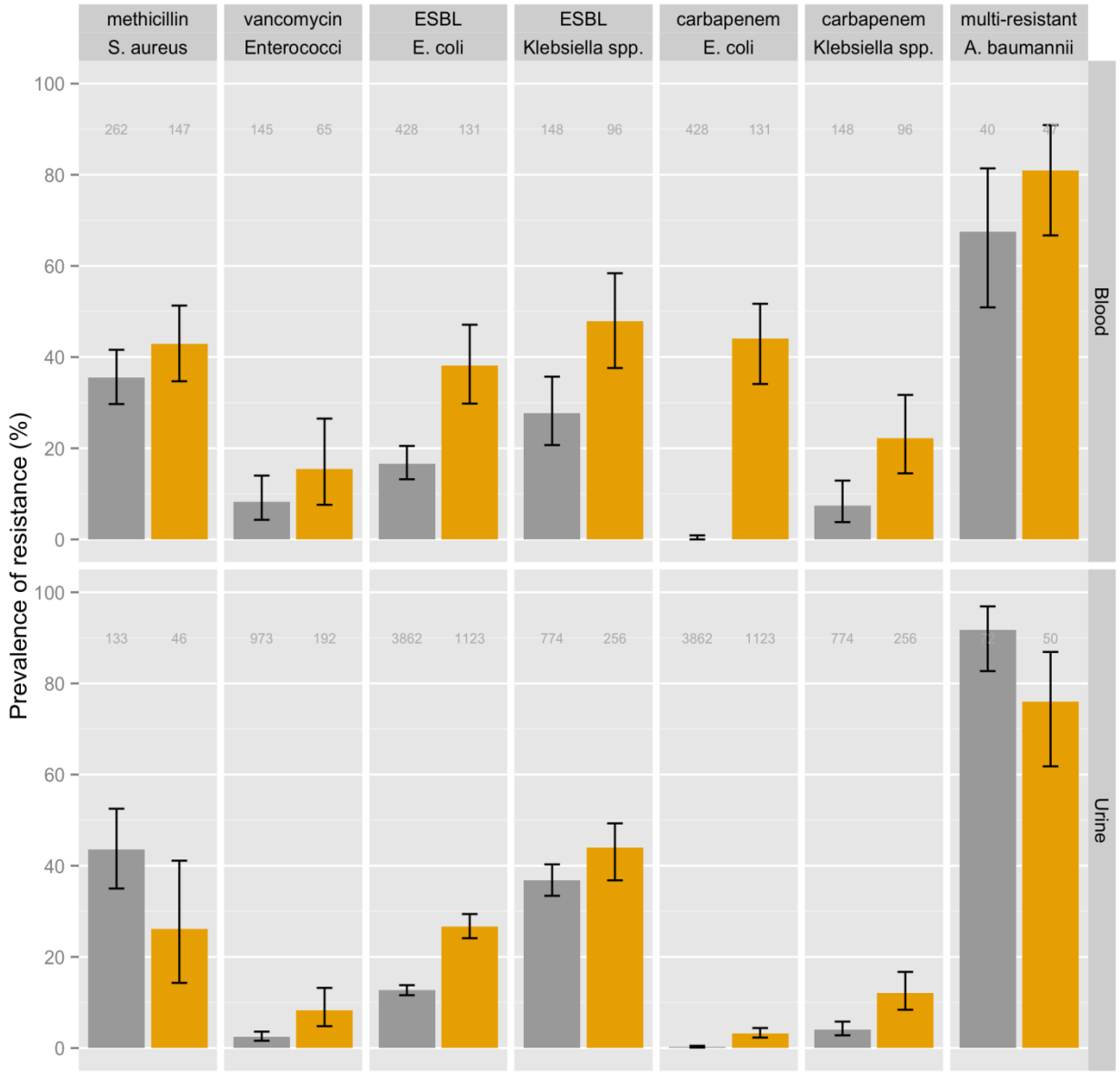
Causes of HAI by infection site

Pathogens	Number of isolates (%) (total number of studies 36)									
	BSI (5 studies)	%	SSI (20 studies)	%	UTI (4 studies)	%	VAP/HAP (7 studies)	%	Total	%
S. aureus	62	14.5	245	20.3	4	1.1	47	10.2	358	14.6
Coagulase Neg Staph	92	21.5	92	7.6	1	0.3	15	3.3	200	8.2
Enterococcus spp	48	11.2	38	3.1		12.0	1	0.2	129	5.3
E. coli	25	5.8	245			15.7	6	1.3	331	13.5
Pseudomonas spp	52	12.1			53	15.1	134	29.2	449	18.3
Enterobacteriaceae (excl E coli)	49			25.7	37	10.5	92	20.0	489	20.0
Acinebacter spp	53	12	18	1.5	23	6.6	110	24.0	204	8.3
Candida spp	30	7.0	13	1.1	130	37.0	1	0.2	174	7.1
Other	17	4.0	37	3.1	6	1.7	53	11.5	113	4.6
Total	428	100	1209	100	351	100	459	100	2447	100

MRSA: 54.5%*

Allegranzi B et al.
Lancet 2011;377:228-41

Prevalence of multidrug resistance from inpatient clinical blood and urine specimens (2014)*



Significantly higher MRSA, ESBL-PE, CRE, and MRAB prevalence from blood cultures **in LMICs**

High income

Middle/low income

* 380 high-quality laboratories worldwide

WHO unpublished data

Why is there so little SSI surveillance in LMIC?

- Lack of dedicated human resources and funds
- Lack of expertise in epidemiology and infection control
- Difficulties in the application of standard definitions:
  - *limited expertise*
  - *lack of reliable microbiological and other diagnostic tools*
  - *poor-quality information from patient records*
  - *need to evaluate clinical evidence*
- Lack or insufficient microbiology laboratory capacity
- Lack of skills for data interpretation and use
- Existence of different payer sources
- Penalization of hospitals and staff by State Inspection Agency

Allegranzi B et al. Lancet 2011

WHO AMR-IPC/SDS unit stream of work - Main areas of work

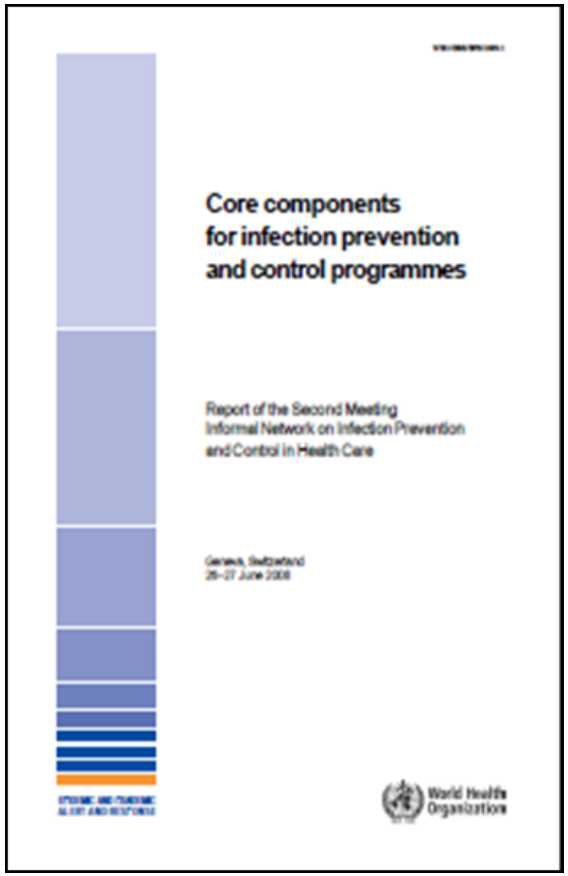
1. providing input for the IPC component of the AMR national action plans (NAPs) templates;
2. promoting and sustaining hand hygiene improvement worldwide
3. developing guidance and implementation packages for the prevention of device- and surgical procedure-associated infections, with focus on antimicrobial resistant microorganisms;
4. developing guidance and implementation packages on specific precautions and procedures to prevent the spread of emerging AMR in health care settings and in the community;
5. providing rapid technical support to countries and health-care facilities to put in place IPC best practices to control nosocomial outbreaks due to emerging AMR

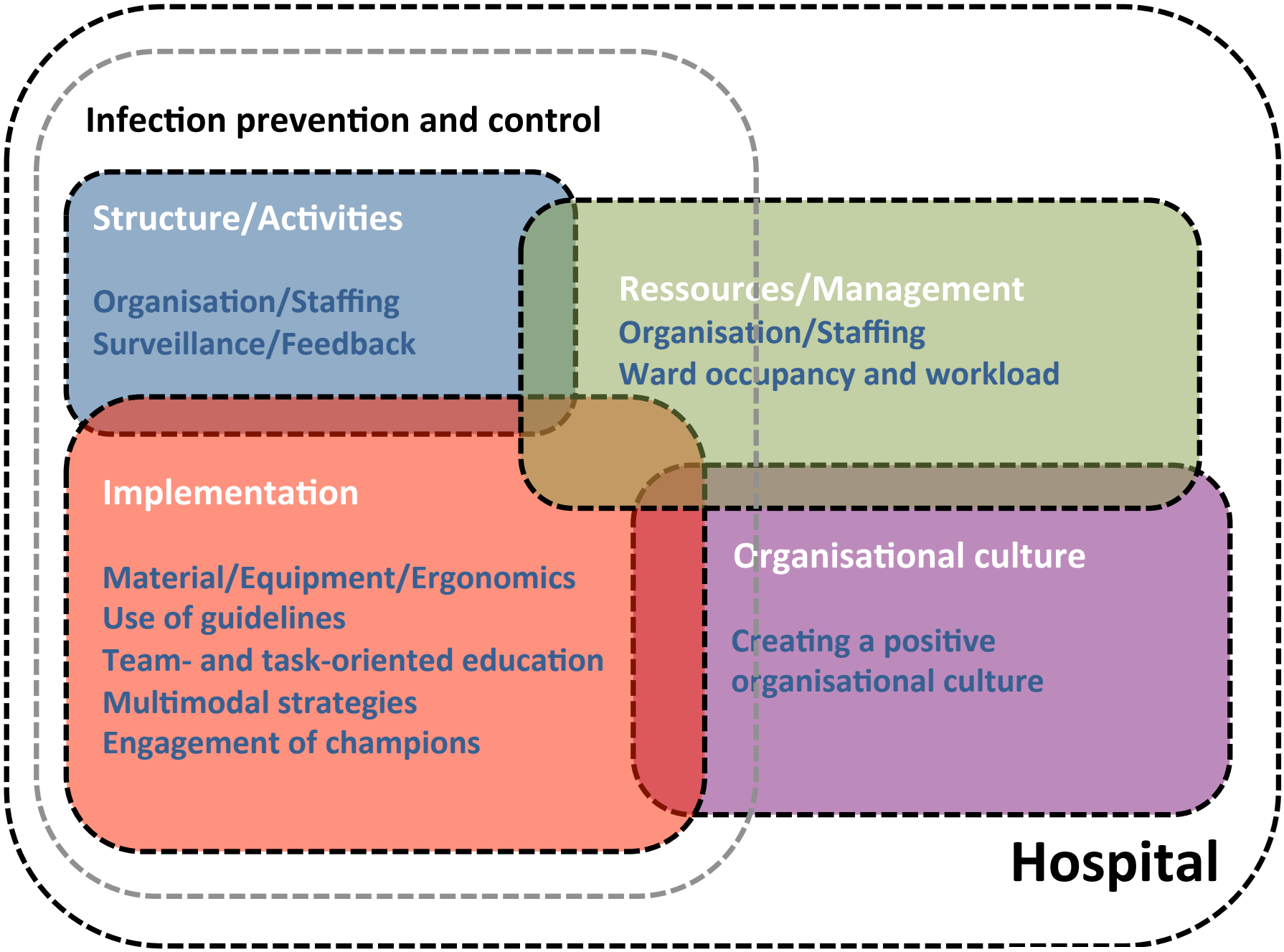
Core components for IPC programmes

Core components

✔ Checklist

- ☐ Organization of IPC programmes
- ☐ Technical guidelines
- ☐ Human resources (training, staffing, occupational health)
- ☐ Surveillance of diseases and of compliance with IPC practices
- ☐ Microbiology laboratory support
- ☐ Clean and safe environment
- ☐ Monitoring and evaluation of IPC programmes
- ☐ Links with public health and other services





Lancet Infect Dis 2015; 15: 212–24

Key issues in identifying the CC

- Available policies/guidance are not evidence based
- The evidence is low quality and very limited
- Very difficult to find evidence on the WASH contribution to HAIs
- No mention to facility infrastructures and standards regarding to water quality, quantity, and sanitation

Core components at facility level: SIGHT 1 & 2

#	Key Component	Specifications	Impact	Indicators
1	**Effective IPC programme**	• at least **one** full-time trained IPC nurse/ up to 250 beds • dedicated **physician** trained in IPC • **microbiological** support • **data management** support	• HAI reduction • *C. difficile* reduction	• Inclusion of IPC at hospital admin agenda • appropriate staffing and budget for IPC
2	**Ward occupancy & workload**	• occupancy not exceed **capacity** • **Frontline** staffing & workload adapted to acuity of care • Pool/agency staff kept to a minimum	• MRSA infections and/or transmission	• Average bed occupancy • Average number of frontline workers

Core components at facility level: SIGHT 1 & 2

#	Key Component	Specifications	Impact	Indicators
3	**Materials, equipment, ergonomics**	• **HH** facilities • **CVC** kits and carts	• HH compliance • CLABSI • VAP	• Availability of ABHR at point of care and sinks stocked with soap and single-use towels
4	**Guidelines**	• Very useful in settings without previous protocols • Combined with education & training	• HH compliance • CAUTI	• Adaptation of guidelines to local situation • number of new staff trained with the local guidelines • teaching programmes are based on local guidelines
5	**Education & training**	• Bed side training • Simulation • Hands-on workshops • Focus groups • Automated training system	• CRBSI • HH compliance • HAI • VAP	• Education and training programmes should be audited • combined with knowledge & competency assessments

Core components at facility level: SIGHT 1 & 2

#	Key Component	Specifications	Impact	Indicators
6	**Audits**	• Daily adherence to bundles • Catheter hub care • Peers-assessment • Checklist	• VAP • Neonatal BSI • Standard precautions • General HAIs	• number of audits (overall, and stratified by departments, units and topics) for specified time periods
7	**Prospective surveillance in network**	• Surveillance plan • Periodic Assessment • Feedback	• HAI • CLABSI • VAP • CAUTI • SSI	• Participation in national & and international surveillance initiatives • number & type of wards • Frequency of review & feedback

Core components at facility level: SIGHT 1 & 2

#	Key Component	Specifications	Impact	Indicators
8	**Multimodal strategies & tools**	• Multimodal approach • Multidisciplinary taskforce • Positive reinforcement • Behavioral change • Product marketing principles	• HH • CLABSI • VAP • CAUTI • MRSA	• Verification that programmes are multimodal; • measurement of process indicators; • measurement of outcome indicators
9	Engaging **champions**	• Role models • One champion/new technology • More than one if behavioral change	• HAI • MRSA • HH	• Incorporated frontline HCWs in implemntation process • Inclusions of champoins in multimodal programmes

Core components at facility level: SIGHT 1 & 2

#	Key Component	Specifications	Impact	Indicators
10	**Positive organisational culture**	• Management engagement & support to IPC • Instructional supervisor feedback • Managers' consistency • Clinical excellence environment • Communication • Role models/peer pressure • Financial incentives for unit	• HAI • HH • MRSA • Respiratory IPC measures • ICU CLABSI & VAP	• Verification that programmes are multimodal • measurement of process indicators • measurement of outcome indicators

IPC Global Unit
THANK YOU VERY MUCH

http://www.who.int/entity/gpsc/5may/EN_PSP_GPSC1_5May_2016/en/index.html

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