



Emilio Bouza



Patricia Munoz

# Who am I

- **Teaching:** Full profesor Microbiology - Medicine
- **Assistance:** Head of the Microbiology–Infectious Diseases Department at Gregorio Marañón General University Hospital
  - ✓ HIV+ care
  - ✓ Consultations for Transplantation, Cardiac Surgery, Gastroenterology, Nephrology, Neurology, Cardiology, Oncology, Hematology, Coronary Unit, and Cardiovascular Surgery Postoperative Care
  - ✓ Nosocomial infection control
- **Research Areas**
  - ✓ Infections in immunocompromised patients
  - ✓ Nosocomial infections in ICUs
  - ✓ Invasive Fungal infections
- **Management** 150 healthcare professionals with diverse backgrounds



# Emilio Bouza



# Universidad Complutense de Madrid





# Hospital General Universitario Gregorio Marañón. Madrid





# Clinical Microbiology-Infectious Diseases







# Diagnostic Clinical Microbiology





# Infectious Diseases

- Ward with 21 beds
- Consultations to all areas of the hospital
- External general consultation
- Specialized consultations (travellers, STD, endocarditis, fecal microbiota transplantation, PREP,





# Clinical challenges in Infection control

## Clinical perspective and some case studies

25.02.2025. 1330-1500

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Clinical Microbiology and Infectious Diseases

Hospital General Universitario Gregorio Marañón

Research Institute Gregorio Marañón

Centro de investigación biomédica en red en Enfermedades Respiratorias (CIBERES)

University Complutense of Madrid, Spain

Sociedad Madrileña de Microbiología

What is a Nosocomial Infection?

What is its numerical significance and etiology?

Misuse of Antimicrobials – Antimicrobial Stewardship Programs (PROA)

Which are the most common nosocomial infections?

What is the reality of nosocomial infections in Spain?

What impact has COVID-19 had?

What is the cost?

What do we need to eliminate it? Eliminate it?

Engineers

Final Messages

Some examples



**What is a Nosocomial Infection?**

# Nosocomial infection. Definition

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Originated or occurring in the hospital

Acquired in the hospital (after >72 hours and not in incubation at admission)

## "Nosocomial"

"nosus": disease

"komeion": to care

An infection contracted while the patient is receiving healthcare





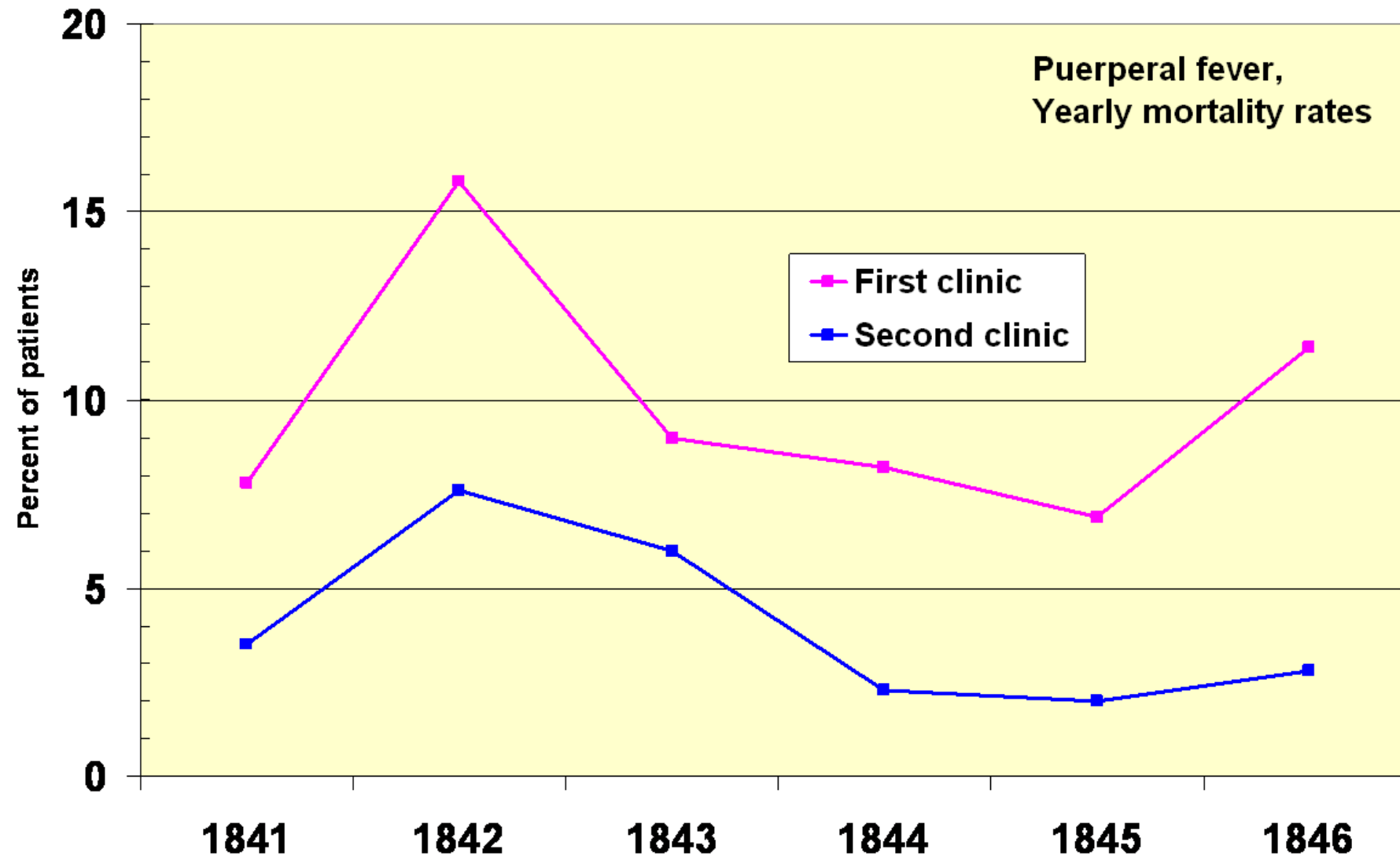
# Concept of NI



**Semmelweis in Wien**

He compared the rates of infection with a similar hospital in Dublin, Ireland, and hypothesized that it was the medical students who somehow were infecting the women after labor.

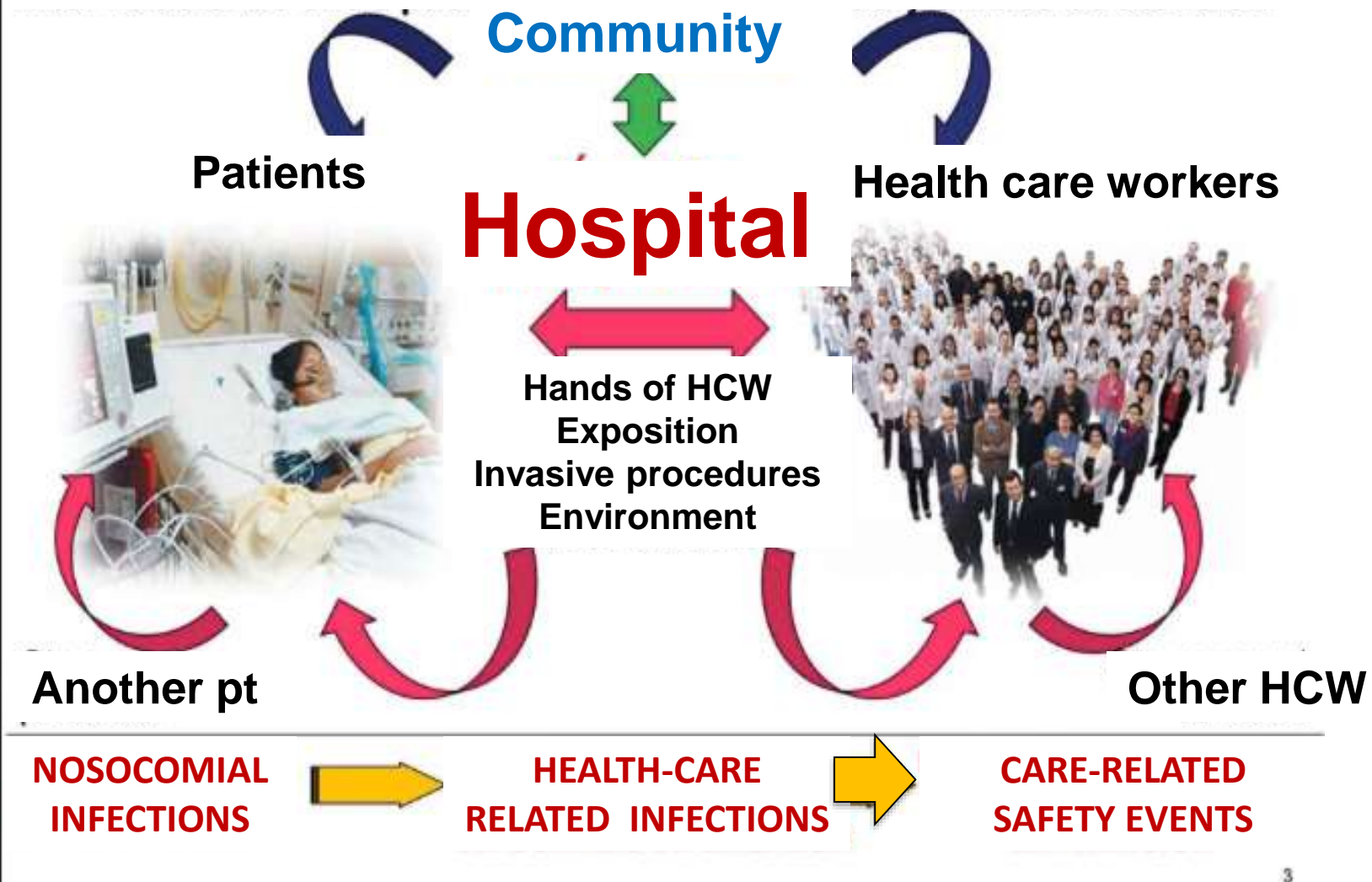
He instituted mandatory hand-washing in May 1847 and infection rates dropped dramatically





# Change of paradigm

Relationship between patients-HCW and site of attention



# Health-care associated infections

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# NOSOHUSIAL

**HCAI** includes infections acquired in other healthcare settings, such as nursing homes, dialysis or outpatient clinics



# Superbug overtakes hospitals

## Sherbrooke hospital superbug killed 100

DILAPIDATED FACILITIES PARTLY TO BLAME  
Expert links epidemic of C. difficile to strain on health-care resources. "We didn't invest. We didn't modernize. We are paying the price."

ACTUALITES

## Bactérie C. difficile: Québec crée un comité d'experts

PASCALE BRETON

Après une opération au genou et un traitement aux antibiotiques, Susan McDougall a soudainement eu des poussées de fièvre et de la diarrhée. Deux symptômes de la bactérie *Clostridium difficile* qui auraient dû mettre la puce à l'oreille du personnel de l'hôpital.

Après six jours d'hospitalisation à l'Hôpital général juif de Montréal, M<sup>me</sup> McDougall a été envoyée dans un centre de réadap-

pital, mais ça n'a pas été détecté avant que je sois au centre de réadaptation. J'avais de la fièvre, de la diarrhée, mais jamais on ne m'a demandé si j'allais bien. Au début, je pensais que c'était normal, que c'était simplement une conséquence de l'opération et des antibiotiques », raconte M<sup>me</sup> McDougall.

Afin d'éviter la répétition d'un tel incident, le ministère de la Santé et des Services sociaux a mandaté un comité d'experts pour tenter de comprendre les

« Les moyens ne sont pas très compliqués, mais ils sont compliqués à mettre en place parce qu'ils touchent tout le monde. C'est d'abord l'hygiène. Les gens doivent apprendre à se laver les mains en passant d'un patient à l'autre », indique le Dr Michel A. Bureau, directeur général à la Direction des services de santé et de la médecine universitaire au ministère, en précisant que le personnel médical a encore du progrès à faire en cette matière.

tion des médecins microbiologistes infectiologues du Québec. Les patients eux-mêmes doivent être vigilants, principalement lorsqu'ils prennent des antibiotiques. « Le patient devrait toujours aviser son médecin lors d'apparition de diarrhée, de douleurs abdominales ou de hausses de température inexplicables. Ces symptômes peuvent survenir quelques semaines après l'arrêt des antibiotiques », précise le Dr Poirier.

La population ne doit pas dire pour autant de prendre des médicaments, mais « la d'antibiotiques devrait être justifiée. Il ne faut pas s'écarter de son médecin pour prendre des antibiotiques, celui-ci ne le recommanderait pas », affirme le Dr Poirier.

Depuis environ un an, le taux de Montréal font face à la recrudescence des cas d'infection. L'épidémie de cas, a décus en voyant de 2,

## Superbug death toll still rising

C. DIFFICILE  
Infections have increased by four

## Infections microbiennes préoccupantes

Une bactérie a causé plus de morts l'an dernier à Montréal que le SRAS à Toronto

PASCALE BRETON

Plus de patients sont morts à Montréal l'an dernier d'une infection contractée à l'hôpital que dans l'épidémie de SRAS qui a frappé Toronto.

Publiée dans le *Journal de l'Association médicale canadienne* (JAMC), une nouvelle étude recense le nombre de patients qui, lors d'un séjour à l'hôpital, ont contracté une infection à la bactérie *Clostridium difficile* (C. difficile),

qui s'attaque principalement au colon. En 2003 et au début de 2004, la bactérie a été détectée chez 1400 patients hospitalisés dans six établissements montréalais. De ce nombre, 79

personnes sont mortes. Comparativement, 44 personnes sont décédées en Ontario à la suite du syndrome respiratoire sévère aigu (SRAS).

» Voir INFECTIONS en A4

## Jumpy Montrealers avoiding hospitals

FEAR CONTRACTING BACTERIAL INFECTION

Patients seeking advice, simple reassurance in wake of 79 deaths linked to potent bug

AARON DERFEL  
GAZETTE HEALTH REPORTER

Hospitals across Montreal are fielding calls from anxious patients who are concerned about

catching an aggressive strain of intestinal bacteria blamed for the deaths of at least 79 people since last year.

Some Montrealers have decided to stay away from hospitals,

cancelling blood tests or appointments.

A 75-year-old heart patient called *The Gazette* yesterday to share his fears about the highly contagious bacterium, *Clostridium difficile*, which can cause repeated bouts of diarrhea and resist common antibiotics.

"If I go in as an in-patient, I'm worried that I could end up like the 79 that died," said the Côte

des Neiges pensioner, who didn't want his name published.

At the Jewish General Hospital, where 16 patients have died, the blood-test centre was eerily quiet at 9:15 a.m. A few patients sat in the waiting area. A woman who went there to have her blood drawn said the centre is usually packed at that hour.

Please see STRAIN, Page A5

## Superbug most lethal in 10 years — experts

APPEARS TO HAVE MUTATED 18 MONTHS AGO  
Microbiologists and physicians have been studying bug for six months to confirm it's a new strain originating in Montreal

AARON DERFEL  
GAZETTE HEALTH REPORTER

The virulent strain of *Clostridium difficile* that has killed at least 79 people in Montreal since last year is

A similar outbreak of C. difficile has struck hospitals in Calgary, where 50 people have died. In the U.S. midwest, doctors are reporting a surge in C. difficile infections and prescribing drugs.

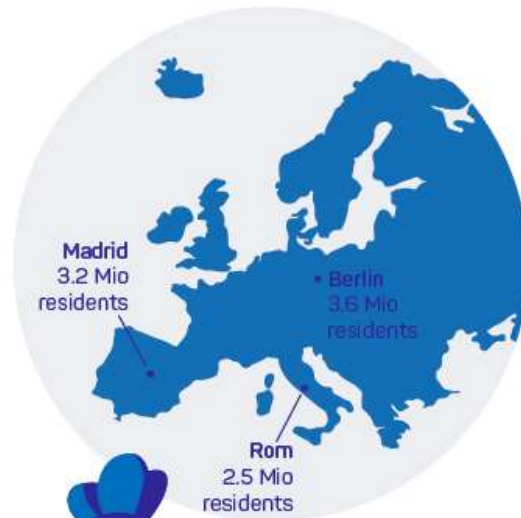


**What is its numerical significance and etiology?**

# Healthcare-associated Infections

**3.8 million**

HAIs in Europe per year

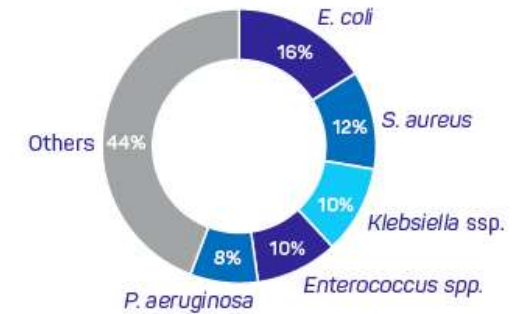


This costs per year  
**€ 7 billion**

The **5** most frequent  
**infections...**



... and the **5** most frequent  
**pathogens**



This calls for

**Basic Hygiene Measures**



Research for  
infection protection



- They affect around **4.1 million patients per year** in the EU,
- leading to a significant increase in morbidity, mortality, and costs.



Una cama de hospital vacía. Frankie Lessin - Flickr

INVESTIGACIÓN / MEDICINA PREVENTIVA

## Mueren más personas en Europa por infecciones en el hospital que por sida o tuberculosis

Un nuevo estudio ofrece una completa radiografía de este problema en la Unión Europea, que afecta a más de dos millones y medio de ciudadanos.

19 octubre, 2016 - 01:28

EN: ENFERMEDADES INFECCIOSAS HOSPITALES ENFERMEDADES HIGIENE

Antonio Villarreal ·

Cada año, 2.609.911 ciudadanos de la Unión Europea pillan una infección en el hospital, de los cuales 91.130 acaban muriendo. Los datos, provenientes de un nuevo estudio publicado en *PLOS Medicine*, avalan las cifras que adelantaba EL ESPAÑOL sobre infecciones hospitalarias en España.



# Nosocomial Infections

## A History of Hospital-Acquired Infections



Jia-Yia Liu, MD<sup>a,b,c,\*</sup>, Jana K. Dickter, MD<sup>d</sup>

1.700.000 infecciones nosocomiales  
90.000 muertes/year  
6ª causa de muerte en EE.UU.

> Que HIV+Cancer+Tráfico juntos

Haque M. Infect Drug Resist 2018;11:2321–33.  
Klevens RM. Public Health Rep 2007;122(2):160–6.

# Nosocomial infection: Cifras

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Entre 5 y 10% de todos los ingresados

88.000 muertes/year en los Estados Unidos (**mortality**)

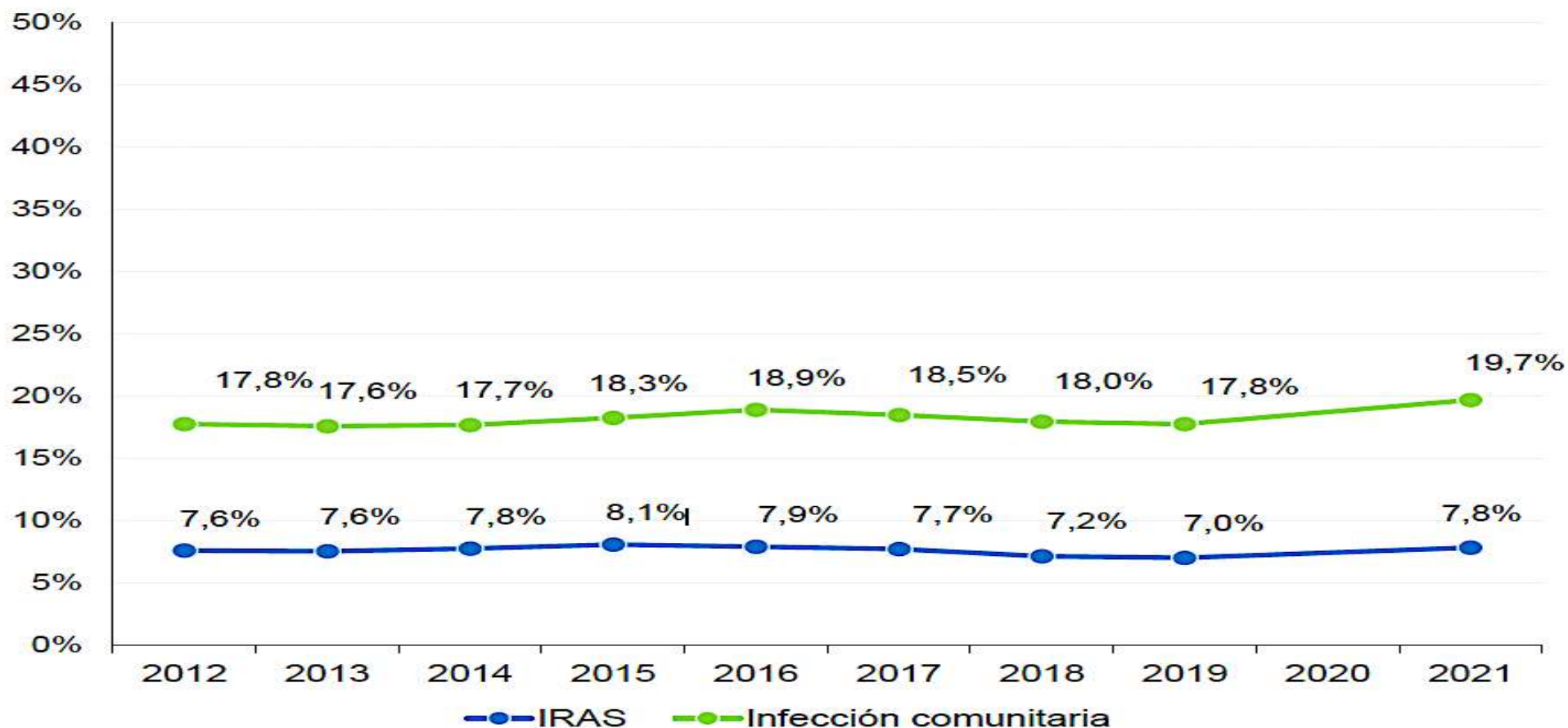
Retraso del alta hospitalaria (**morbilidad**)

Aumento consumo de antimicrobianos

Aumento de costes

Impertante parámetro de **calidad asistencial**

## Community acquired or nosocomial infection in 300 Spanish hospitals



23.24

2022

8.23

2022



# On any given day:



1 / 15

hospital patients have at least one HAI.

98 000

patients have at least one HAI.



1 / 26

long-term care facilities residents have at least one HAI.

130 000

residents have at least one HAI.

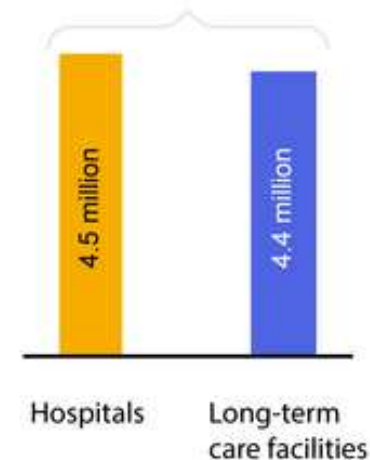
## Facts

A total of 8.9 million HAIs were estimated to occur each year in European hospitals and long-term care facilities combined.

HAIs in hospitals (for example pneumonia, surgical site infections and bloodstream infections, are usually more severe than HAIs in long-term care facilities (for example respiratory infections other than pneumonia, urinary tract infections and skin and soft issue infections).

More than half of certain HAIs are considered preventable.

8.9 million HAIs occur



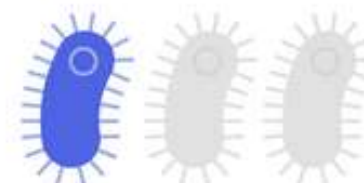
### Microbiological samples

HAIs are frequently treated without taking microbiological samples or samples remain negative.



### Microorganisms

The responsible microorganism was identified in 53% of HAIs in hospitals and only in 19% of HAIs in long-term care facilities.



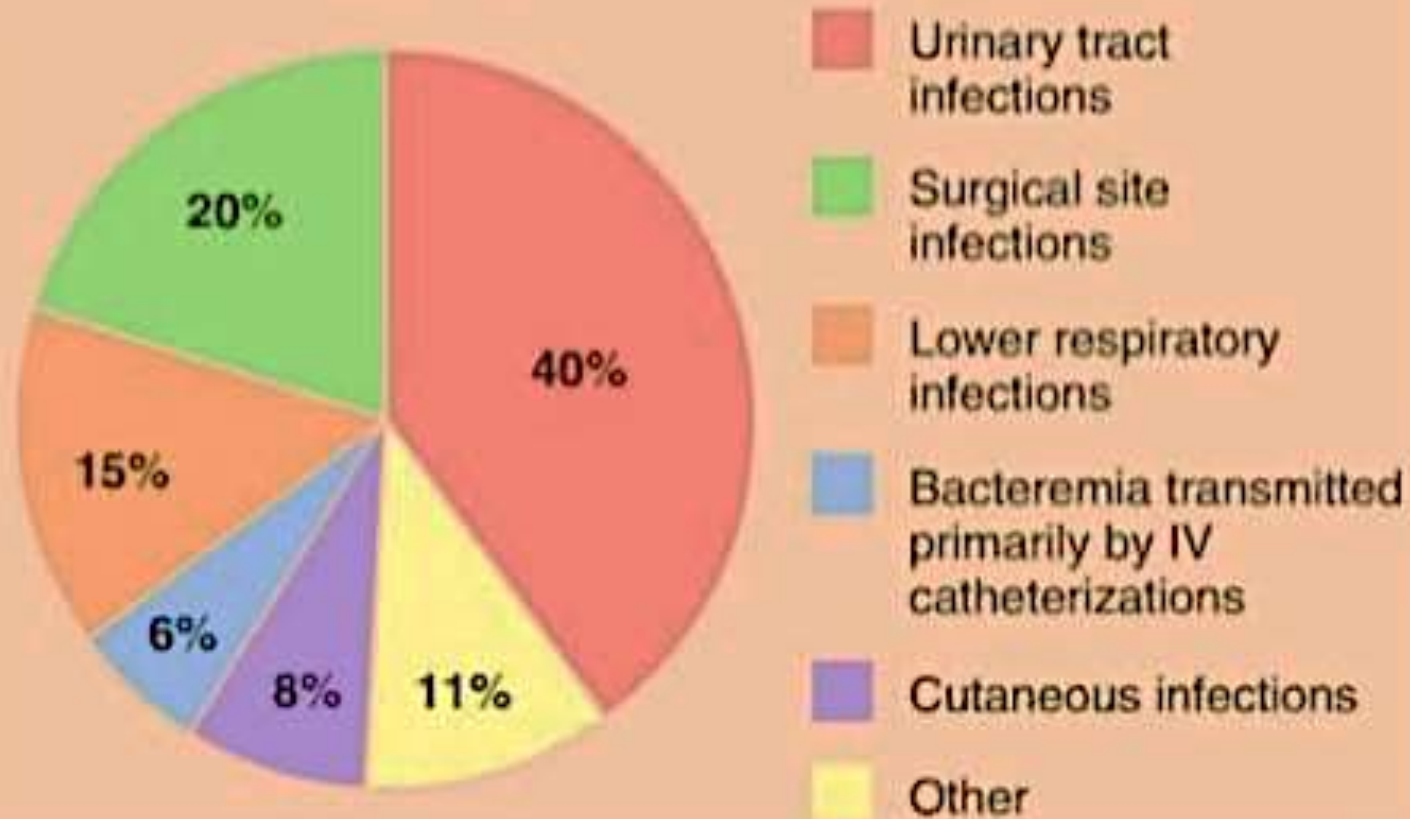
### Resistance to antibiotics

1 in 3 bacteria associated with HAIs, both in hospitals and in long-term care facilities, was resistant to antibiotics.

**¿Which are the most important nosocomial infections?**

## Nosocomial infections: most common sites

Source: Data from CDC, National Nosocomial Infection Surveillance.





Catheter-related UTI

Nosocomial bloodstream infection (iv catheter-related)

Surgical site infection

Hospital acquired pneumonia

Hospital acquired diarrhea

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<b>Incidence or prevalence figures</b>	
<b>Strength of the data</b>	
<b>Evolution last 10 years</b>	
<b>Mortality</b>	
<b>Cost</b>	
<b>Impact of COVID-19 pandemic</b>	
<b>Measurement parameters</b>	

## **Indwelling bladder catheter-related UTI**



# Nosocomial UTI

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UTIs are the most common NI (CDC and WHO)

75% of HCAs

Instrumentation of urinary tracts with urethral or suprapubic catheters

CDC. (CAUTI). 2015. Available at: [https://www.cdc.gov/hai/ca\\_uti/uti.html](https://www.cdc.gov/hai/ca_uti/uti.html). Accessed September 18, 2019.  
Iacovelli V, Urologia 2014;81(4):222–7.



# UTI

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Indwelling bladder  
catheters  
10-15% hospital pts

Urinary catheter 15% in the hospital

Advanced age

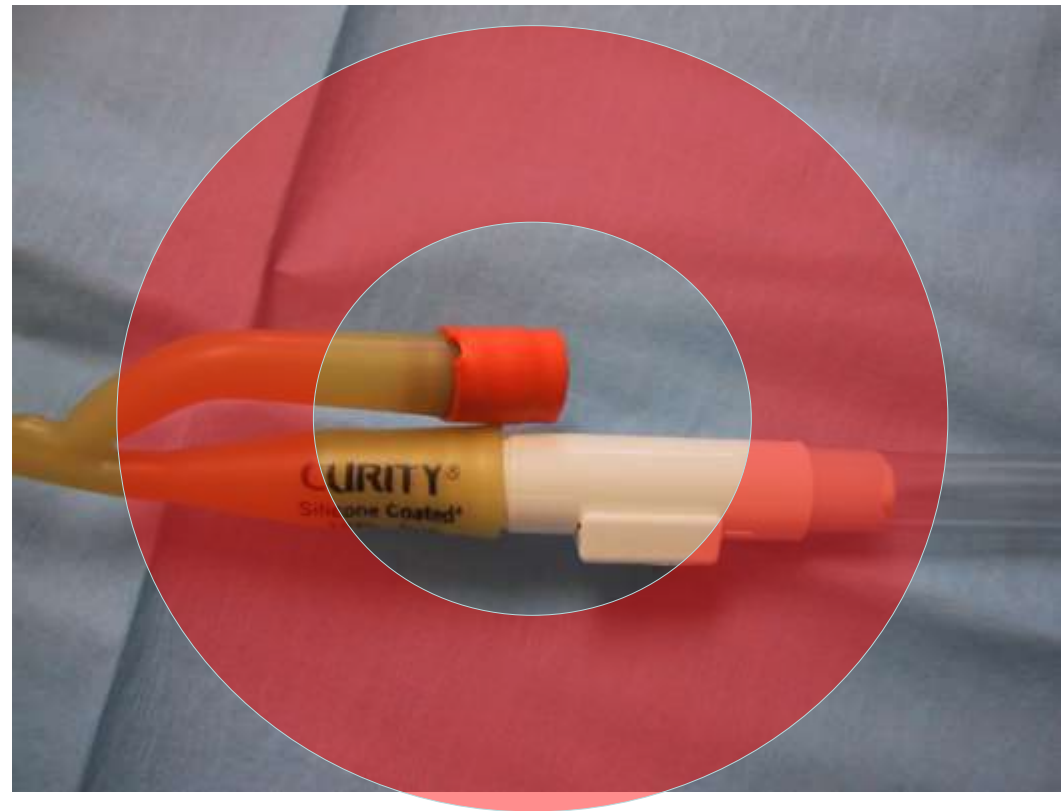
Women

Instrumentation/Surgery

UTI in 5-25% of patients with catheter (2-4% bacteremia)

**INFECTION: 10% PER DAY OF CATHETERIZATION**

5.3 UTI/1,000 catheter days

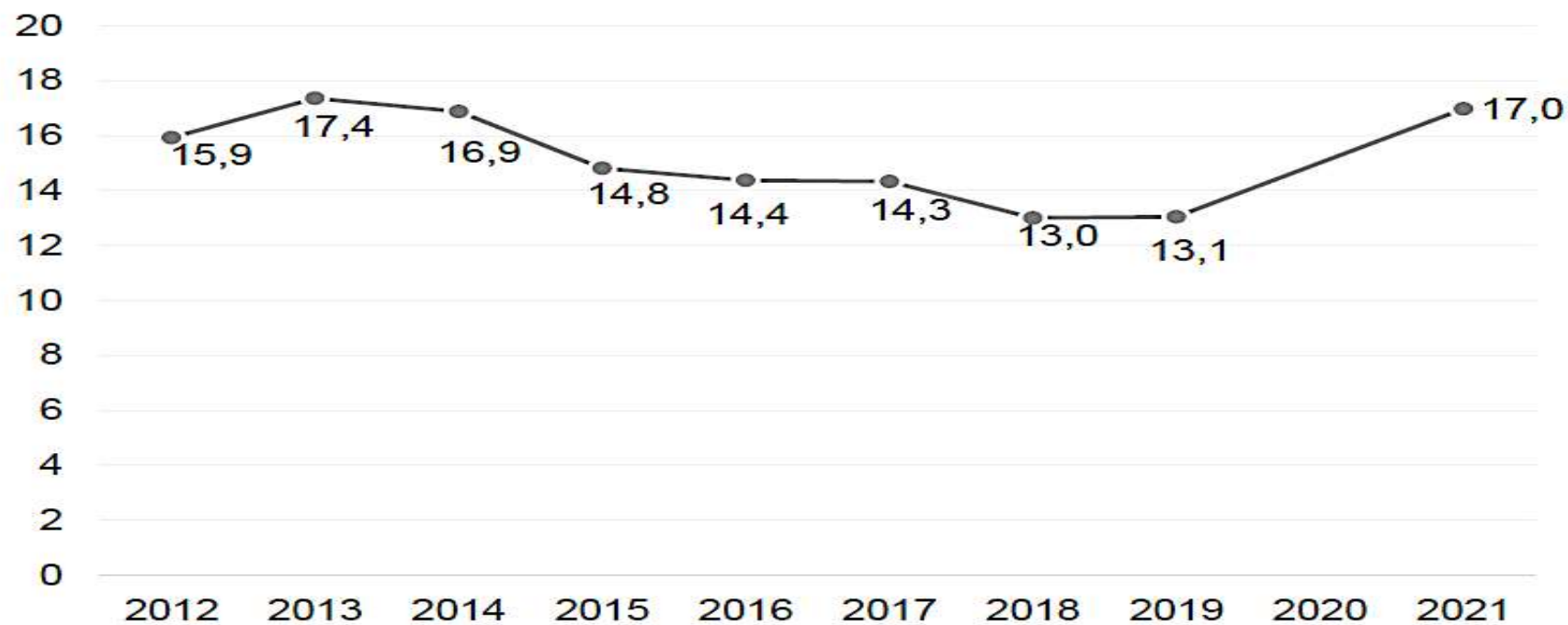


# CAUTI

Incidence	3% of pts with indwelling bladder catheter 3.97 episodes/1,000 admissions 5.28 episodes/1,000 catheter-days catéter 9.86 episodes/1,000 catheter-days (Japón)
Strength of the data	Weak
Evolution last 10 years	Reduction in adults and in ICU
Mortality	8-10%
Cost	~ 1,000 \$ per episode Cost reduction (288 000-392 000 \$), after interventions
Impact of COVID-19 pandemia	Questionable increase during the pandemic
Measurement parameters	CAUTI/1,000 admissions or CAUTI/10,000 days

# UTIs

Prevalence of HA.UTI acquired in the own center (0/00). EPINE 2012-21



18.65

2022

**Endovascular infection. Bacteremia. Fungemia.  
Infective endocarditis**

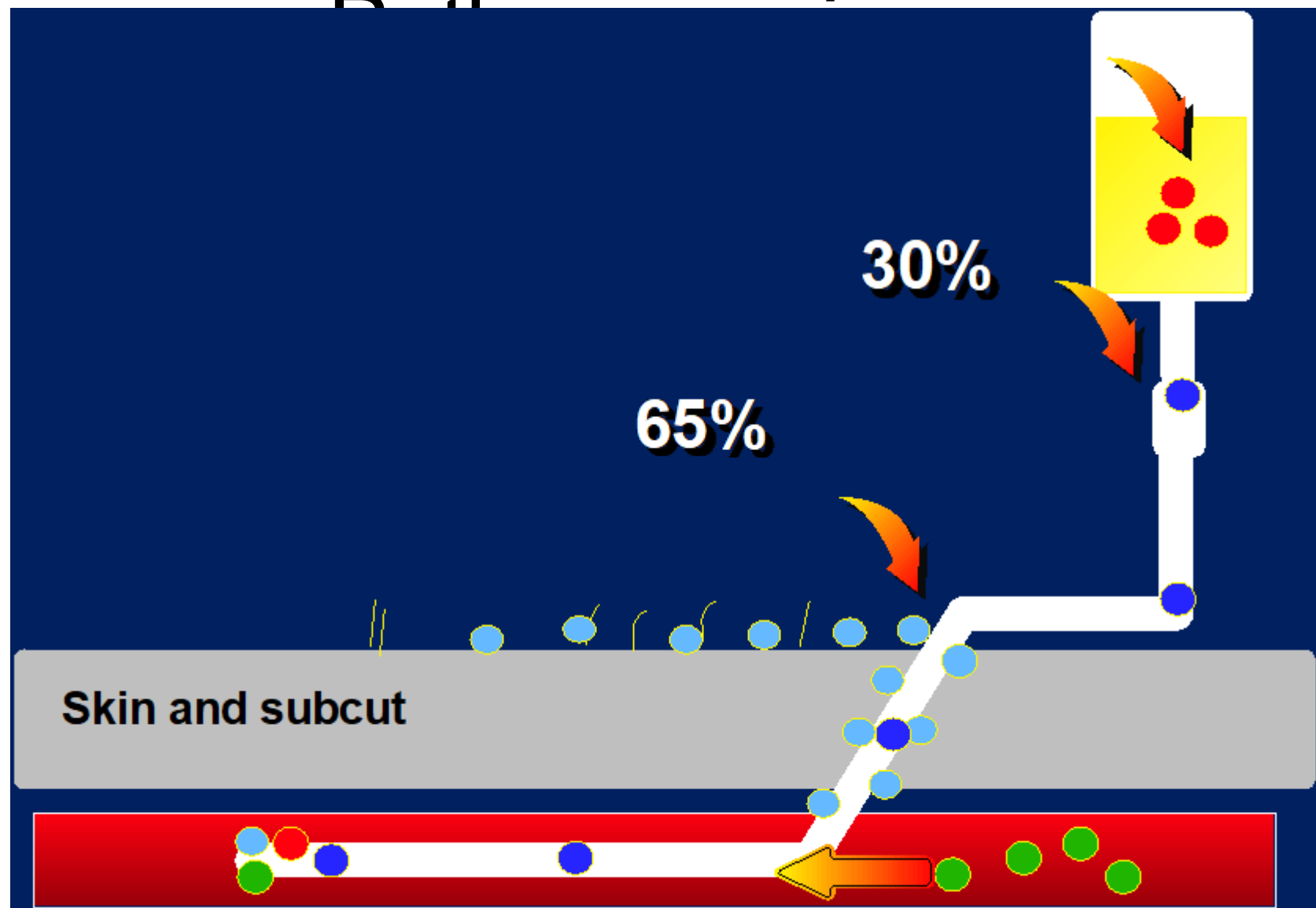


# Nosocomial infection: CR-BSI

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Intravenous catheters 15%





# Central and peripheral catheters

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10%



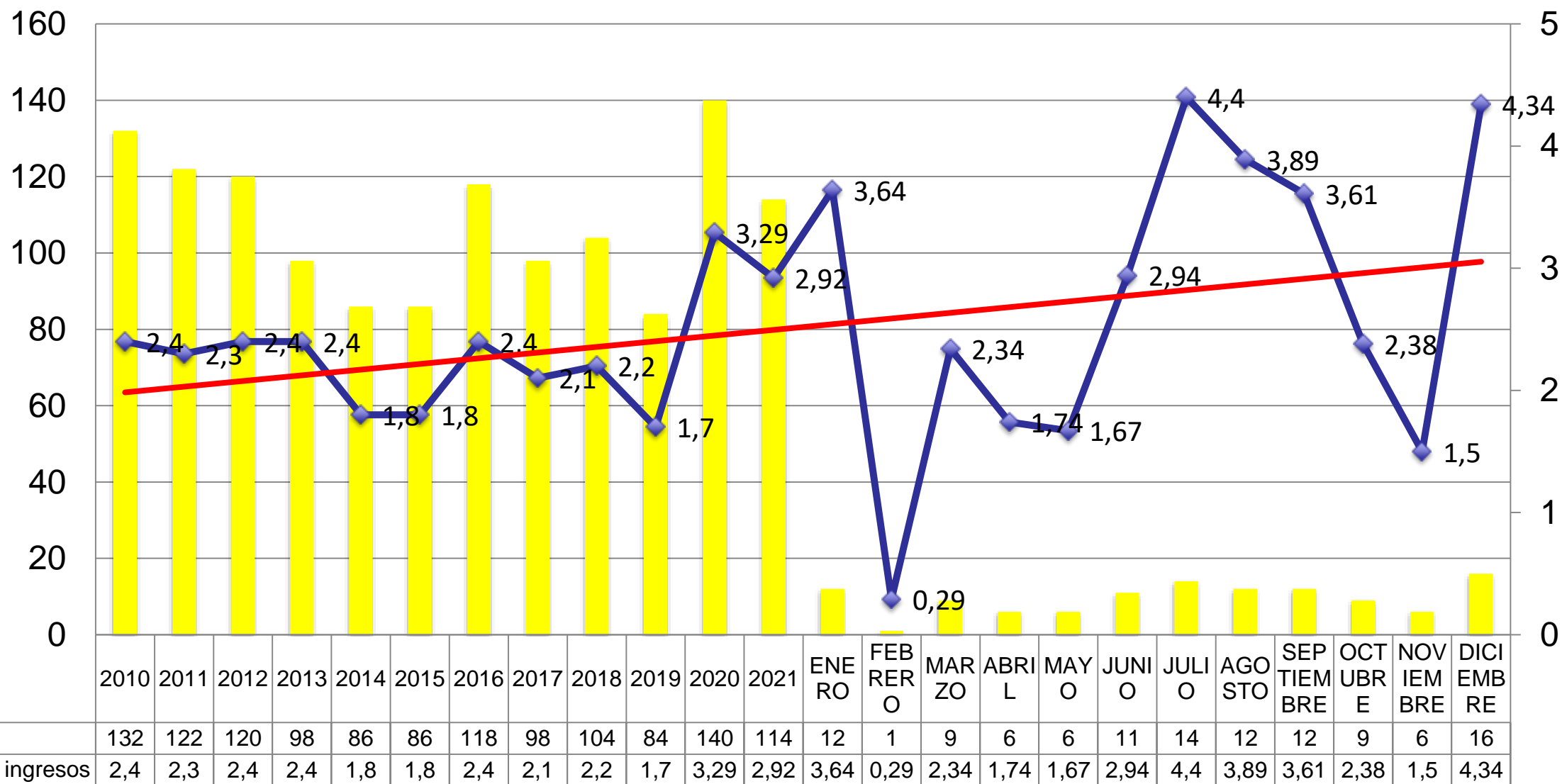
73%

# Bacteriemia/fungemia Relacionada con el Catéter (CR-BSI)

Incidence	<b>1.9 - 2.3/1,000 admissions</b> <b>7-10% of all BSIs</b>
Strength of the data	<b>Weak</b>
Evolution last 10 years	<b>Stable or reduction</b>
Mortality	<b>14% (17.9% to 10.6%)</b>
Cost	<b>\$33,000 - \$75,000 . Approximately 18.000 € in Spain(?)</b>
Impact of COVID-19 pandemia	<b>Clear increase</b>
Measurement parameters	<b>CLABSI/1,000 cath-days or CR-BSI/1,000 admissions</b>



# Episodes of CR-BSI



# Catheter-related infections



Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

Journal of Hospital Infection

journal homepage: [www.elsevier.com/locate/jhin](http://www.elsevier.com/locate/jhin)



## Increase in the frequency of catheter-related bloodstream infections during the COVID-19 pandemic: a plea for control

M.J. Pérez-Granda<sup>a,b,c,d,\*</sup>, C.S. Carrillo<sup>a</sup>, P.M. Rabadán<sup>a</sup>, M. Valerio<sup>a</sup>,  
M. Olmedo<sup>a</sup>, P. Muñoz<sup>a,b,c,e</sup>, E. Bouza<sup>a,b,c,e</sup>

Pre Pandemic (2019) 1.9 episodes/1,000 admissions  
Pandemic (2020) 5.5 episodes /1,000 admissions; P<0.001.

CR-BSI: Cost HGUGM

Cost per episode: 18,078 Euros

	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
CR-BSI episodes	122	120	98	86	86	118	98	104	84	140	114	114
CR-BSI/1000 adm	2,3	2,4	2,0	1,8	1,8	2,4	2,0	2,2	1,78	3,29	2,92	2,69
Stimulated cost	2.205.516	2.169.360	1.771.644	1.554.708	1.554.708	2.133.204	1.771.644	1.880.112	1.518.552	2.530.920	2.060.892	2.060.892

Difference 2021/2022: 0 Euros

# Bacteremias/Fungemias

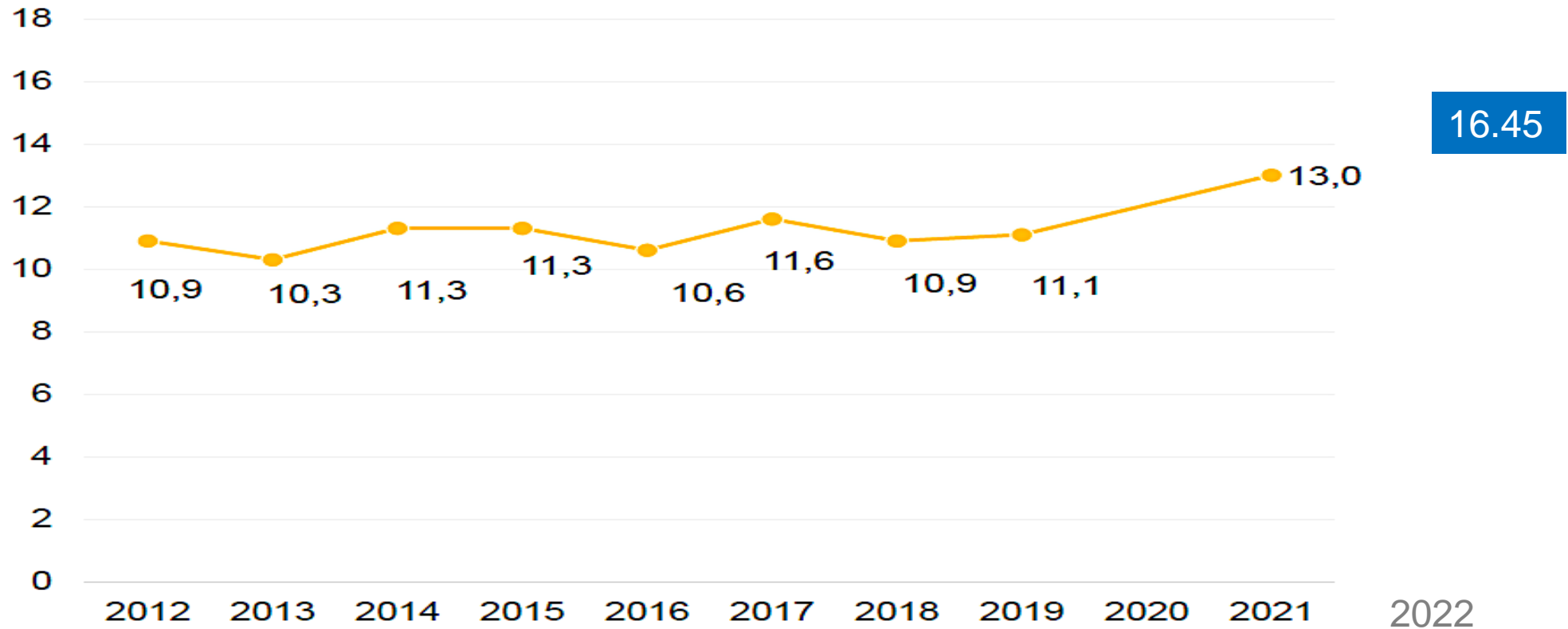


Incidence	101 to 309 episodes/100,000/year 1.3 to 31.4 episodes /1,000 admissions
Strength of the data	Weak
Evolution last 10 years	Stable. No clear proof of incidence changes No proof of changes in the mortality
Mortality	21-32 muertes/100.000 inhabitants/year 13-20% mortality
Cost	6.000-30.000 € per episode
Impact of COVID-19 pandemia	Increase from 1.89 to 5.53 CR-BSI/1,000 admissions
Measurement parameters	BSI episodes/1,000 admissions BSI/100,000 population



# Bacteremias

Prevalence of pts with bacteremia and CRI acquired in the own center (‰).  
EPINE 2012-21



# NOSOCOMIAL + EI-RAS Endocarditis

	ICE-PS	Giannitsioti et al	Fdez-Hidalgo et al	Lomas
Catheter origin	56.9%	31%	39.8%	48%
Peripheral catheter	32.1%	23%	39.4%	32.8%
Etiology				
<i>S. aureus</i>	45%	12%	33%	31%
<i>Enterococcus</i> spp.	15%	31%	22.9%	17%
CNS	13%	26%	21.7%	28%
MRSA	47%	29.5%	28.6%	30.7%
LVF	37%	33%	47%	32%
Surgery	41%	18%	22.9%	40.2%
Inhospital mortality	25%	39.5%	45.8%	44.9%
Death risks	-	LVF, PVE	ACVA, CF, No surgery	Shock, No surgery

# Nosocomial pneumonia

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# Hospital Acquired Pneumonia



National study in Portugal - 5 years

100 hospitals

28,632 episodes of NN

Incidence 0.95/100 admissions.

Length hospital stay (median 26.4 days)

Mortality (33.6%).

Needed mechanical ventilation 18.8%





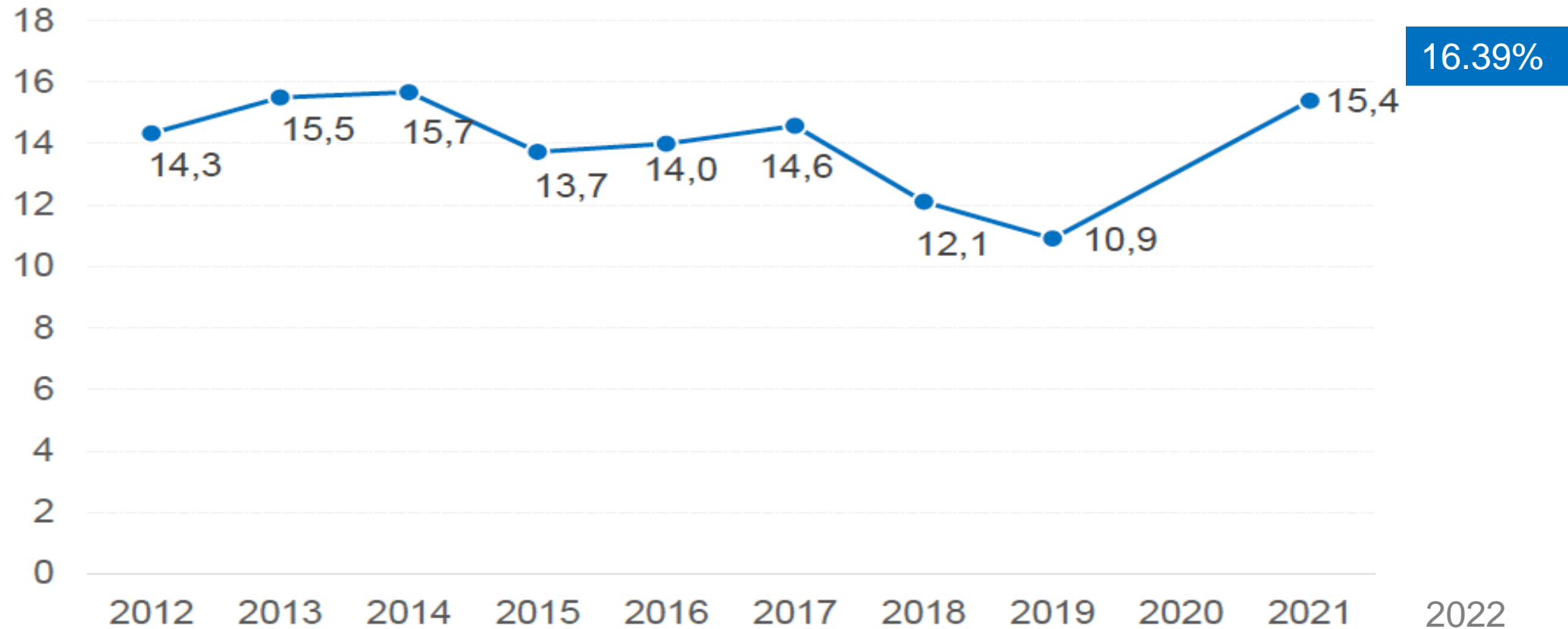
# Hospital Acquired Pneumonia (HAI)



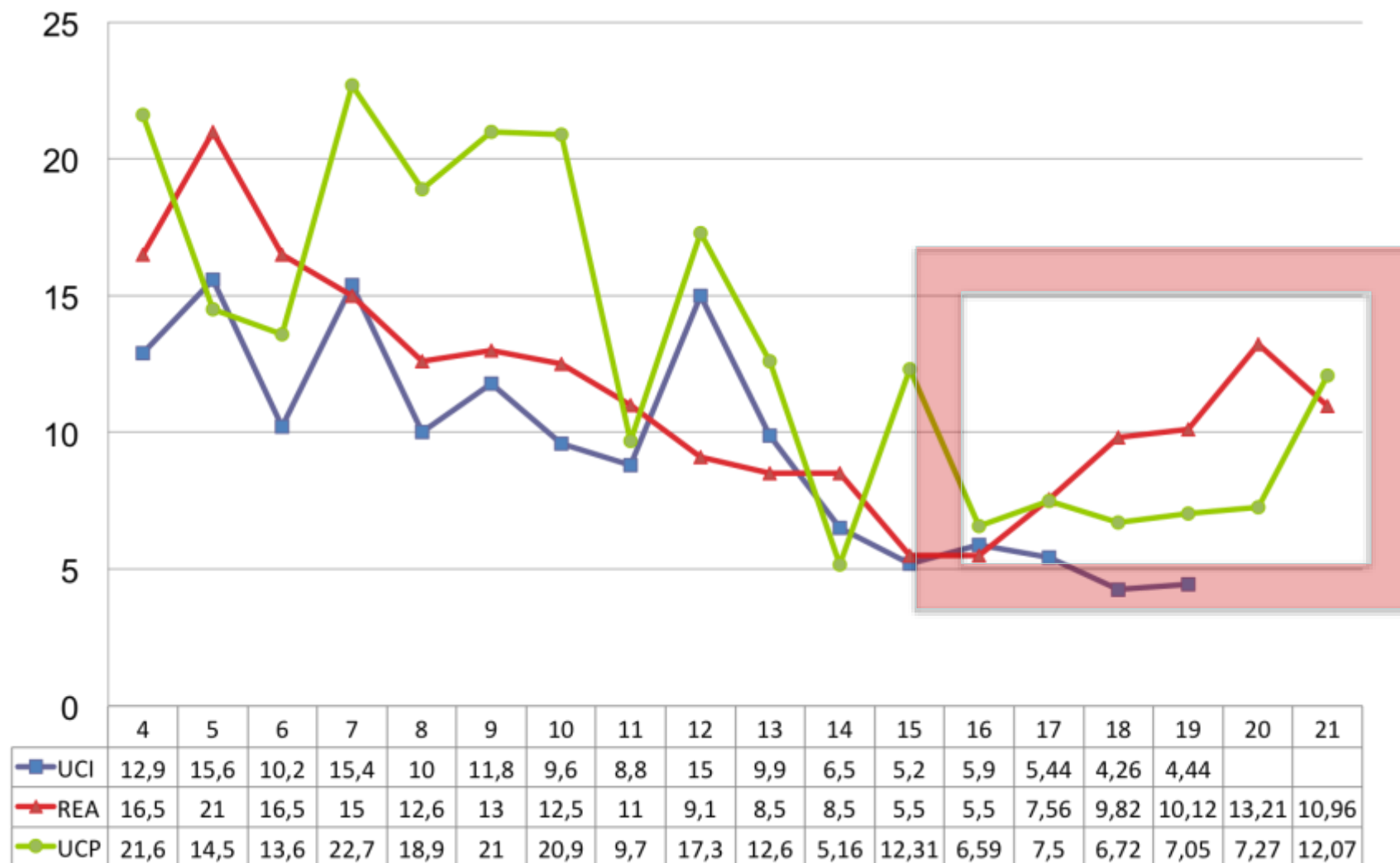
Incidence	<b>Approximately 1% of all hospital admissions 2,63/1,000 hospital days</b>
Strength of the data	<b>Weak</b>
Evolution last 10 years	<b>Reduction in the incidence (VAP)</b>
Mortality	<b>20.7 to 33%.</b>
Cost	<b>49,000 \$</b>
Impact of COVID-19 pandemia	<b>More pts with VAP among COVID-ARDS vs Non COVID-ARDS</b>
Measurement parameters	<b>Incidence density: VAP episodes/10,000 days of VM</b>

# IRAS Respiratorias

Prevalence of pts with respiratory tract infections acquired in the home center (‰).  
EPINE 2012-21



# Incidence Density. VAP. Gregorio Marañón Hospital



# Nonventilator hospital-acquired pneumonia

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Incidence, mortality, and cost trends in nonventilator hospital-acquired pneumonia in medicaid beneficiaries, 2015–2019

Incidence 1.34% hospital patients

2.63/1,000 hospital days

Mortality 7.76%



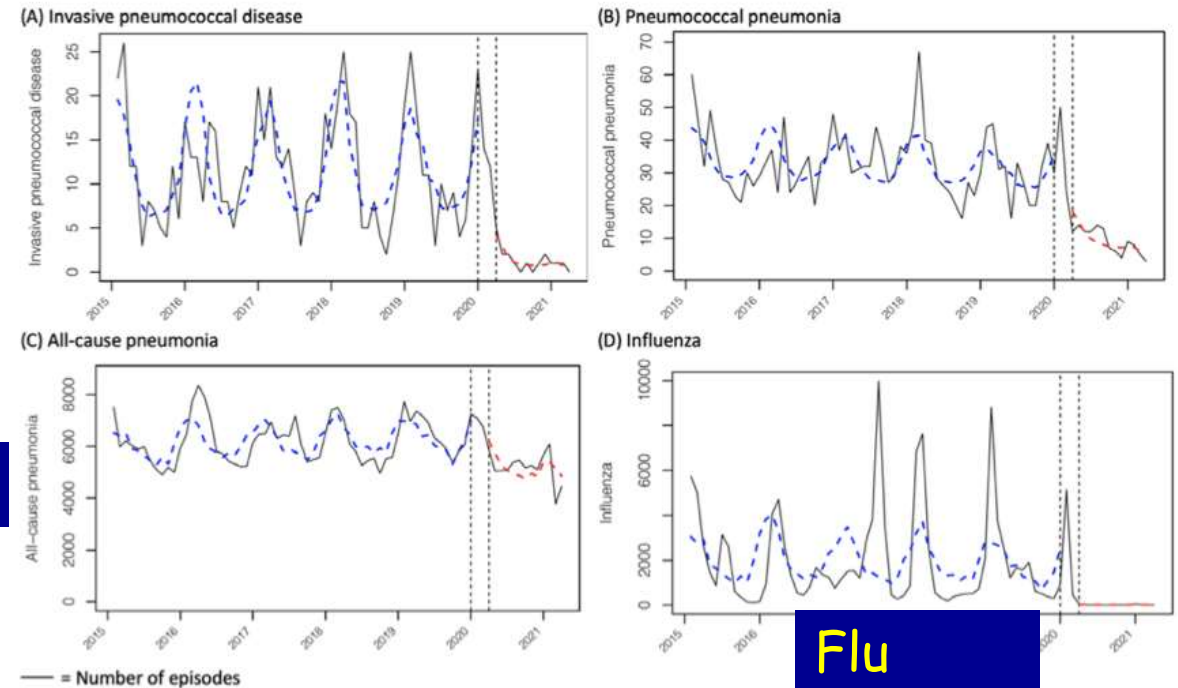
# All cause pneumonia during COVID-19:

**BMJ Open Invasive pneumococcal disease, pneumococcal pneumonia and all-cause pneumonia in Hong Kong during the COVID-19 pandemic compared with the preceding 5 years: a retrospective observational study**

**Pneumococcal**

**All causes**

**Invasive pneumococcal**

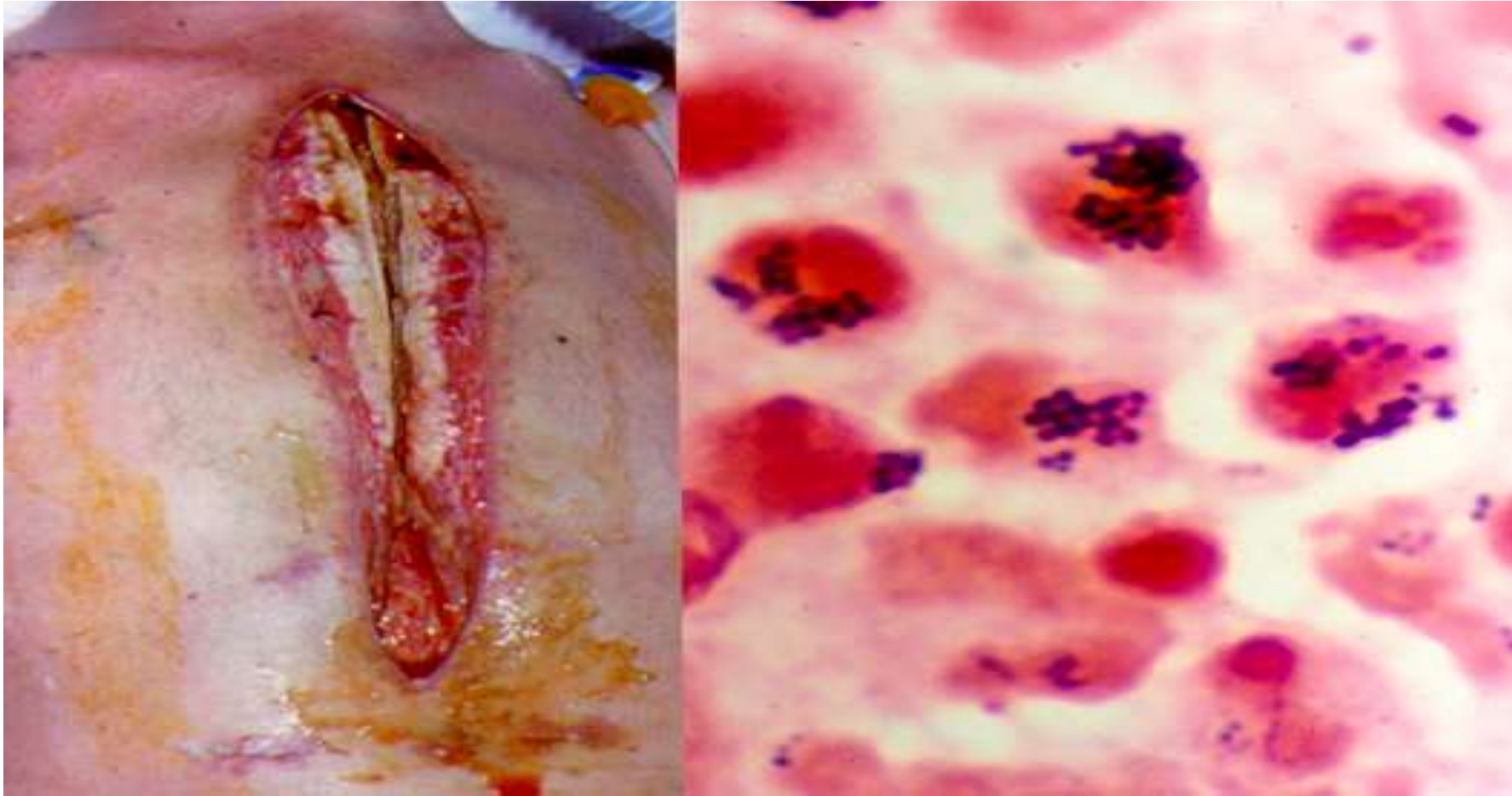


**Flu**

# Surgical site infection (SSI)

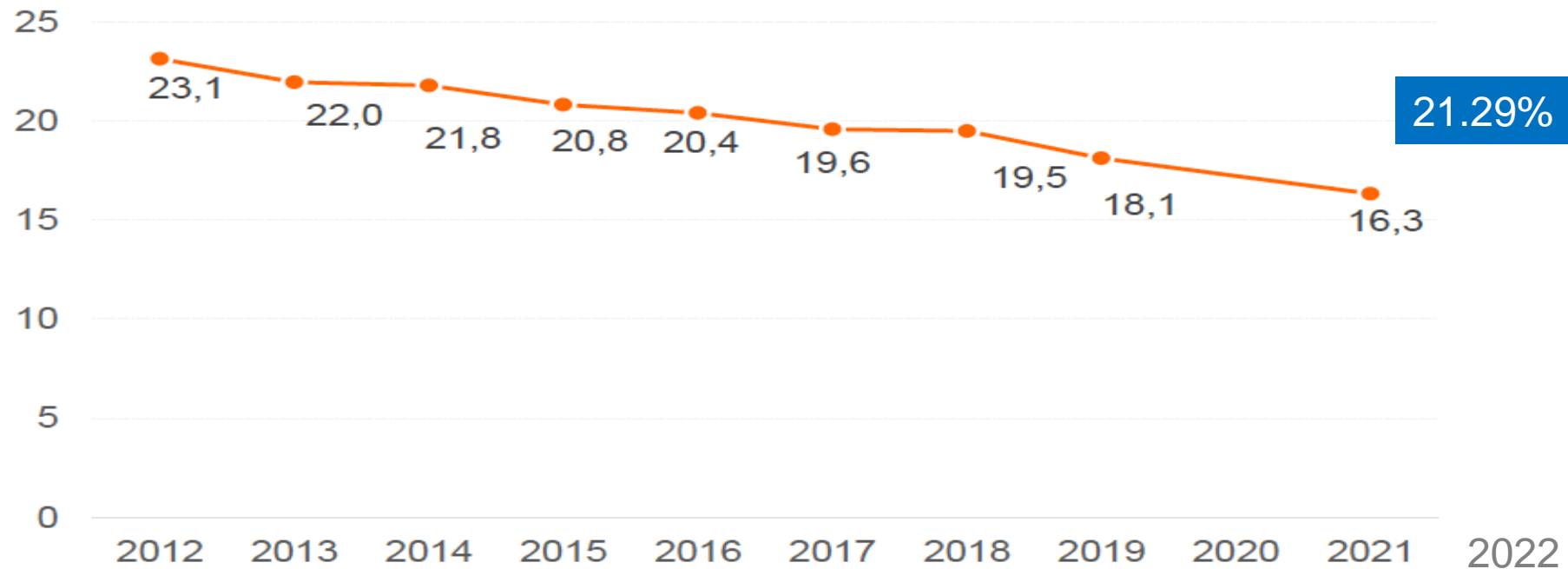
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26% of Nosocomial infections



# Surgical site infections

Prevalence of pts with surgical site infections acquired in the home center (‰).  
EPINE 2012-21



# Surgical site infections



Incidence	<p><b>0.5% to 10.1%</b> [Prevalence ECDC] Annual Report 2017 47% superficial, 30% Deep, 22% Organ/space</p> <p><b>8%</b> Studio di Prevalenza Italiano Sulle Infezioni Correlate All'assistenza e Sull'uso di Antibiotici Negli Ospedali per Acuti—Protocollo ECDC; Università di Torino (2018).</p> <p><b>6.5%</b> (Incidence). Wan Y. Br.J.Surg 2021</p>
Strength of the data	Weak
Evolution last 10 years	SSI rate reduced in one French Study: <b>3.0%</b> in 2003 to <b>1.1%</b> in 2016 Bataille C. J.Hosp.Infect. 2019
Mortality	<p><b>3.4%</b> related mortality Wan Y. Br.J.Surg 2021.</p> <p>99 deaths among 44 814 Pts</p>
Cost	Direct/Indirect. Frequently unknown or imprecise. Significant increase of cost
Impact of COVID-19 pandemia	No clear increase during the pandemic

# Surgical site infections: Impact of the pandemic



SURGICAL INFECTIONS  
Volume 23, Number 5, 2022  
© Mary Ann Liebert, Inc.  
DOI: 10.1089/sur.2022.012

Open camera or QR reader and  
scan code to access this article  
and other resources online.



Effect of the COVID-19 Pandemic on Rates of Ninety-Day  
Peri-Prosthetic Joint and Surgical Site Infections after Primary  
Total Joint Arthroplasty: A Multicenter, Retrospective Study

**No substantial  
differences (0.35% vs  
0.26%;  $p = 0.303$ )**

Tyler Humphrey,<sup>1,2</sup> Hayley Daniell,<sup>1</sup> Antonia F. Chen,<sup>3</sup> Brian Hollenbeck,<sup>4</sup> Carl Talmo,<sup>5</sup> Christopher J. Fang,<sup>4</sup>  
Eric L. Smith,<sup>5</sup> Ruijia Niu,<sup>5</sup> Christopher M. Melnic,<sup>1,2</sup> Shayan Hosseinzadeh,<sup>1</sup> and Hany S. Bedair<sup>1,2</sup>

**Multicentric, retrospective study. USA**  
**3 years pre and during the pandemic**  
**14,844 TJAs in the pre-COVID-19**  
**5,453 TJAs in the COVID-19 pandemic cohort**



# ESTUDIO EPINE-EPPS n° 32: 2022

## 4.1.1 Localización de las infecciones por grupos: prevalencia de infecciones por pacientes y distribución por infecciones

Localización infección (grupo)	IRAS				Infección comunitarias			
	Nº pac	% Prev	Nº infec	% Rel	Nº pac	% Prev	Nº infec	% Rel
COVID-19	668	1,16	668	12,60	3441	5,99	3441	23,23
Urinarias	888	1,55	888	16,75	2583	4,50	2583	17,44
Quirúrgicas	1123	1,95	1129	21,29	0	0,00	0	0,00
Respiratorias	864	1,50	869	16,39	3349	5,83	3358	22,67
Bacteriemias e IAC	737	1,28	747	14,09	871	1,52	873	5,89
Otras localizaciones	976	1,70	1002	18,89	4453	7,75	4556	30,76
<b>Total</b>	<b>4728</b>	<b>8,23</b>	<b>5303</b>	<b>100,00</b>	<b>13355</b>	<b>23,24</b>	<b>14811</b>	<b>100,00</b>

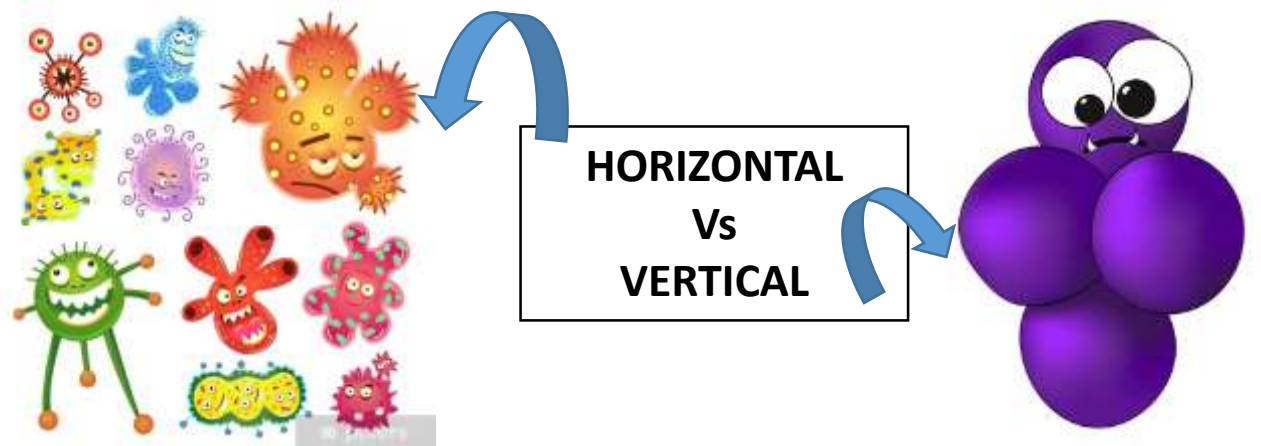


# Consequences of surgical site infections

- Spain: 4.7 million people surgery/year
- 1-10% SSI → **47,000-470,000 persons/year**
- ↑ 2-11 mortality risk
- ↑ 7-10 days hospital stay
- Cost 9,000-18,000 E per episode
- **Preventable in at least 60%**



# Bundles



Pre-Sx

Intra-Sx

Post-Sx

## Non modifiable

Type of surgery  
Urgency  
Duration

## Modifiable

"CATS" + antisepsia and  
decolonization



## Modifiable

“CATS” +  
antisepsia and  
decolonization



**C**ut hair

**A**ntibiotic prophylaxis

**T**emperature

**S**ugar



# Programa de Reducción de la Infección Quirúrgica del Observatorio de Infección en Cirugía. Documento de priorización y consenso Delphi de recomendaciones para la prevención de la infección de localización quirúrgica.



Programa de  
Reducción de  
Infección  
Quirúrgica

Método de consenso Delphi modificado

40 medidas de prevención de ILQ  
revisadas

73 Redactores

53 recomendaciones emitidas

10 recomendaciones priorizadas

1 bundle general de prevención

3 bundles específicos



4 CHECK-LISTS



## 17 Sociedades Científicas

AEC	Asociación Española de Cirujanos
AACP	Asociación Española de Coloproctología
AEEQ	Asociación Española de Enfermería Quirúrgica
AEU	Asociación Española de Urología
SEDAR	Sociedad Española de Anestesiología, Reanimación y Terapéutica del Dolor
SEACV	Sociedad Española de Angiología y Cirugía Vascular
SECCE	Sociedad Española de Cirugía Cardiovascular y Endovascular
SECO	Sociedad Española de Cirugía de la Obesidad y Enfermedades Metabólicas
SECOM-CyC	Sociedad Española de Cirugía Oral y Maxilofacial y de Cabeza y Cuello
SECOT	Sociedad Española de Cirugía Ortopédica y Traumatología
SECP	Sociedad Española de Cirugía Pediátrica
SECPRE	Sociedad Española de Cirugía Plástica Reparadora y Estética
SEIMC	Sociedad Española de Enfermedades Infecciosas y Microbiología Clínica
SEIQ	Sociedad Española de Investigaciones Quirúrgicas
SEMPSPGS	Sociedad Española de Medicina Preventiva, Salud Pública y Gestión Sanitaria
SENEC	Sociedad Española de Neurocirugía
SEOQ	Sociedad Española de Oncología Quirúrgica

PRIQ-O: Programa de Reducción de la Infección Quirúrgica del Observatorio de Infección en Cirugía  
ILQ: Infección de Localización Quirúrgica; OIC: Observatorio de Infección en Cirugía

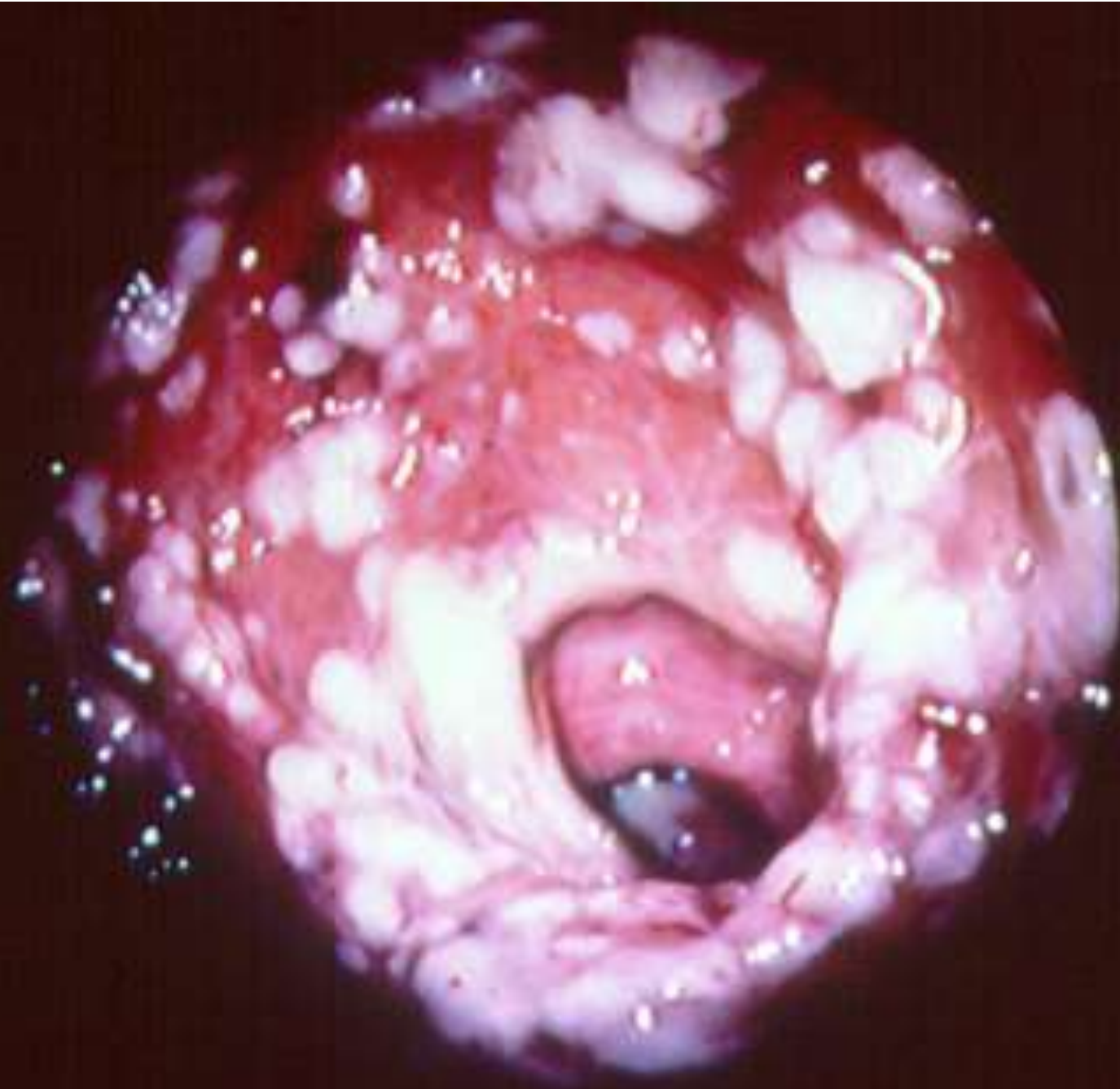
. et al. Cir Esp 2022

<https://oincir.org/>

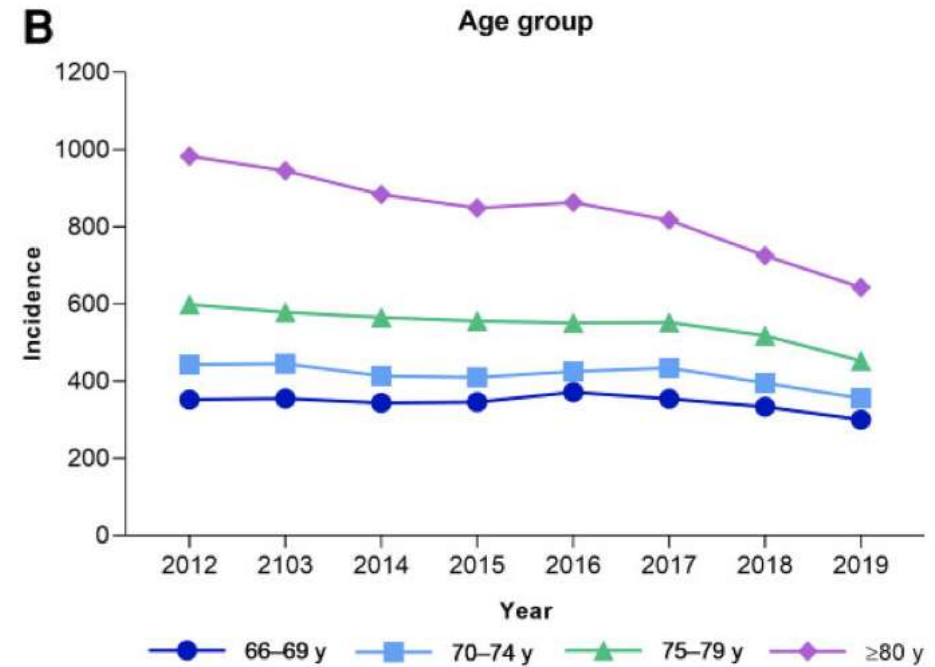
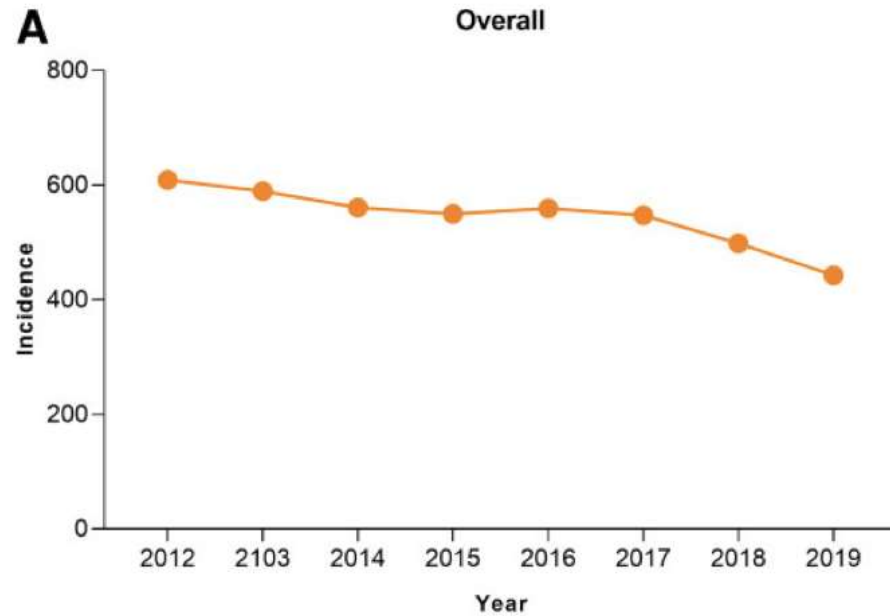
CIRUGÍA  
ESPAÑOLA



**Hospital acquired diarrhea - *C. difficile* infection**



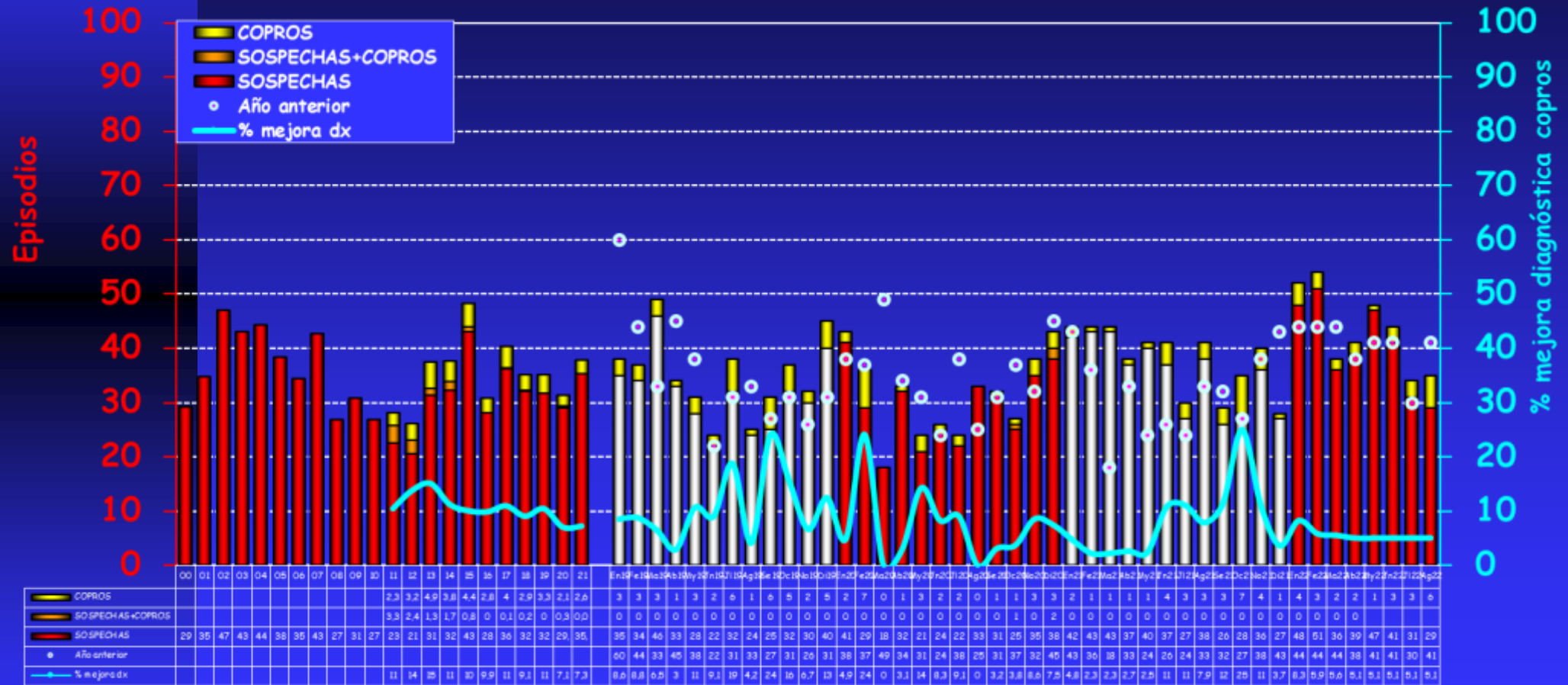
# CDI: incidence





# *Clostridium difficile* toxigénico

## Monthly episodes HGUGM (>2 years)



# *Clostridioides difficile* infections (CDI)

Incidence	6-7 episodes /10,000 hospital days
Strength of the data	Weak
Evolution last 10 years	Reduction
Mortality	1.5- 7.9%
Cost	13.476 € per episode. Increase up to 18 days of LOS
Impact of COVID-19 pandemia	Overall reduction. Increase in COVID-19 +
Incidence	Hospital Onset CDI (HO-CDI) CDI/10.000 stays





# *Clostridioides difficile* infection epidemiology and clinical characteristics in COVID-19 pandemic

Silvia Vázquez-Cuesta<sup>1,2,3</sup>, María Olmedo<sup>1,2</sup>,  
Elena Reigadas<sup>1,2,4,5\*</sup>, Luis Alcalá<sup>1,2,6</sup>, Mercedes Marín<sup>1,2,4,6</sup>,  
Patricia Muñoz<sup>1,2,4,6</sup> and Emilio Bouza<sup>1,2,4,5,6</sup>

Overall reduction of infection rate  
Increase in COVID-19 outcomes

# *Clostridioides difficile* infections: Cost of recurrences



Official journal  
of the Spanish Society  
of Chemotherapy

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Original

Revista Española de Quimioterapia  
doi:10.37201/req/135.2020

Emilio Bouza<sup>1</sup>  
Javier Cobo<sup>2</sup>  
M<sup>a</sup> Jesús Rodríguez-  
Hernández<sup>3</sup>  
Miguel Salavert<sup>4</sup>  
Juan P. Horcajada<sup>5</sup>

Economic burden of recurrent *Clostridioides difficile* infection in adults admitted to Spanish hospitals. A multicentre retrospective observational study

**Mean hospital stay (SD) 17.18 days**

**Isolation for a mean of 10.30 days.**

**Mean cost per episode €10,877 (9,499-12,777)**

**What microorganisms cause it?**

# Nosocomial infection: Microorganisms

---

Prions

Viruses

Influenza/Hepatitis

Bacteria

E.S.K.A.P.E.

Gram Positive

Gram Negative

MultiResistents

Fungi

Aspergillus, Candida

Parasites

Scabies

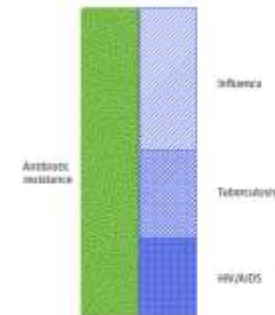
# Antimicrobial resistance



## Antibiotic resistance – an increasing threat to human health

Antibiotic resistance is the ability of bacteria to combat the action of one or antibiotics. Humans and animals do not become resistant to antibiotics, but bacteria carried by humans and animals can.

The burden of infections with bacteria resistant to antibiotics in the European population is comparable to that of influenza, tuberculosis and HIV/AIDS combined.

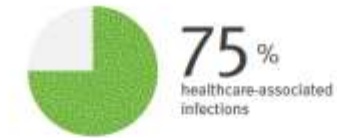


### Last-line antibiotics

50% of the burden is caused by infections with bacteria resistant to last-line antibiotics such as carbapenems and colistin – the last treatment option available.

33000 deaths

Each year, 33000 people die from an infection due to bacteria resistant to antibiotics. This is comparable to the total number of passengers of more than 100 medium sized airplanes.



75% of the burden of bacteria resistant to antibiotics in Europe is due to healthcare-associated infections. This could be minimised through adequate infection prevention and control measures, as well as antibiotic stewardship in health care settings.

### Solutions

There is still time to turn the tide of antibiotic resistance and ensure that antibiotics remain effective in the future by:



Using antibiotics prudently and only when they are necessary.



Implementing good infection prevention and control practices, including hand hygiene as well as screening for carriage of infection with multidrug-resistant bacteria and isolation of carriers/infected patients.



Promoting research and development of new antibiotics with novel mechanisms of action.

### Increasing burden

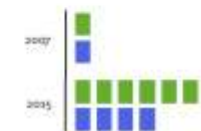
Between 2007 and 2015, the burden of each of the six antibiotic-resistant bacteria under study has increased in particular for *Klebsiella pneumoniae* and *Escherichia coli*.

#### *Klebsiella pneumoniae*

The number of deaths attributable to infections with *Klebsiella pneumoniae* resistant to carbapenems – a group of last-line antibiotics – increased six-fold.

#### *Escherichia coli*

The number of deaths attributable to infections with third-generation cephalosporins-resistant *Escherichia coli* increased four-fold.



### Everyone is responsible

Everyone is responsible for addressing this threat to human health: patients, doctors, nurses, pharmacists, veterinarians, farmers, policy makers.





# Candidemia by *Candida auris*

---

*Clinical Infectious Diseases*

MAJOR ARTICLE



## Simultaneous Emergence of Multidrug-Resistant *Candida auris* on 3 Continents Confirmed by Whole-Genome Sequencing and Epidemiological Analyses

Isolates from 54 patients across 3 continents, Asia, America, and Africa.

41% Diabetes, 51% recent surgery, 73% central catheter  
Resistance to Fluco (93%), Ampho B (35%), Candins (7%)

Lockhart SR Clin .Infect. Dis. 2017; 64 :134-140.

**We can improve the situation!! Yes, we can**

## **CDC's 2019 AR Threats Report: PREVENTION WORKS.**

**↓ 18%** fewer deaths from  
antibiotic resistance  
overall since 2013 report

**↓ 28%** fewer deaths from  
antibiotic resistance  
in hospitals since 2013 report

### **AND DECREASES IN INFECTIONS CAUSED BY:**

**↓ 41%** Vancomycin-resistant  
*Enterococcus*

**↓ 33%** Carbapenem-resistant  
*Acinetobacter*

**↓ 29%** Multidrug-resistant  
*Pseudomonas aeruginosa*

**↓ 25%** Drug-resistant  
*Candida*

**↓ 21%** Methicillin-resistant  
*Staphylococcus aureus*  
(MRSA)

**STABLE** Carbapenem-resistant  
Enterobacteriaceae (CRE) &  
drug-resistant tuberculosis  
(TB disease cases)

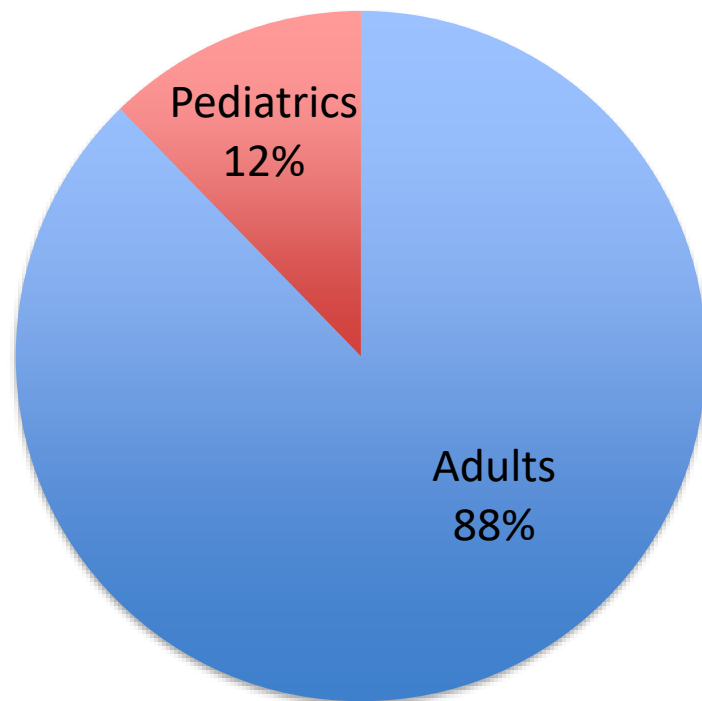
**Antimicrobials misuse?**

# Why we should protect antimicrobials

---

- Antibiotics are a valuable and threatened resource
  - They change the natural course of infections that cause high morbidity and mortality
  - Essential for performing other procedures (surgery, transplantation, oncological treatment, etc.)
- The use of antibiotics **exposes them to loss of efficacy**
  - One Health (humans, agriculture, veterinary, construction)
  - Complex process of induction / selection / transmission of resistance mechanisms
  - Requires their use with great precision / attention
- In **30-50% of antibiotic treatments**, there is room for improvement

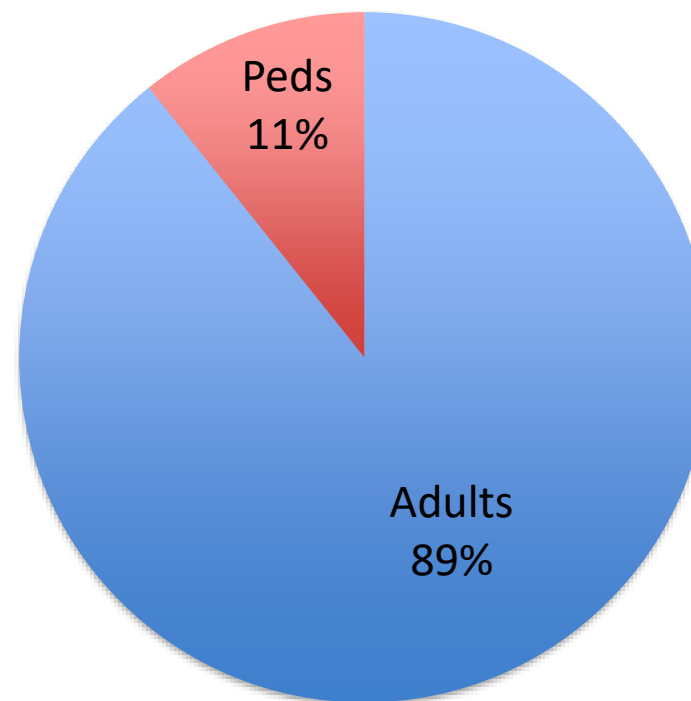
## 684 Antimicrobials



Nº Ab / pts Adults: **1.4** (range 1-5)  
Nº Ab / pts Pediatrics: **1.6** (range 1-4)

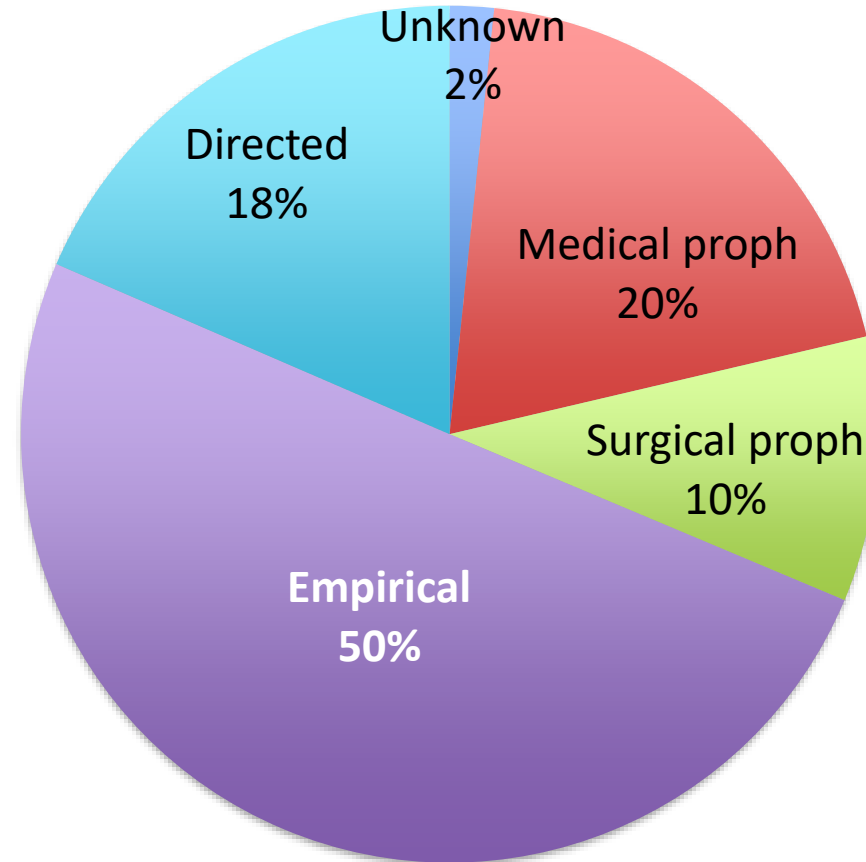
Prevalence ABS use: **43%**  
Prevalencia en Pediatría: **34,93%**  
Prevalencia en Adultos: 40,86 – **43,88%**

## 466 Pacientes

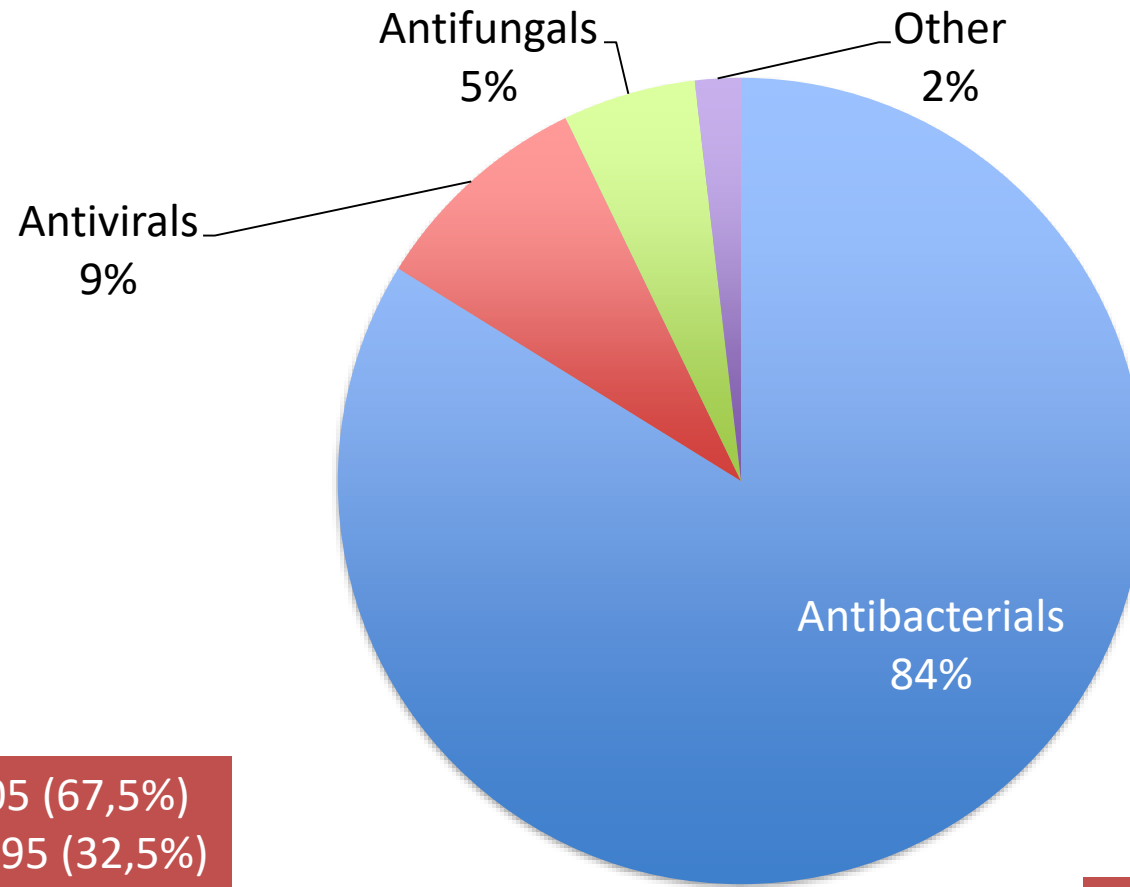




# Type of prescription



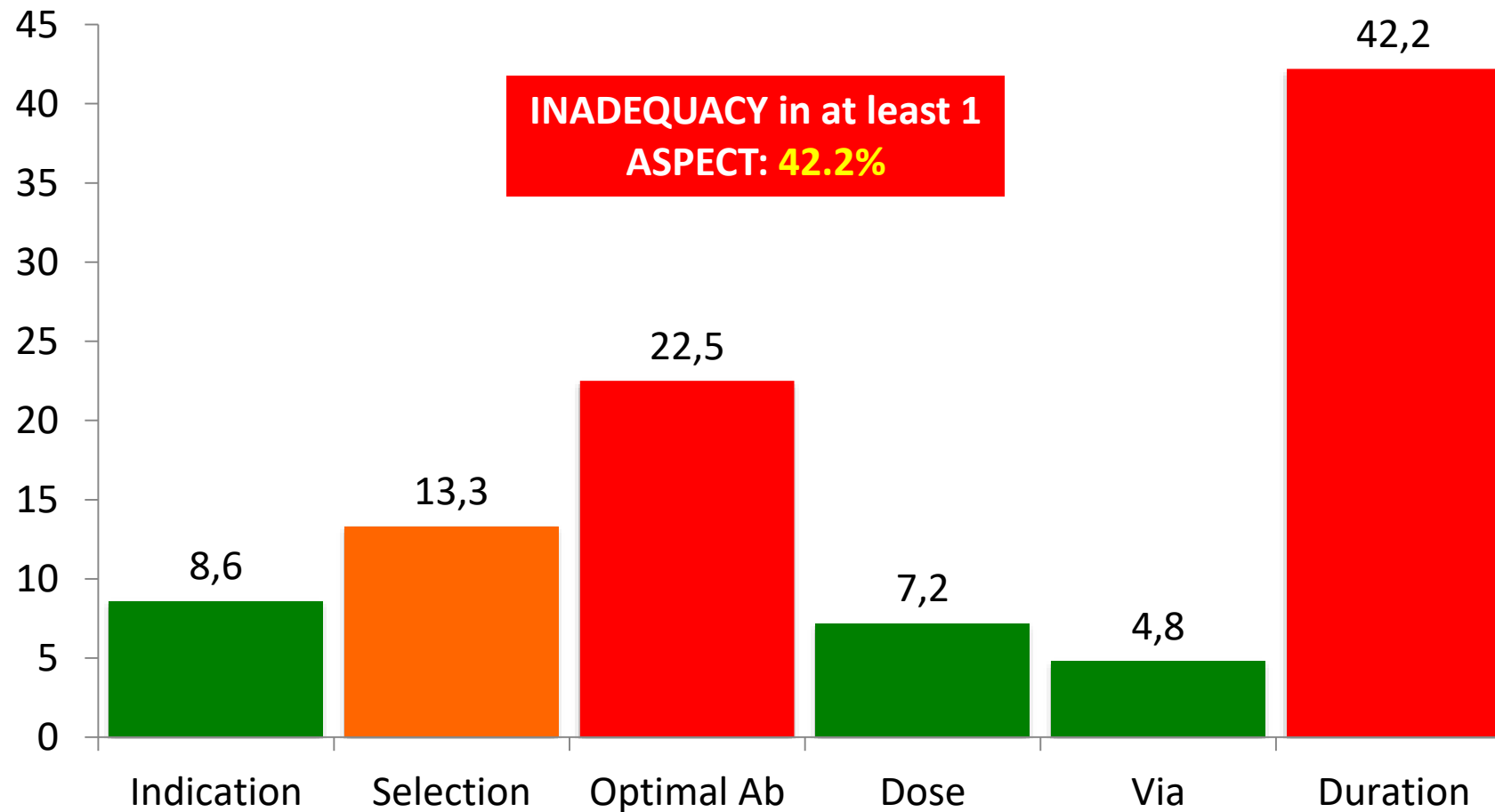
# Type of antimicrobials. Adults



IV: 405 (67,5%)  
PO: 195 (32,5%)

24,3% Not reflected in Clinical chart

# Inadequacy in the use of antimicrobials (%) in adults



**Which is the reality of NI in Spain?**

# INFORME DE VIGILANCIA

## Encuesta de Prevalencia de infecciones relacionadas con la asistencia sanitaria y uso de antimicrobianos en hospitales de agudos en España

2012-2021

ESTUDIO EPINE-EPPS nº 32: 2022

### Informe España

Prevalencia de infecciones (relacionadas con la asistencia  
sanitaria y comunitarias) y uso de antimicrobianos en  
hospitales de agudos

Versión 1.0

Fecha elaboración: 01/12/2022



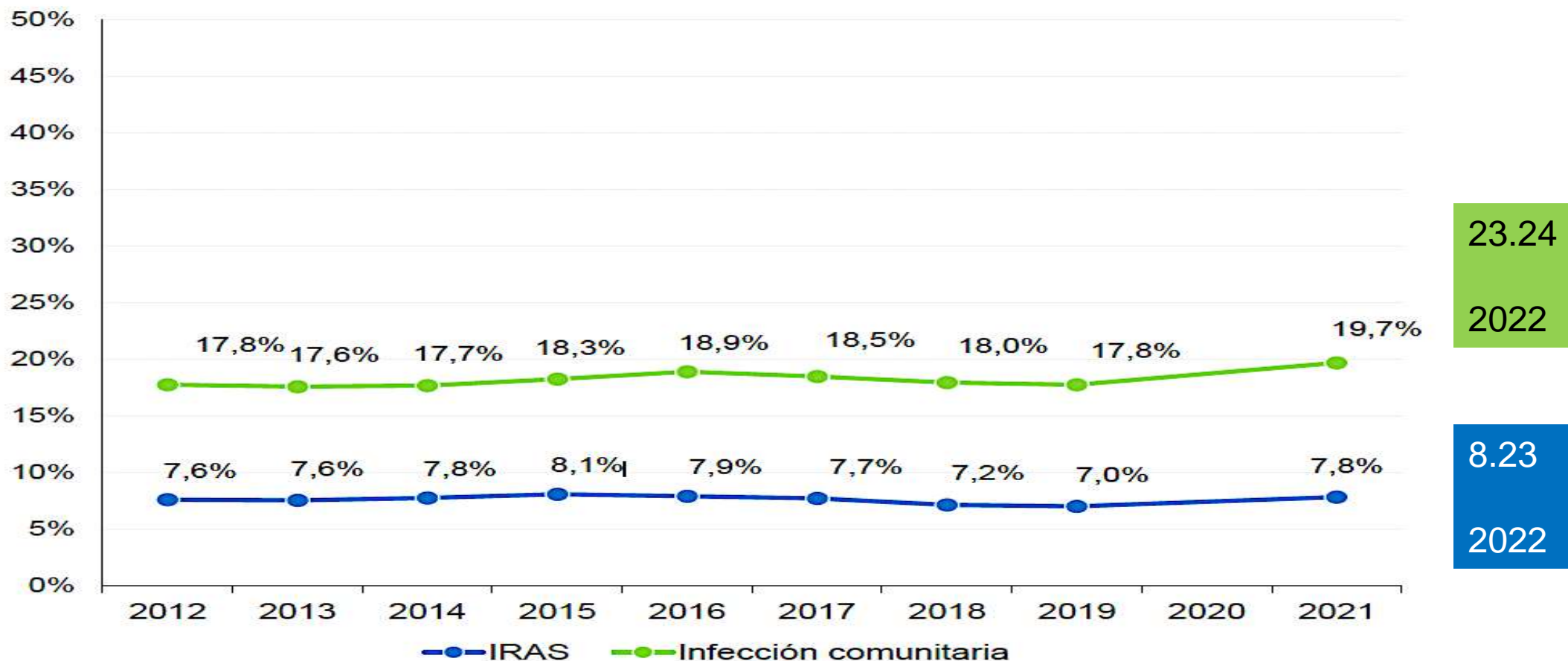
**Sociedad Española**  
Medicina Preventiva,  
Salud Pública y Gestión Sanitaria

SEMPSPGS. Estudio EPINE 2021-2022



# Infección Comunitaria/nosocomial en Hospitales españoles

**Figura 5. Prevalencia de pacientes con IRAS e infecciones comunitarias. EPINE 2012-2021.**



# Nosocomial infection:

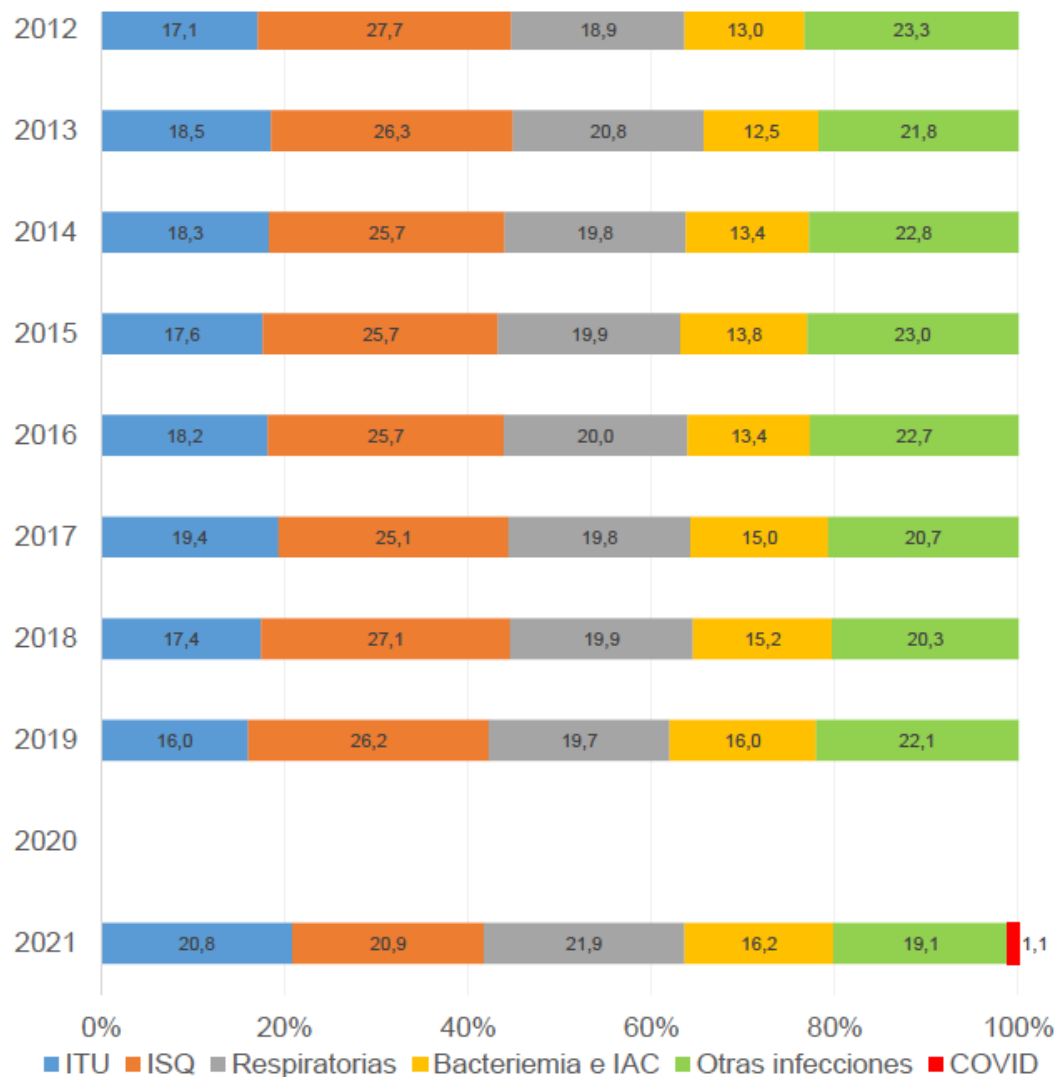
## Pacientes ingresados

Año	N. de hospitales	N. de pacientes	Edad Media (años)	Categorías de edad		
				<16 años	16-64 años	>=65 años
2012	271	53976	59,63	8,12	38,71	53,17
2013	281	56202	59,91	7,64	39,14	53,22
2014	266	55903	60,01	7,89	38,64	53,47
2015	277	57513	60,24	8,09	37,88	54,03
2016	294	59624	60,80	7,62	38,05	54,32
2017	313	61772	60,86	7,56	38,08	54,36
2018	313	60436	60,82	7,81	37,86	54,28
2019	293	60152	61,31	7,29	37,73	54,97
2021	290	49840	61,63	6,52	39,25	54,44

Nº=número

# Nosocomial infection:

Figura 11. Distribución de las IRAS según grupo. EPINE 2012-2021.



Distribución de las IRAS

SEMPSPGS. Estudio EPINE 2021-2022

Nosocomial infection:

## Prevelencia uso antibióticos

**Figura 18. Prevalencia de uso de antimicrobianos. EPINE 2012-2021.**

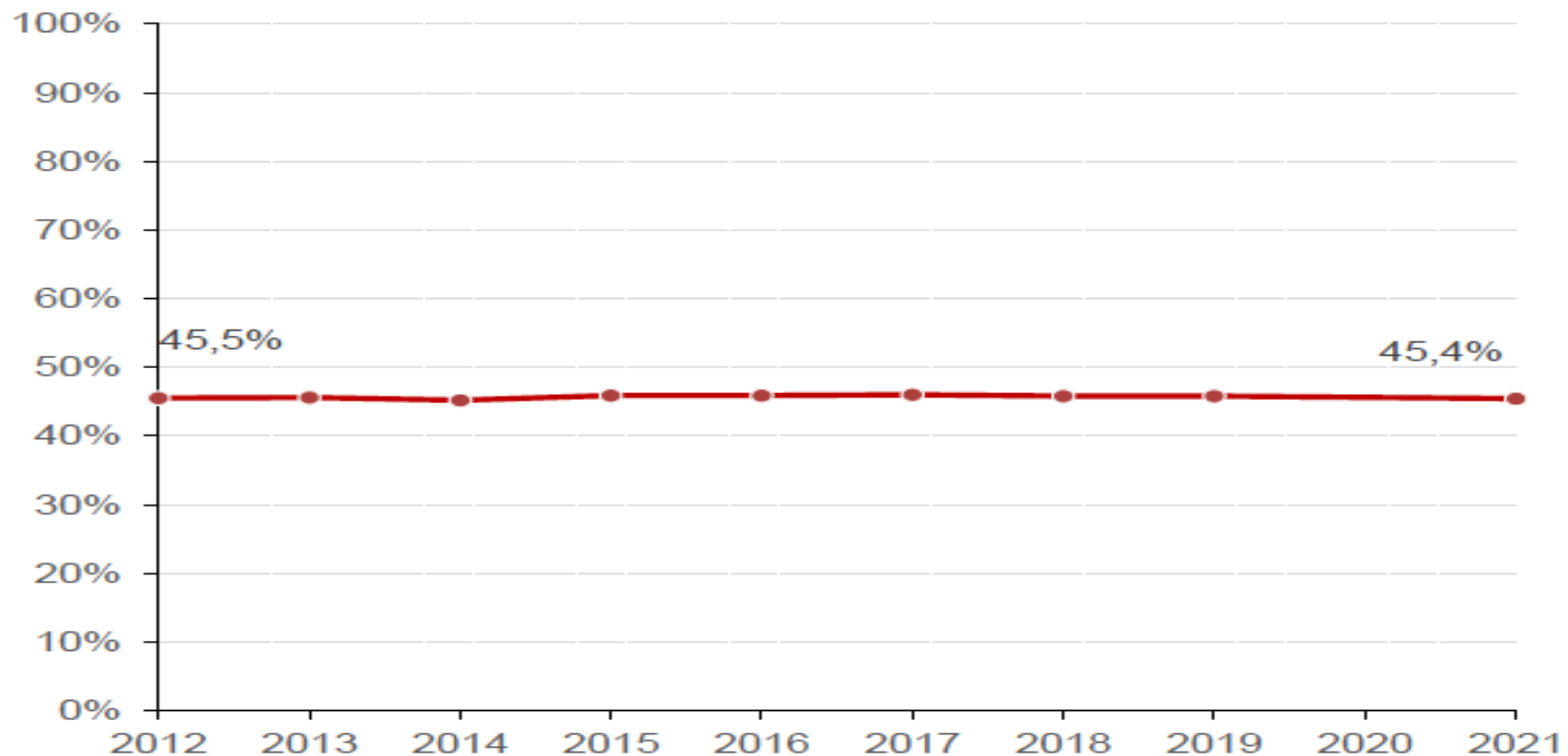
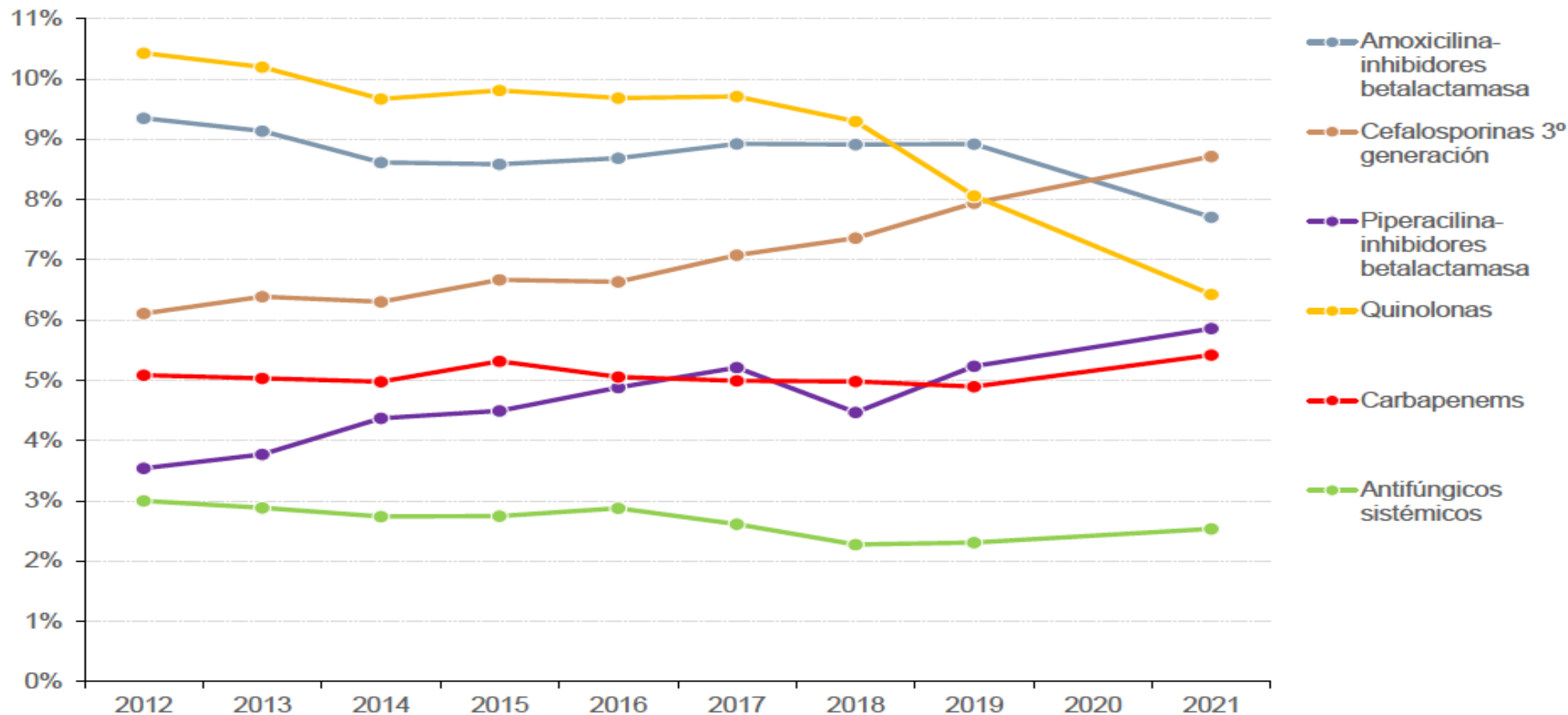
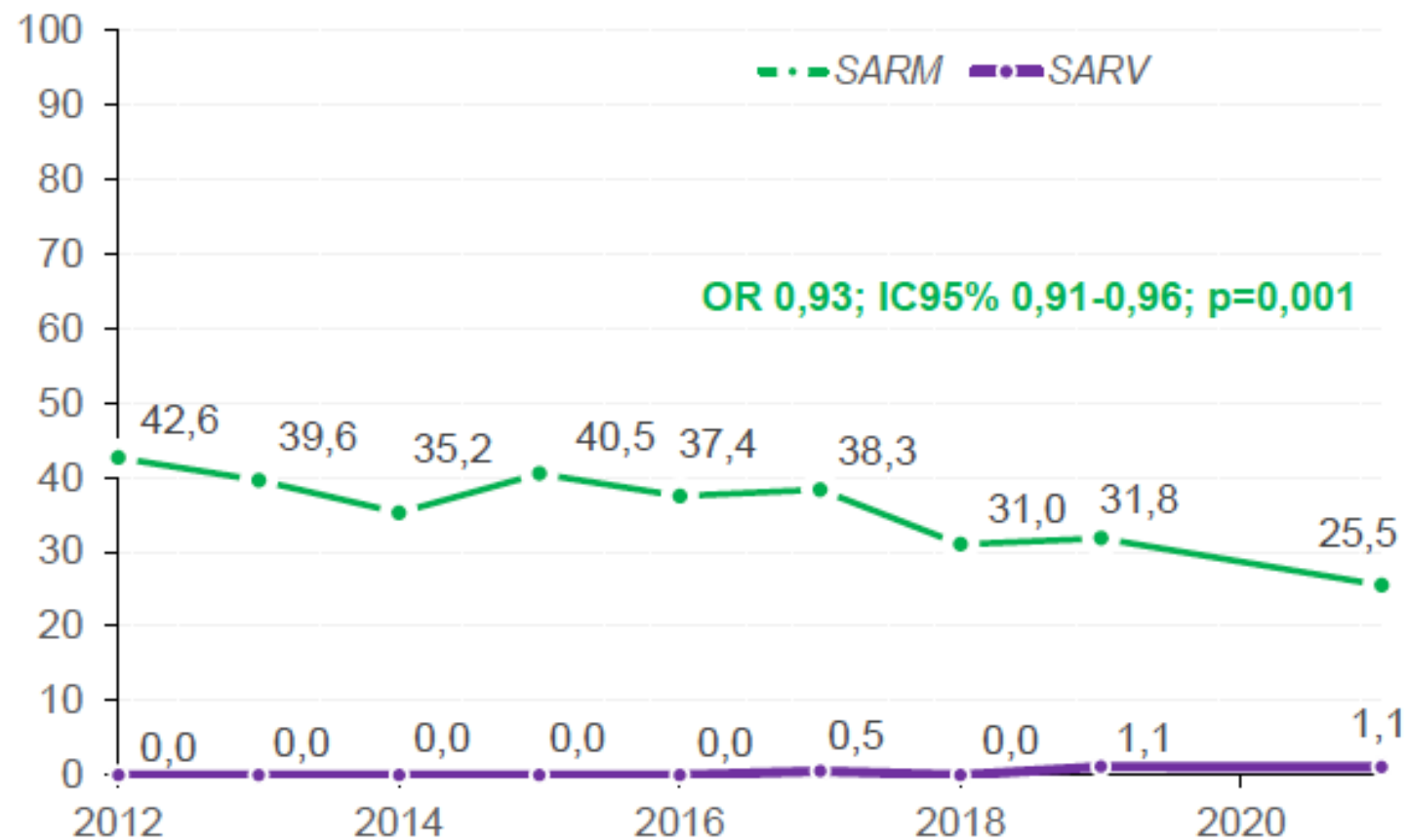


Figura 20. Prevalencia de uso de algunos antimicrobianos. EPINE 2012-2021.

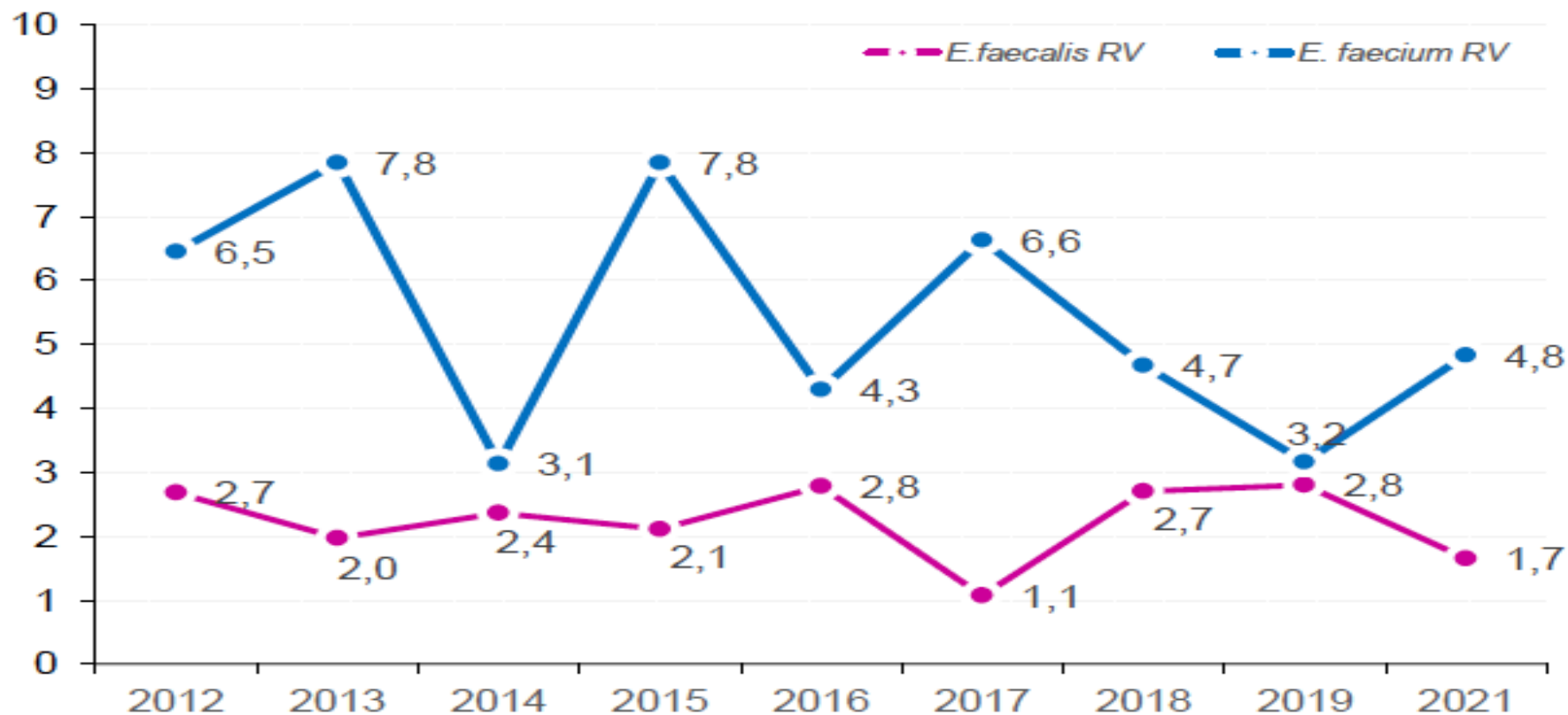


**Figura 14. Resistencias antimicrobianas en IRAS para *S. aureus*. EPINE 2012-2021.**



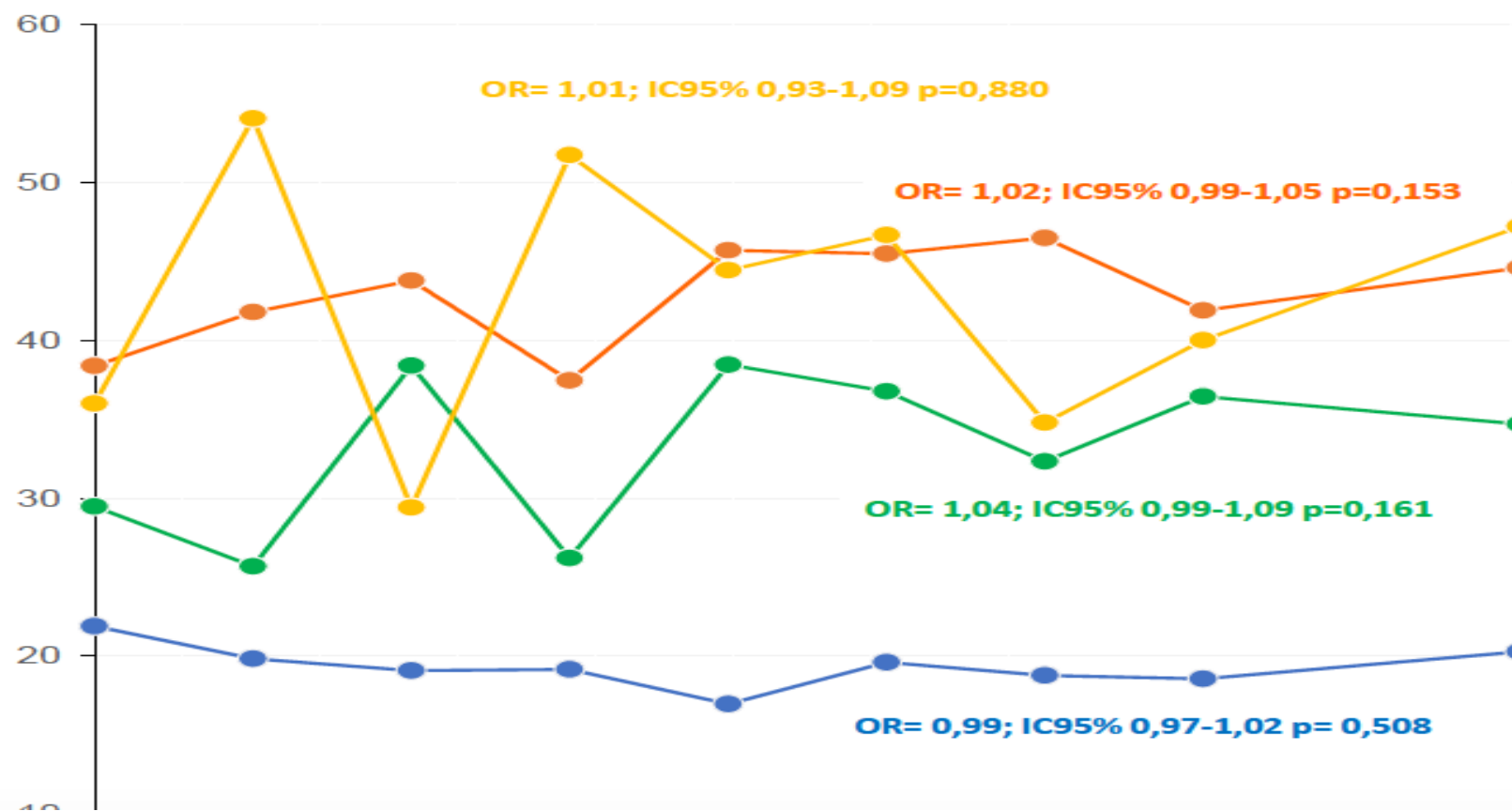


**Figura 13. Resistencias antimicrobianas en IRAS para *E. faecalis* y *E. faecium*. EPINE 2012-2021.**



# Resistencias Cefas 3ºG. Enterobacterias

Figura 15. Resistencia a Cefalosporinas de 3º generación en IRAS para algunas Enterobacterias. EPINE 2012-2021.



# Resistencia Carbapenems. Enterobacterias

Figura 16. Resistencias antimicrobianas a carbapenémicos en IRAS para algunas Enterobacterias. EPINE 2012-2021.



**Impact of COVID-19?**



*Clinical Infectious Diseases*

MAJOR ARTICLE



## The Disproportionate Impact of Coronavirus Disease 2019 (COVID-19) Pandemic on Healthcare-Associated Infections in Community Hospitals: Need for Expanding the Infectious Disease Workforce

Sonali D. Advani,<sup>1,2,\*</sup> Emily Sickbert-Bennett,<sup>3</sup> Rebekah Moehring,<sup>1,2</sup> Andrea Cromer,<sup>2</sup> Yuliya Lokhnygina,<sup>4</sup> Elizabeth Dodds-Ashley,<sup>1,2</sup>

Retrospective, longitudinal, multicenter cohort study  
53 hospitals, academic and community

CLABSI	Increase 24%	CAUTI	Stable
VAP	Increase 34%	CID	Increase 4.2%

# COVID-19 nosocomial co-infection

Hospital Gregorio Maryearn

1350 beds.

Population of 750,000 inhabitants

1-24 March: 1088 COVID-19 admissions

$\geq$  2 months follow-up

Nosocomial infection 118 par/1088  
Total number of infections 212  
(microbiologically proven)

10.9%

Previously 5.87% (observatorio resultados CAM)

Datos HGUGM



# Prevalence of nosocomial infection in COVID-19 patients in HGUGM

*Proven nosocomial infection 1-24 March: 1088 COVID-19 admissions in the HGUGM*

Type of infection	Nº	Infections /1000 admissions	Infections /1000 d
Urinary tract infections	62 (29.2%)	57.0	3.5
MV-related pneumonia	43 (20.3%)	39.5	17.6*
Bacteremia related to CVC	33 (15.6%)	30.3	1.8
Bacteremia (non related to CVC)	25 (11.8%)	23.0	1.3
CMV reactivation	15 (7.1%)	13.8	0.8
Nosocomial pneumonia	8 (3.8%)	7.3	0.4
CR-candidemia	8 (3.8%)	7.3	0.4
SSTI	8 (3.8%)	7.3	0.4
<i>C. difficile</i>	7 (3.3%)	6.4	4.0**
Gastrointestinal	2 (0.9%)	1.8	0.1
CNS	1 (0.5%)	0.9	0.05
<b>No. of infections</b>	<b>212 (100%)</b>	<b>194.8</b>	<b>12</b>

CVC: Central venous catheter; CMV: Citomegalovirus

\*1,000 days de VM; \*\* 10,000 days de estancia hospitalaria

**What is the cost?**

# Infection costs

---

## ■ DIRECT

- Diagnosis
- Therapy
  - Antimicrobials
  - **Excess of hospital stay (60-80% total cost)**
  - ICU admission
  - Adverse events
  - Surgery, drainages, etc
- Control of nosocomial infections

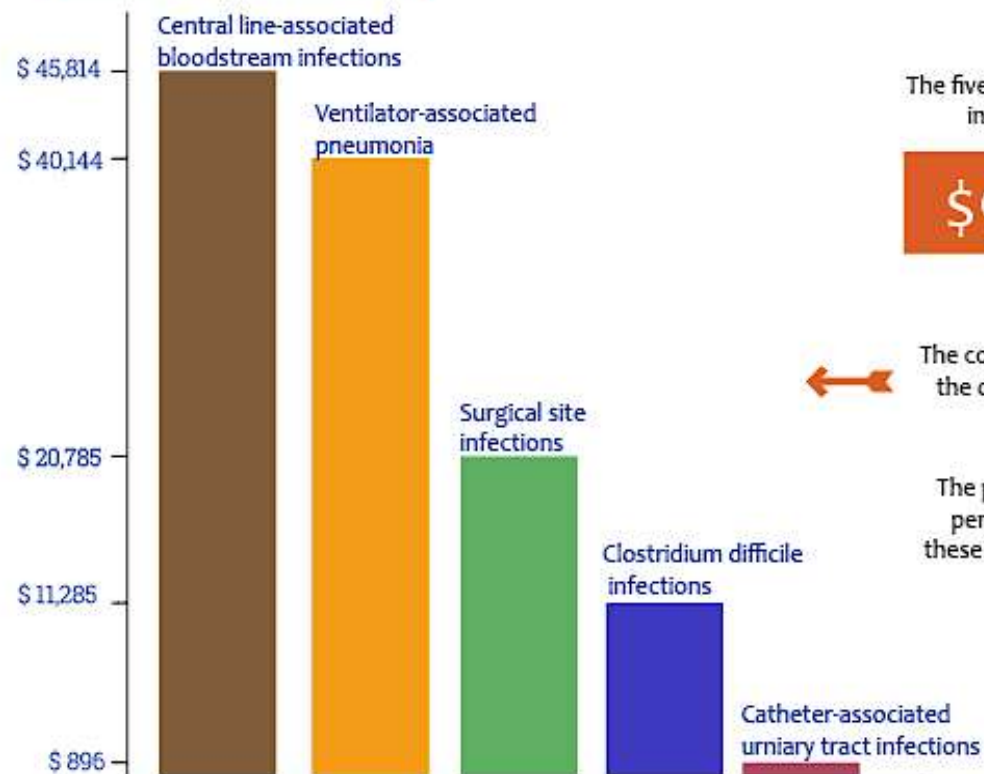
## ■ INDIRECT

- For the patient
  - Morbidity /Sequelas
  - Mortality (DALY\*)
  - Productivity loss
  - Personal and family costs
- Other institutions
- Society
  - Resistance
  - Legal demands and loss of reputation (litigiousness)
  - Opportunity costs (waiting lists...

\*DALY: dissability adjusted life year

# Costs of the five most common hospital-acquired infections (HAIs) in the US

## Costs per case



The five most common hospital-acquired infections (HAIs) cost the US

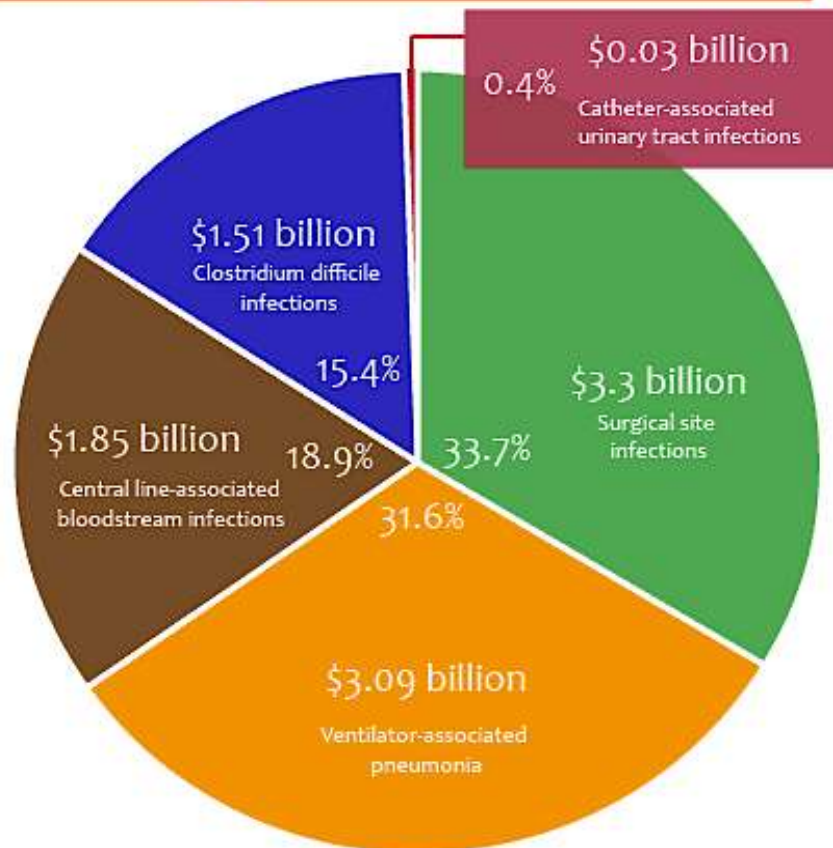
**\$9.8 billion**

annually.

The column graph on the left shows the cost per infection for each of these infections.

The pie-chart on the right displays the percentage contribution of each of these infections to this total annual cost.

## Percentage share of total annual costs



Data source: Eyal Zimlichman, Daniel Henderson, Orly Tamir, Calvin Franz, Peter Song, Cyrus K. Yamin, Carol Keohane, Charles R. Denham, & David W. Bates. Health Care-Associated Infections: A Meta-analysis of Costs and Financial Impact on the US Health Care System. *JAMA Internal Medicine*.

**CDDEP** THE CENTER FOR  
Disease Dynamics,  
Economics & Policy  
WASHINGTON DC • NEW DELHI



# Cost of Nosocomial Infections in the USA

---

Estimated: \$28 billion to \$34 billion

Potentially Avoidable: \$25 billion to \$32 billion  
with infection control programs

Scott RD. CDC, 2009. Available at: [https://www.cdc.gov/HAI/pdfs/hai/scott\\_costpaper.pdf](https://www.cdc.gov/HAI/pdfs/hai/scott_costpaper.pdf). Accessed September 18, 2019.

## Global cost of nosocomial infection

---

- In **Spain**, it is estimated to be around **1,000 million euros annually<sup>1</sup>**.
- According to the WHO, the estimated cost due to HAIs in **Europe** is around **7,000 million euros annually<sup>2</sup>**.

1. Revisión Bibliográfica sobre Trabajos de Costes de la “No Seguridad del Paciente”. Madrid: Ministerio de Sanidad y consumo, 2008.

2. Report of the burden of endemic health care-associated infection worldwide. Geneva: World Health Organization, 2011.



# Nosocomial infection: direct costs

Type of Nosocomial infection	Cost (€ 2012)* per infected patient
<b>IV Catheter</b> local infection	664 €
<b>Urinary tract</b> infection	1,107 – 1,158 €
<b>IBC related bacteremia</b>	4,713 €
<b>CR-bacteremia</b>	9,971 – 16,182 €
<b>VAP-related bacteremia</b>	11,473 – 18,214 €
<b>Nosocomial pneumonia</b>	22,249 €
<b>Surgical site</b> infection	29,400 €
<b>Bacteremia/Infection due to MRSA</b>	<b>44,541 €</b>
* Costs from 2005.	

Revisión Bibliográfica sobre Trabajos de Costes de la “No Seguridad del Paciente”. Madrid: Ministerio de Sanidad y Consumo, 2008.

# Economic impact of resistance

---

## ■ Europe 2007: at least **1.5 billion euros**

- Productivity loss: **40%**
- Accounts for an external visit after discharge
- Excess mortality and stay calculated based on studies with non-time-dependent models, sometimes small and without adjustment for empirical treatment



## ■ USA 2000: **55 billion dollars** (cost of hospitalization and patient)

- Indirect patient costs: **64%** (includes loss of earnings due to illness or premature death)



([http://www.tufts.edu/med/apua/consumers/personal\\_home\\_5\\_1451036133.pdf](http://www.tufts.edu/med/apua/consumers/personal_home_5_1451036133.pdf)) Alliance for the Prudent Use of Antibiotics

Based on Roberts' study

**What is needed to eradicate it?**

# Means to combat it

---

Eradicate complacency

Working groups

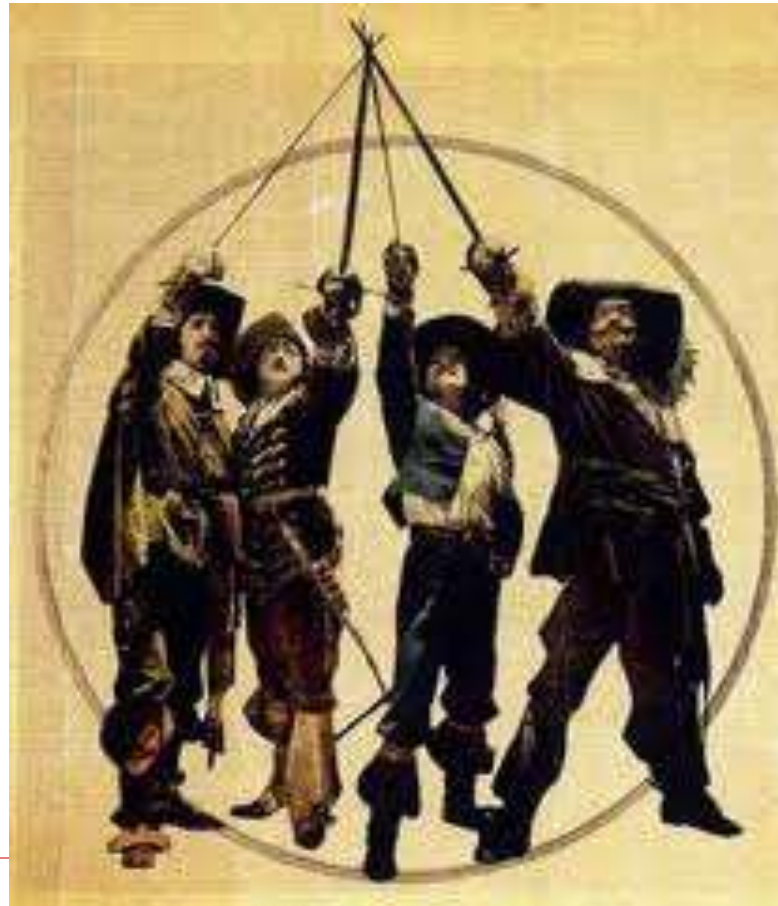
Operational dynamics

Indicator parameters

Expectations

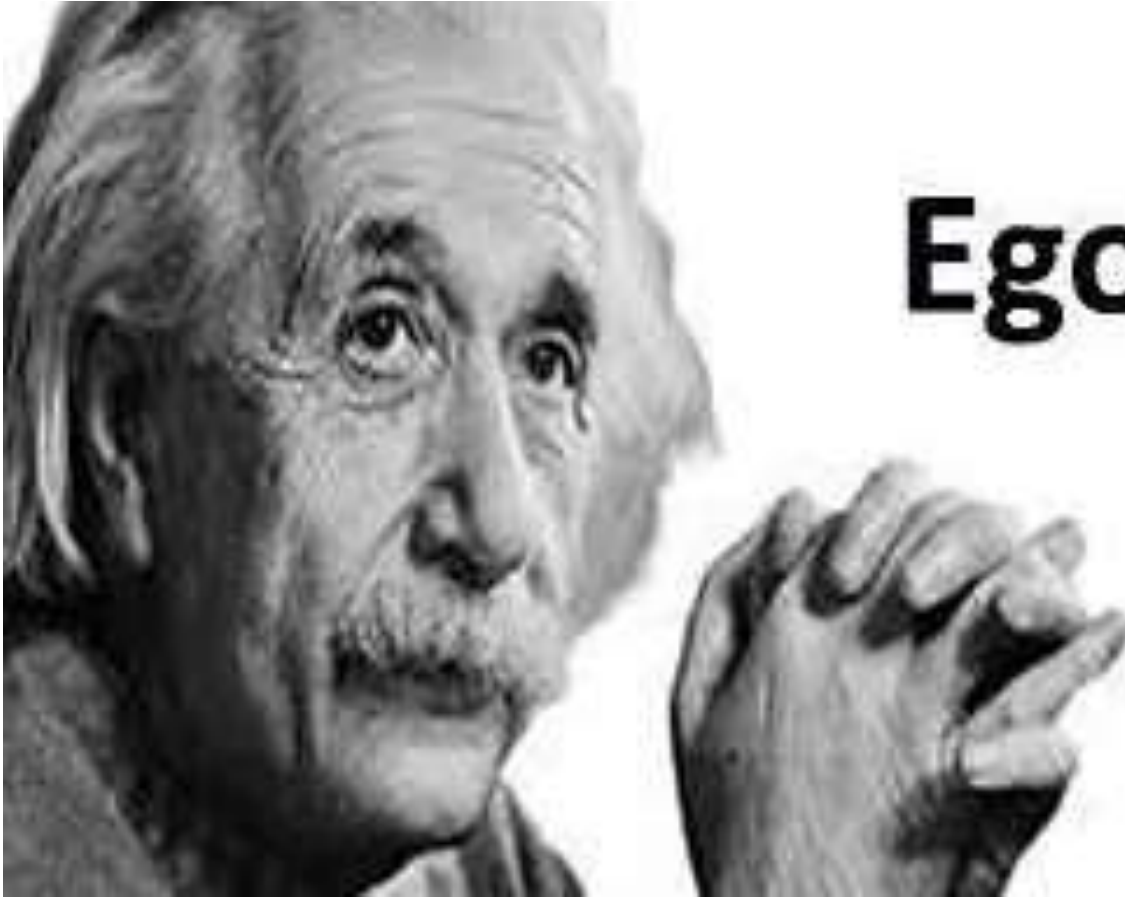
**IF YOU ARE NOT PART OF THE SOLUTION, YOU  
ARE PART OF THE PROBLEM**

**Omnes  
omnibus**



# Multidisciplinary team

---



$$\text{Ego} = \frac{1}{\text{Knowledge}}$$

*"More the Knowledge  
Lesser the Ego,*



# Perception of nosocomial infection

---



- Inherent to medicine advances
- Inevitable
- Evitable and caused by a system mistake
- **It is acknowledged and requires a corrective action**

# How it all started

- An **18-month-old girl** is admitted to **Johns Hopkins** for burn injuries.
- Three weeks later, while she is already recovering, she **dies from CR-BSI** (catheter-related bloodstream infection).
- After months of considering whether to take the case to court and the media, the **mother agrees to settle with the hospital**.
- She eventually **donates part of the settlement money** to help **prevent similar incidents** from happening in the future.



# Peter Pronovost

---



Anesthesiologist–Intensivist at Johns Hopkins, highly interested in patient safety.  
His father had died due to a medical error when he was a medical student.



From tragedy, a quest for safer care



ADVERTISEMENT

Related

## Death of toddler in hospital spurs mother to action

Sorrel King's mission: Push for safety in hospitals

## The power of a mother's grief

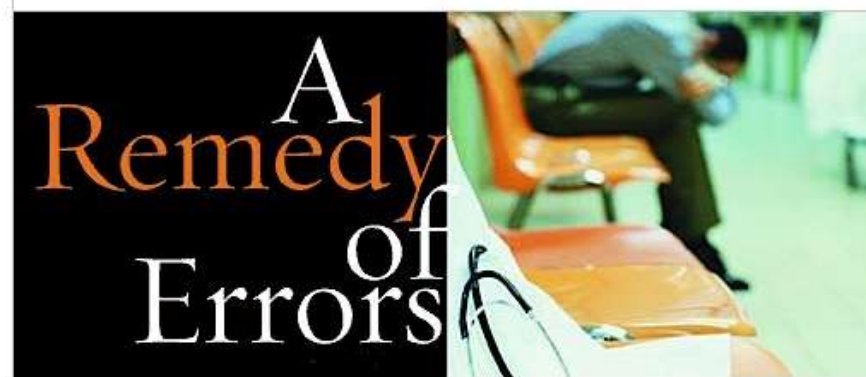
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MEDICINE

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*an online version of the magazine*

SPRING/SUMMER 2004

### FEATURES



Out of a deadly medical mistake at Hopkins Hospital sprang a patient-safety effort that has united a bereaved parent with malpractice lawyers, physicians and nurses.

BY MARY ANN AYD

### FEATURES

- A Remedy of Errors
- Childhood Trials
- Meat Muddle

### DEPARTMENTS

- Circling the Dome
- Medical Rounds
- Annals of Hopkins

### OPINIONS

- Learning Curve
- Post-Op

# What Johns Hopkins Children's Center did well

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- The hospital **acknowledged the error** and visited the parents at their home.
- An **investigation** was launched, and the hospital director set aside 30 minutes every Friday to update the parents by phone.
- System errors were **identified**:
  - The child died from dehydration and catheter-related sepsis.
  - There was a communication failure between medical teams.
  - The mother's concerns were not heard, and clinical signs were not recognized.

# 2001 ICU checklist protocol



## INSERTION OF THE CATHETER

**Doctors** should:



1. Wash their hands with soap.
  2. Clean the patient's skin with chlorhexidine antiseptic.
  3. Put sterile drapes over the entire patient.
  4. Wear a sterile mask, hat, gown and gloves.
  5. Put a sterile dressing over the catheter site
- A nurse** could stop the proceeding (backup from the administration to intervene)
- 5'.** Remove unnecessary catheters (nurse ask each day)



# "Patient Safety Culture"

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- It is not only ZERO NI rates, but ..
- Zero tolerance to non-compliance with proven effective preventive measures
- Traceability!!!!
- Posters in the hallways keeping track of the **SENTINEL EVENTS OF THE MONTH**

# Mistake vs Reckless

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- Reckless behavior should be **punished**
- Risky behavior should be corrected through **training**
- Human error should be **supported**
  
- The secret of quality is love; we need to ensure we respond to errors with love.

# Aspectos beneficiosos

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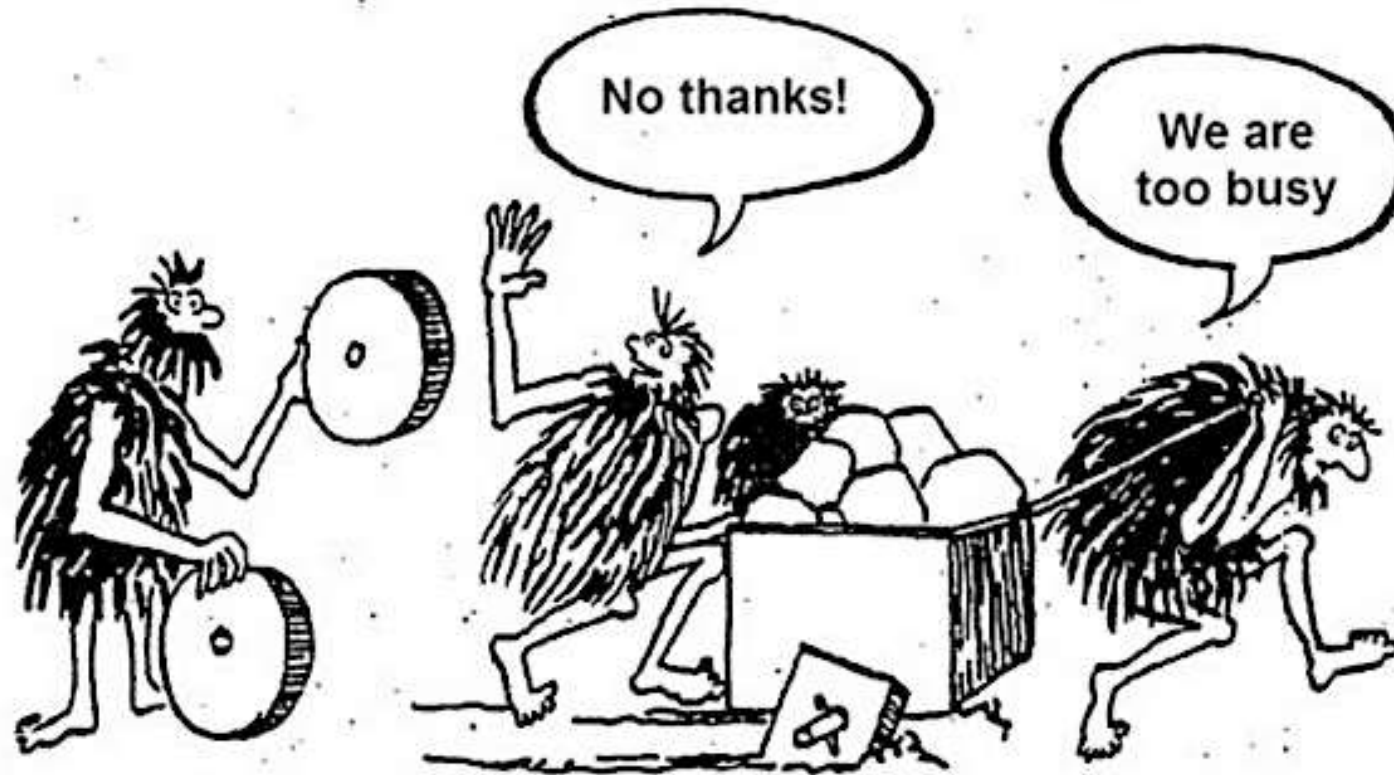


- Safety culture
- Reduction of nosocomial infection
- Reduction of other complications
- Double-checking, medication errors, thromboembolism, etc.
- Technological development

# Innovation for patient security



- Making it **easy** to do the **right** thing



# Always more

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- “100,000 Lives Campaign”
- “5 Million Lives Campaign”
- The “**Never Events**” preventable errors mandate
- ZERO RISK, ZERO TOLERANCE
- **Wise facts**

Berwick DM,. The 100.000 Lives Campaign: setting a goal and a deadline for improving health care quality. JAMA 2006; 295:324.

Michaels RK. Achieving the National Quality Forum’s “Never Events”: prevention of wrong site, wrong procedure, and wrong patient operations. Ann Surg 2007; 245:526.

# Choosing Wisely in Healthcare Epidemiology and Antimicrobial Stewardship



TABLE 1. Society for Healthcare Epidemiology of America Choosing Wisely Recommendations

## *Final Choosing Wisely recommendations*

1. Don't continue antibiotics beyond 72 hours in hospitalized patients unless patient has clear evidence of infection.
2. Avoid invasive devices (including central venous catheters, endotracheal tubes, and urinary catheters) and, if required, use no longer than necessary. They pose a major risk for infections.
3. Don't perform urinalysis, urine culture, blood culture, or *Clostridium difficile* testing unless patients have signs or symptoms of infection. Tests can be falsely positive leading to overdiagnosis and overtreatment.
4. Do not use antibiotics in patients with recent *C. difficile* without convincing evidence of need. Antibiotics pose a high risk of *C. difficile* recurrence.
5. Don't continue surgical prophylactic antibiotics after the patient has left the operating room.

## *Choosing Wisely runner-up items*

1. Don't use antibiotics for apparent viral respiratory illnesses (sinusitis, pharyngitis, bronchitis, otitis media).
2. Don't reuse syringes, needles, medication vials, or intravenous solutions.
3. Don't come to work sick.
4. Don't treat *Candida* in the respiratory tract specimen.
5. Don't perform cultures of vascular catheter tips in the absence of suspected infection.



# Zero infection, Zero risk?



- "Impossible" objectives and campaigns for ICU
  - Confusion in society
  - Frustration among professionals
- Achievable objectives (UTI)
- Penalties/Extrinsic incentives
- Handling of "errors"
- Underdiagnosis and underreporting. Coding changes
- Threat to Microbiology progress



## Will Regulatory and Financial Considerations Dampen Innovation in the Clinical Microbiology Laboratory?

Peter H. Gilligan,<sup>a,b</sup> Melissa B. Miller<sup>a,b</sup>

Clinical Microbiology-Immunology Laboratories, UNC HealthCare, Chapel Hill, North Carolina, USA<sup>a</sup>; Pathology and Laboratory Medicine, University of North Carolina School of Medicine, Chapel Hill, North Carolina, USA<sup>b</sup>

# Hospital Characteristics Associated With Penalties in the Centers for Medicare & Medicaid Services Hospital-Acquired Condition Reduction Program

- 721/3284 hospitals (**22.0%**) **were penalized**
  - Major teaching hospitals, cared for more complex patients, were safety-net hospitals and offered advanced services
  - Higher hospital quality scores, more quality accreditations, and better performance on other process and outcome measures!!!

November 1999

# INSTITUTE OF MEDICINE

*Shaping the Future for Health*

## **TO ERR IS HUMAN: BUILDING A SAFER HEALTH SYSTEM**

**H**ealth care in the United States is not as safe as it should be--and can be. At least 44,000 people, and perhaps as many as 98,000 people, die in hospitals each year as a result of medical errors that could have been prevented, according to estimates from two major studies. Even using the lower estimate, preventable medical errors in hospitals exceed attributable deaths to such feared threats as motor-vehicle wrecks, breast cancer, and AIDS.



## **Fifteen years after *To Err is Human*: a success story to learn from**

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Peter J Pronovost,<sup>1</sup> James I Cleeman,<sup>2</sup> Donald Wright,<sup>3</sup> Arjun Srinivasan<sup>4</sup>

# The “Zero Risk” Concept for Hospital-Acquired Infections: A Risky Business!

Clinical Infectious Diseases 2009; 49:747

Jean Carlet,<sup>1</sup> Jacques Fabry,<sup>2</sup> René Amalberti,<sup>1</sup> and Laurent Degos<sup>1</sup>

<sup>1</sup>Haute Autorité de Santé, Saint-Denis La Plaine, and <sup>2</sup>Université Claude Bernard, Lyon, France

## “Never Events”: Not Every Hospital-Acquired Infection Is Preventable

Clinical Infectious Diseases 2009; 49:743

Jack Brown,<sup>1,2,3</sup> Fred Doloresco III,<sup>2,3,6</sup> and Joseph M. Mylotte<sup>4,5</sup>

- The risk will remain in units that deal with the most severely ill patients.
- Practitioners need to discuss potentially harmful procedures with their patients and explain that the risk will not be zero even if all preventive action is taken.

# Real situación

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- Limited resources and little technological innovation
- Political dependence and constant financial crisis
- Lack of patient safety culture
- NON-EXISTENT PROBLEM FOR THE MEDIA, OR ONLY TO DENOUNCE A SPECIFIC CASE, NOT TO REALLY SUPPORT CHANGE
- Motivation and individual freedom

What can we do with the professional that...

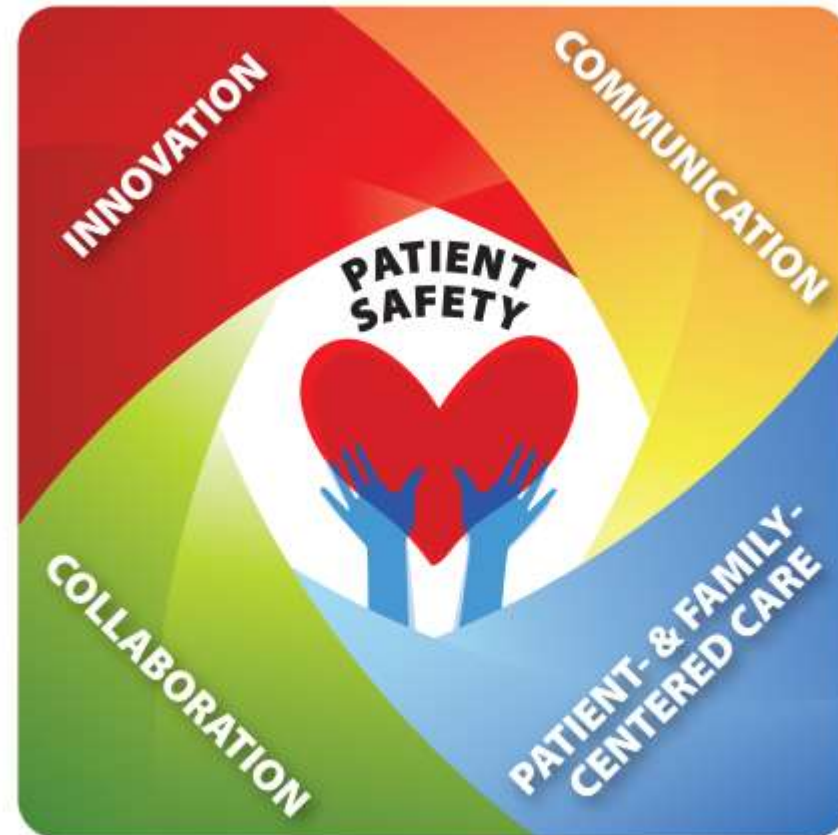
- Does not get the flu vaccine
- Does not comply with preventive measures
- Does not attend training sessions.....



# Conclusions



- Useful develop department
- Object influence
- Expansion
- Need to work. or und



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# **Committee for Infection Control and Antibiotic Policy**

## **Composition: Representatives of**

**Infectious Dis  
Microbiology  
Preventive med  
Pharmacy  
Occupational health  
Management**

**Surgery  
ICUs  
Medicine  
Pediatric  
Nurses  
Engineering**

# **Committee for Infection Control and Antibiotic Policy**

**Periodic meetings**

**Minutes**

**Agenda**

**Data review**

**Design of action protocols**

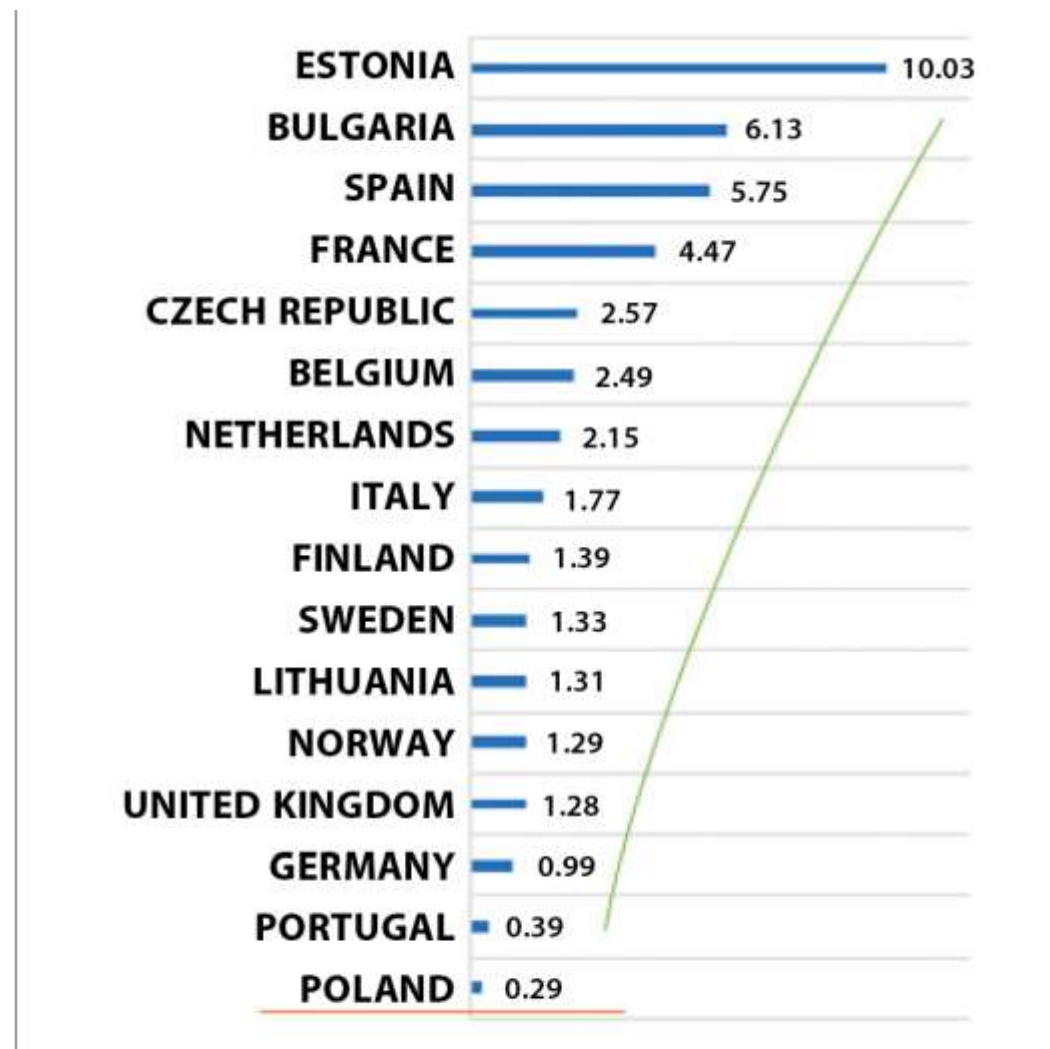
**Impact measurement**

**Issuance of recommendations**

# Microbiologists

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Microbiologists/100.000  
inhabitants. E.U.



**Figure 1.** Number of practicing physicians specializing in medical microbiology in selected EU countries per 100,000 inhabitants

## Nosocomial infection:

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56.2% of Spanish hospitals have routine microbiological diagnosis during the weekends

Provide results on weekends

Tertiary 43.7%

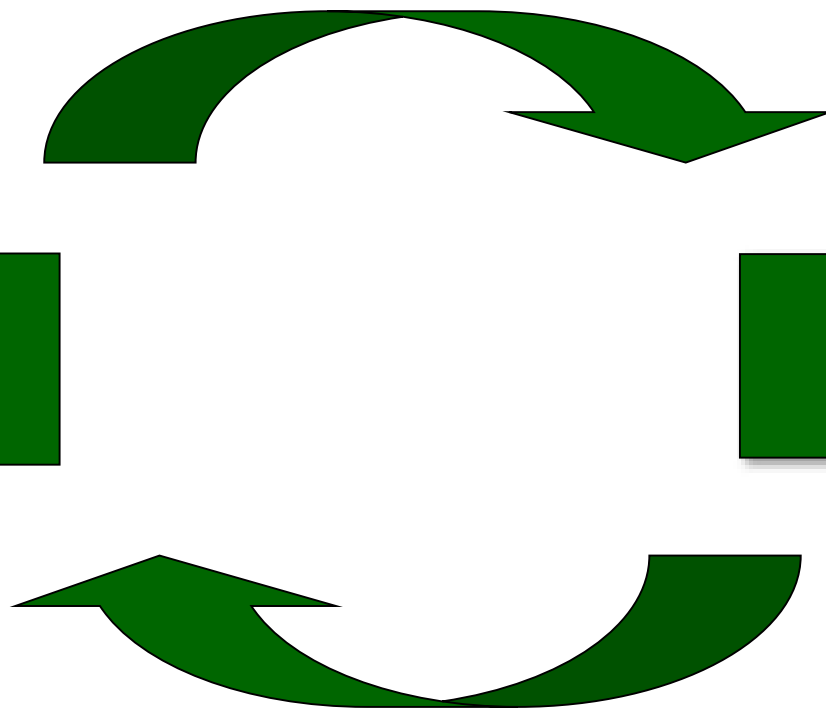
Secondary 34.9%

Primary 15.4%

Specialized 5.4%

Measure

Act



# Future control base of the use of bacteriophages?

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## **Potential of Therapeutic Bacteriophages in Nosocomial Infection Management**

*Nannan Wu<sup>1\*</sup> and Tongyu Zhu<sup>1,2\*</sup>*

Wu N, Zhu T. Front. Microbiol. 12:638094. Doi: 10.3389/fmicb.2021.638094



# Hospitalized Patients

Reference	Patients	Design	Variable	Results
Cisneros JM CMI. 2014	1206 Hospitalized Spain	Prospective. Pre/Post	Inadequate	53% 26% ↓
Spoorenberg V. CID 2014	1964 pts cUTI 19 hosp. Netherlands	Prospective	Different Quality Indicators. Inadequate Guide follow/up	69%
Davey P. Cochrane D.S.R.2013	Cochrane Review	Systematic review	Comparison of efficacy of Persuasive vs Restrictive interventions	35-42%
Zarb P. JAC 2011	25 countries 172 hospitals	Point.Prev. Stud	No-Compliance Guidelines	37%

# Emergency Departments

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Referen.	Patients	Design	Variable	Results
Yunquera-Romero L. R.E.Q. 2018	676 Adults Emergency Dept Spain	Retrospective	Inadequate indication  Inadequate dosing  Inadequate lenght  Goobally inadeqaute	43%  17%  55%  79%
Zatorski C. BMC Infect.Dis. 2016	103 Non- complicated UTI. UK	Prospective, observational, single centre	Inadequate	63%
Fleming-Dutra KE. JAMA 2016	184032 visits Ambulatory care USA	Retrospective. Dsata base	Inadequate	50%

# Engineers and nosocomial infections

## 1. Facility Design:

Layouts that reduce patient crowding, proper ventilation systems, and materials that are easy to clean and disinfect.

## 2. Water and Air Quality Control

ensure the quality of water and air within healthcare facilities

filtration systems, UV disinfection, and proper humidity levels to prevent the growth of pathogens.

## 3. Hand Hygiene Infrastructure

Designing and installing hand hygiene stations at strategic locations throughout the hospital can encourage better compliance with hand hygiene practices among healthcare workers and visitors.

# Engineers and nosocomial infections

## 4. Sterilization and Reprocessing

Develop and maintain equipment for the sterilization and reprocessing of medical instruments use.

## 5. Monitoring and Surveillance Systems

Advanced monitoring systems to track infection rates and identify potential outbreaks early (sensors and data analytics to monitor environmental conditions and infection control practices. Prediction of risks AI softwares)

## 6. Construction Practices

Proper infection control during hospital construction or renovation (dust containment, negative pressure rooms, antimicrobial surfaces)

## 7. Education and Training:

Work with healthcare professionals to provide training on the proper use and maintenance of infection control technologies and systems.

# Nosocomial infection

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1. They affect between 5% and 10% of hospitalized patients
2. Their economic cost in Spain is estimated at around 1,000 million euros
3. The most important are Surgical Site Infection, UTI (Urinary Tract Infection), and Respiratory Infection...
4. Multi-resistant and difficult-to-treat microorganisms are more frequent

# Nosocomial infection

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5. The control of HAIs (Hospital-Acquired Infections) is structured through a Committee or Multidisciplinary Team
6. It defines problems and documents them with figures
7. It establishes control measures, both educational and of other natures
8. It sets up action plans for specific outbreaks



# Nosocomial infection

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9.- Hand hygiene is the main control mechanism

10.- Transmission precautions are other useful way of fighting NI

# 67 yo pt with complicated heart surgery

- A yeast is recovered from a blood culture
- It is identified as *Candida auris*







