ESCMID EUROPEAN SOCIETY OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

EUCIC EUROPEAN COMMITTEE ON INFECTION CONTROL

European Society of Clinical Microbiology and Infectious Diseases

EUCIC Local Module

Improving Antibiotic Prescription and Infection Control in the Emergency Room

The burden of infection and antibiotic prescription in the ER: where it all begins!

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Lisbon, Portugal
7 April 2018

HOSPITAL DA LUZ LEARNING HEALTH

Hospital Universitario La Paz

Competing interest

The burden of infection and antibiotic prescription in the ER: where it all begins!

During the last 5 years I have received research grants, consultant/speaker honoria as well as financial support for continious education of my department :

Fresenius Kabi	Pfizer
Merck	GlaxoSmit Kline
Novartis	Sanofi
Novo Nordisk	Menarini
Leo Pharma	Termo Phiser
Bristol-Myers Squibb	Angelini
Tedec meiji	AstraZeneca
Boehringer Ingelheim	Bayer

Key questions

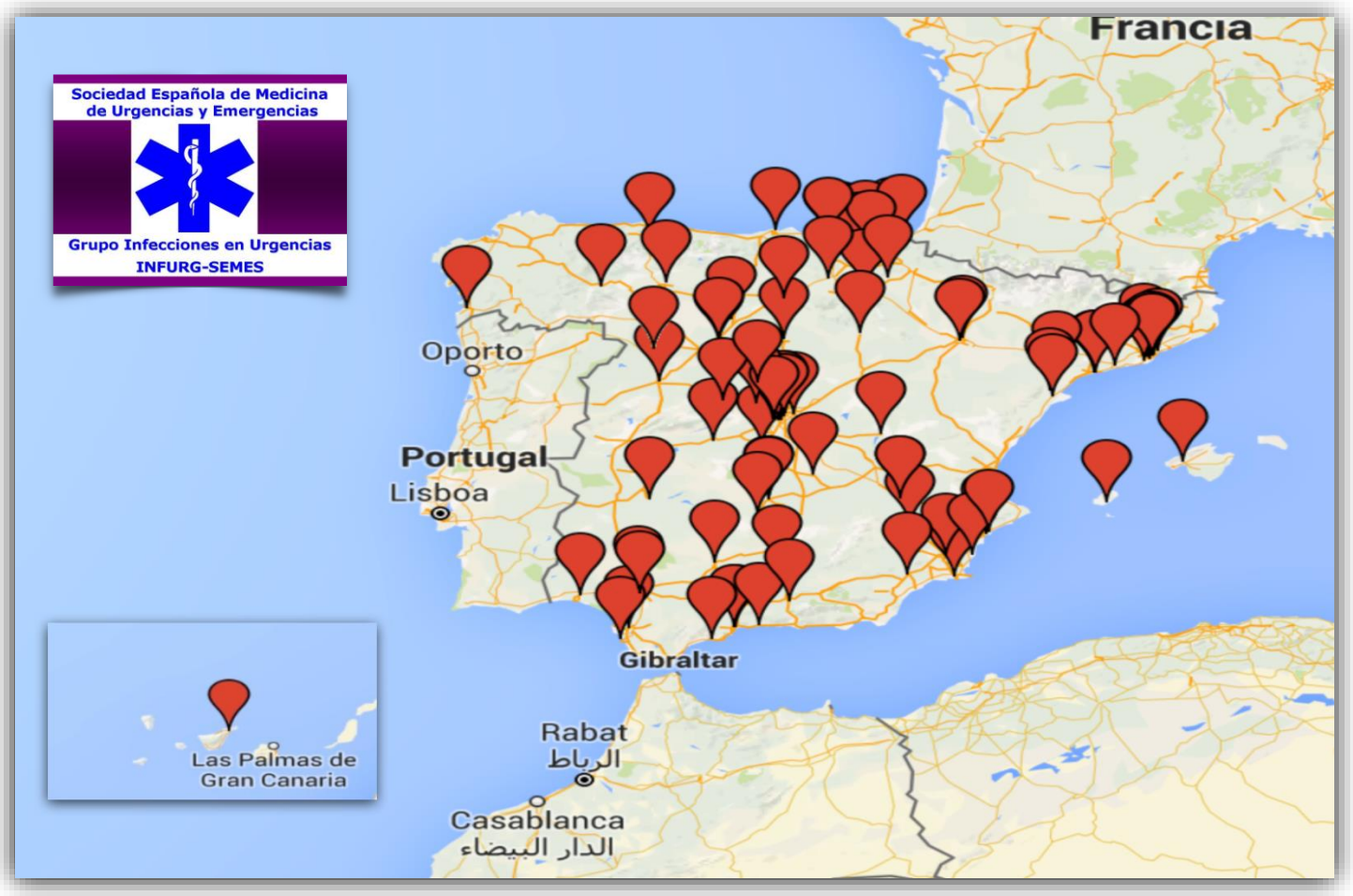
The burden of infection and antibiotic prescription in the ER: where it all begins!

- **Population profile**
- **Which antibiotic treatment are we using?**
- **Problems:**
  - Is the patient infected?
  - Is the patient severely illness?
  - Problems of resistances
  - What are the consequences of inappropriate antibiotic treatment?
- **Solutions:** research

INFURG-SEMES

The burden of infection and antibiotic prescription in the ER: where it all begins!

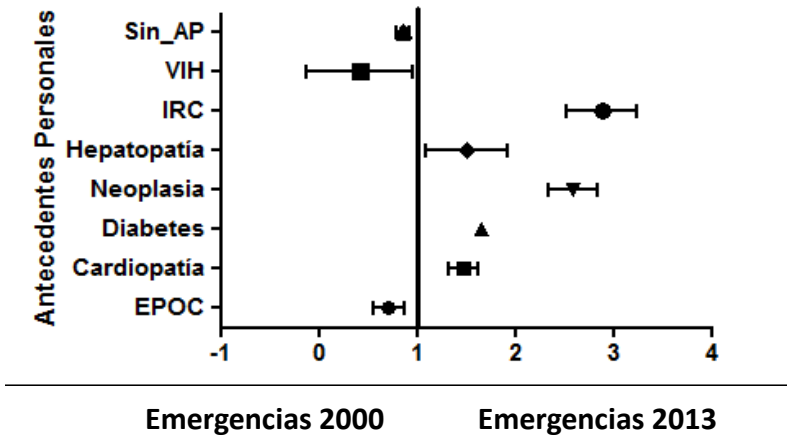
- **Infectious Disease Group of Spanish Emergency Medicine Society**



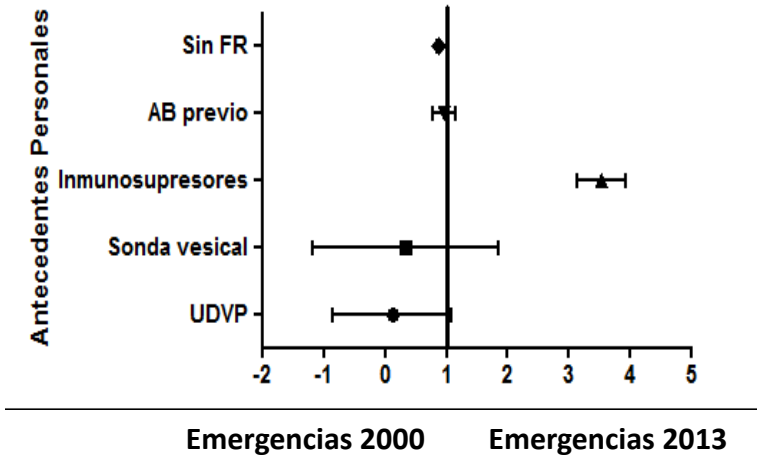
Population profile

The burden of infection and antibiotic prescription in the ER: where it all begins!

Comorbility



Risk Factor for infection by resistance microorganism

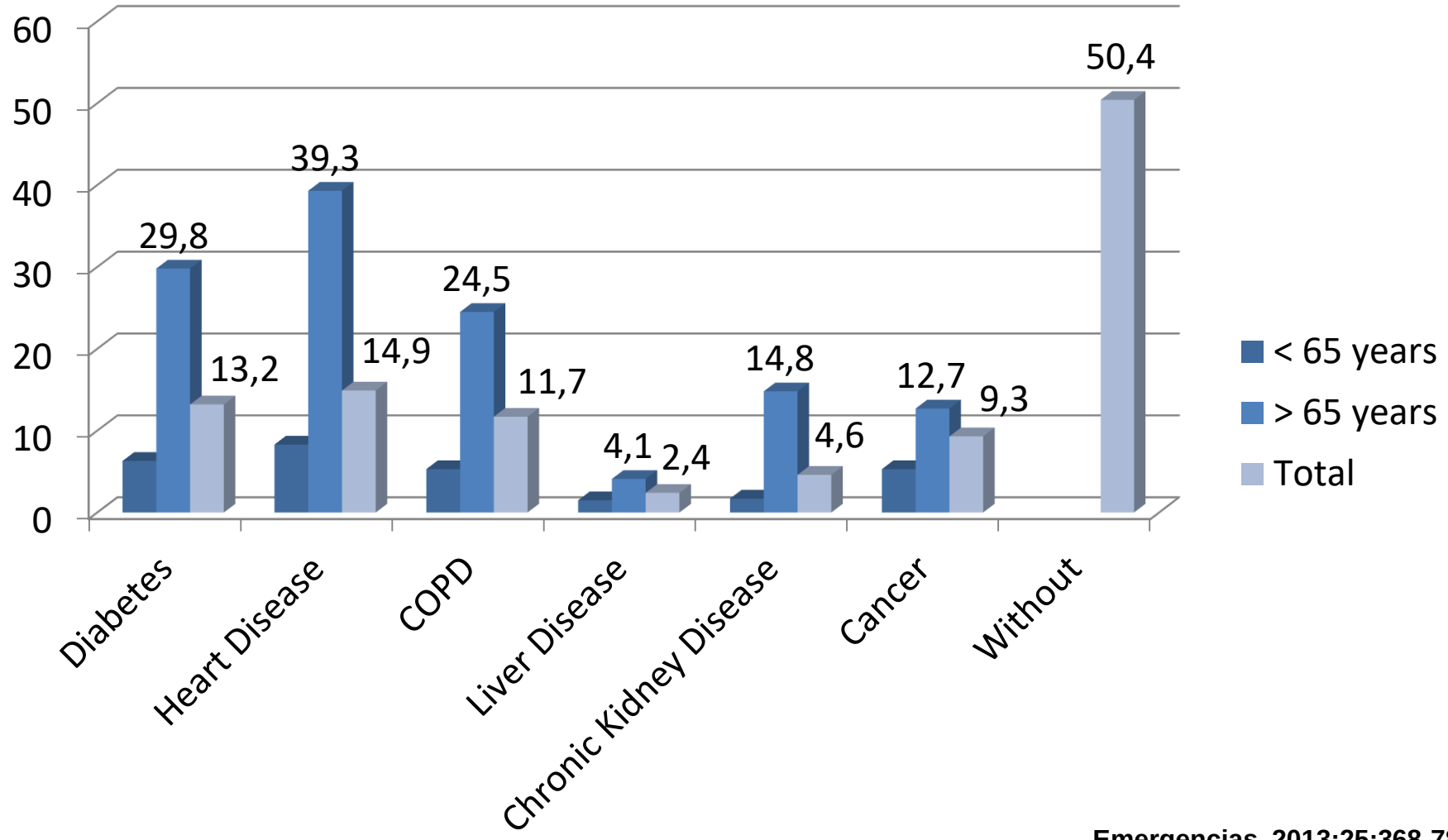


- **Sepsis criteria: 5.3% (2000) vs 6.2% (2013); p=0.001; RP 1.17; IC 95% (1.07-1.27)**
- **Increase prevalence of patients attended for infections in the ED with a profile of older patients, comorbidity, risk factors and sepsis**

Emergencias. 2013;25:368-78

Population profile

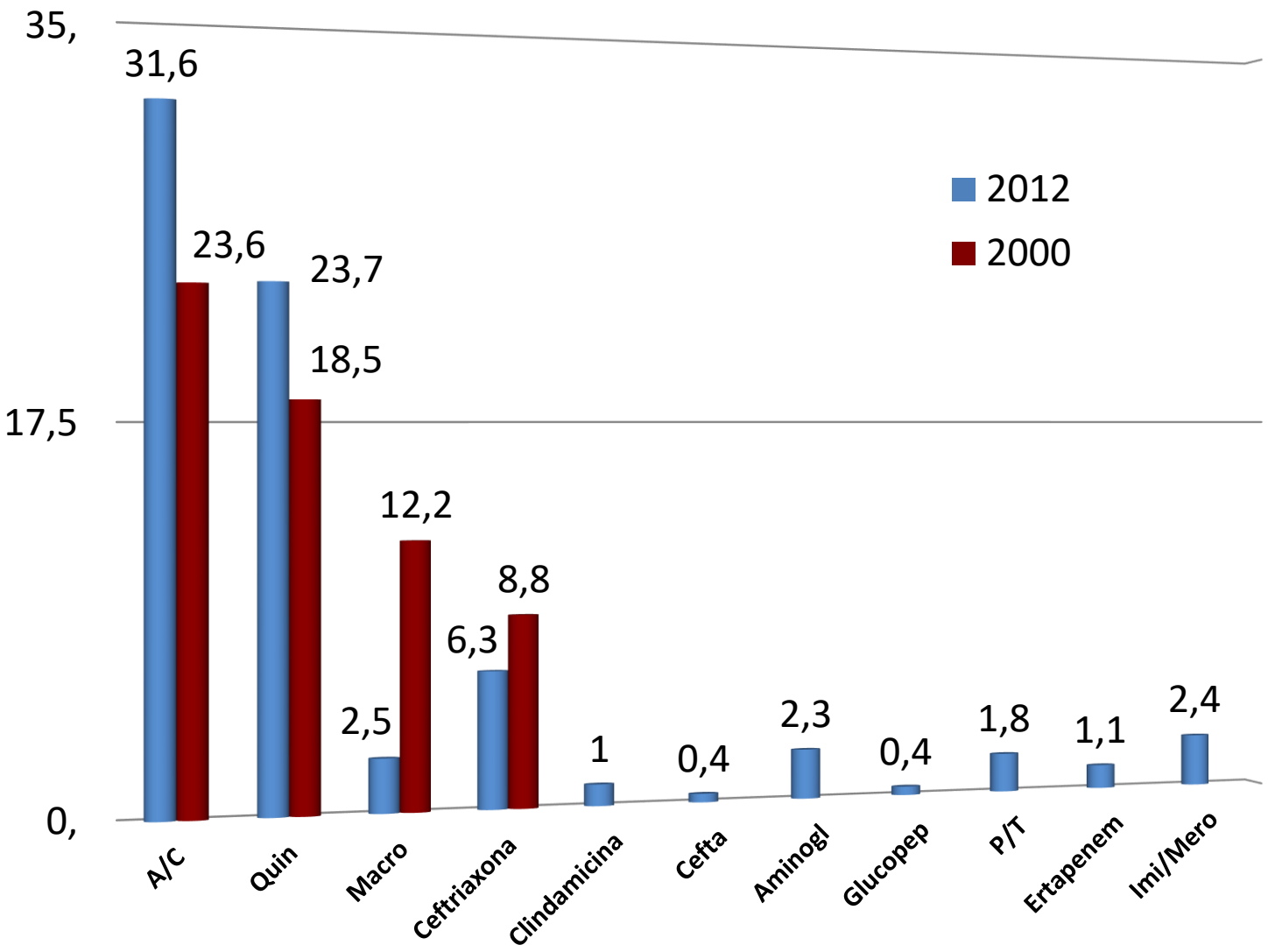
The burden of infection and antibiotic prescription in the ER: where it all begins!



Emergencias. 2013;25:368-78

Which antibiotic treatment are we using?

The burden of infection and antibiotic prescription in the ER: where it all begins!

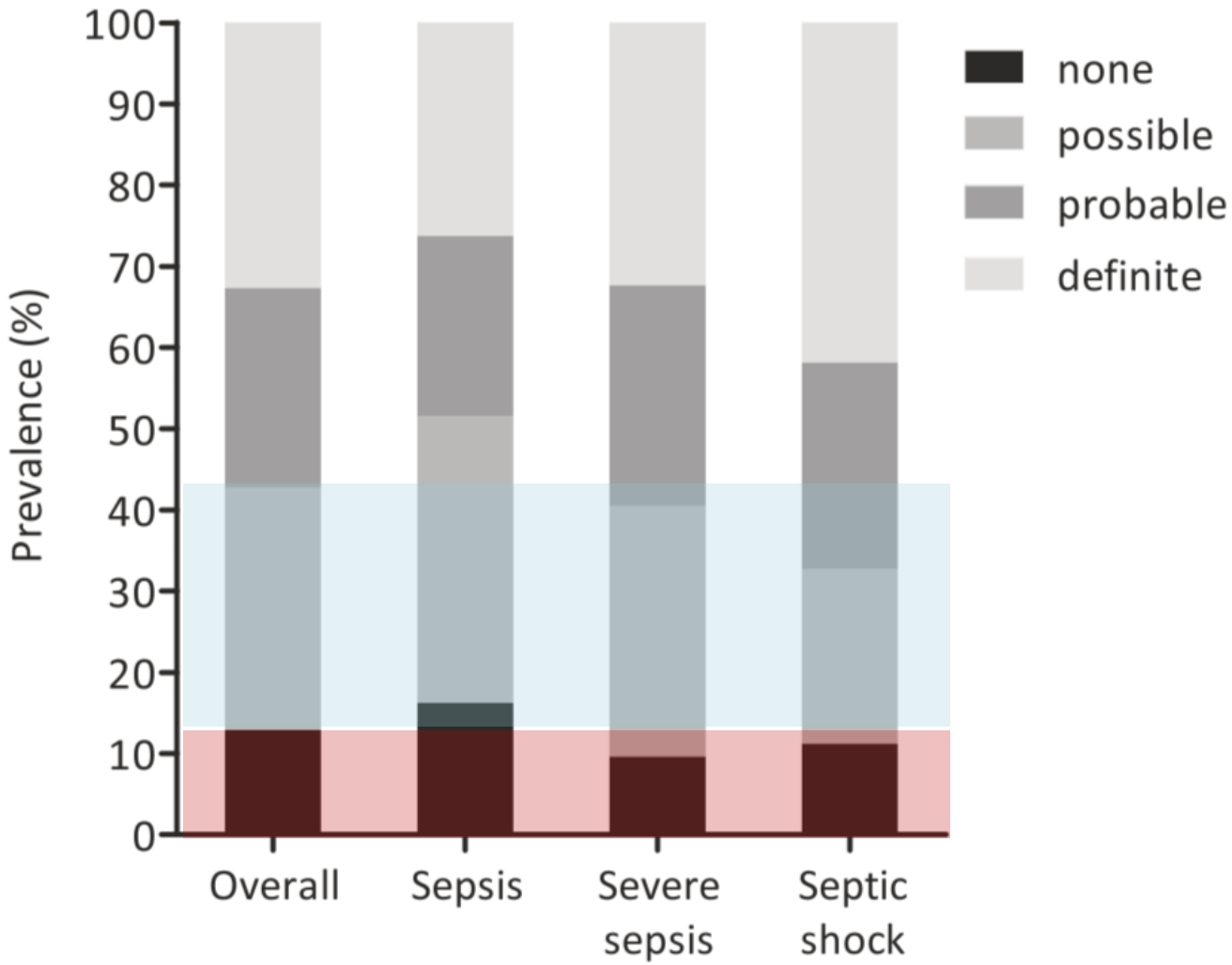


Emergencias. 2013;25:368-78

Problems

Is the patient infected?

The burden of infection and antibiotic prescription in the ER: where it all begins!



Klein Klouwenberg PM. Crit Care. 2015;19:319

Is the patient infected?

The burden of infection and antibiotic prescription in the ER: where it all begins!

	Efecto	Etiología
Tissue damage	Production of pro and anti-inflammatories	Injuries, hypoxia, ischemia, toxins
Hemodynamic effects (initial stages)	Decrease in peripheral resistances, with increased cardiac output and tachycardia	Distributive shock: anaphylaxis, pancreatitis, spinal cord injuries
Hemodynamic effects (late stages)	Increase in peripheral resistances, decrease in cardiac output, colder peripheral limbs with poor capillary refill time	Hypovolemic shock
Laboratory data	Leukocytosis with left deviation Coagulopathy C reactive protein Procalcitonin Lactic	Physiological stress Systemic inflammation
Fever	Cardinal sign of infection Cytokines in the hypothalamus	Problems in the elderly, immunosuppressed, patients with biological therapies

Long B, et al. J Emerg Med. 2017;52:34-42

Is the patient infected?

The burden of infection and antibiotic prescription in the ER: where it all begins!

%	Reason
41	Unspecific symptomatology
30,7	Misinterpretation of clinical signs
19,2	Physical exploration
9,1	Interpretation of results

Okafor N. Emerg Med J. 2016;33:245-52

Is the patient infected?

The burden of infection and antibiotic prescription in the ER: where it all begins!

Table 1 Diagnostic error frequency

Disease	Number of cases (%) (N=209)
Sepsis	20 (9.6)
Acute coronary syndrome	19 (9.1)
Fractures—vertebral spine, extremity, rib or pelvic	18 (8.6)
Vascular injury*	18 (8.6)
Cerebrovascular accident	8 (3.8)
Cardiac dysrhythmia	6 (2.9)
Non-septic shock	6 (2.9)
Hypoglycaemia	6 (2.9)
Ectopic pregnancy	5 (2.4)
Electrolyte derangement	5 (2.4)
Pericardial effusion	5 (2.4)
Pneumonia	5 (2.4)
Pulmonary embolism	5 (2.4)
Abscess	4 (1.9)
Appendicitis	4 (1.9)

Reason
symptomatology
ation of clinical signs
al exploration
tation of results

Okafor N. Emerg Med J. 2016;33:245-52

Conventional detection of sepsis

- **Detection of bacterial pathogen**
  - Slow and all too often negative
- **Detection of host response**
  - NEWS for fever, tachycardia, tachypnoea
  - "Conventional" lab tests (WBC, CRP etc)
  - The eyeball test

Is the patient severely illness?

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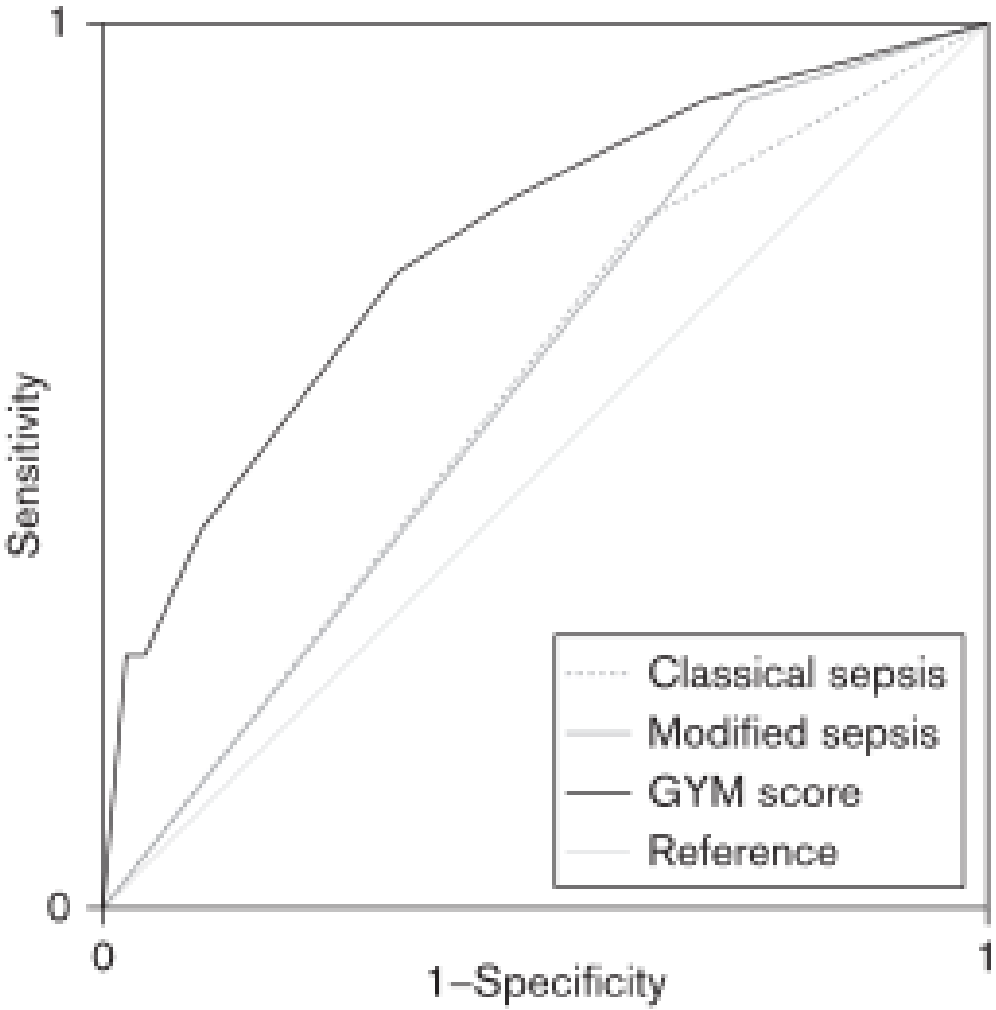

GYM score: 30-day mortality predictive model in elderly patients attended in the emergency department with infection

Juan González del Castillo[a,c], Luis Escobar-Curbelo[c], Mikel Martínez-Ortíz de Zárate[d], Ferrán Llopis-Roca[e], Jorge García-Lamberechts[a,c], Álvaro Moreno-Cuervo[a], Cristina Fernández[b,c] and Francisco Javier Martín-Sánchez[a,c]; Representing the Infectious Disease Group of Spanish Emergency Medicine Society

	OR	IC 95%	p
(Glasgow < 15)	7,27	2,78-19,01	< 0,001
TachYpnea > 20	2,34	0,88-6,18	0,086
CoMorbidity (Charlson ≥ 3)	3,42	1,35-8,68	0,009

SIRS: 0.58 (95% CI 0.488–0.681)
SEPSIS: 0.59 (95% CI: 0.502–0.685)
GYM: 0.751 (95% CI: 0.660–0.841)

González del Castillo J, et al. Eur J Emerg Med. 2015:24:183-188

Is the patient severely illness?

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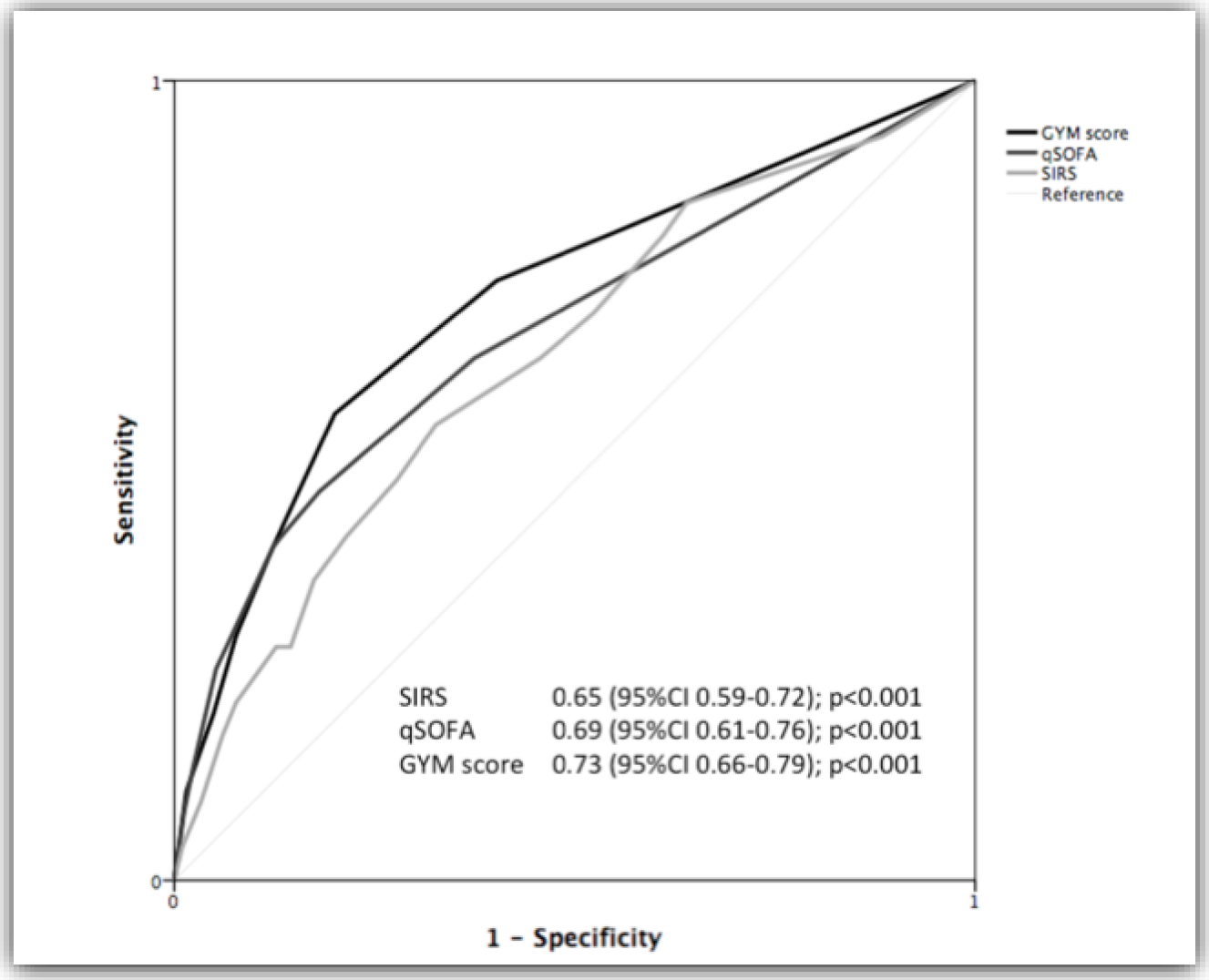

González Del Castillo J, et al. Eur J Clin Microbiol Infect Dis. 2017;36:2361-2369

Is the patient severely illness?

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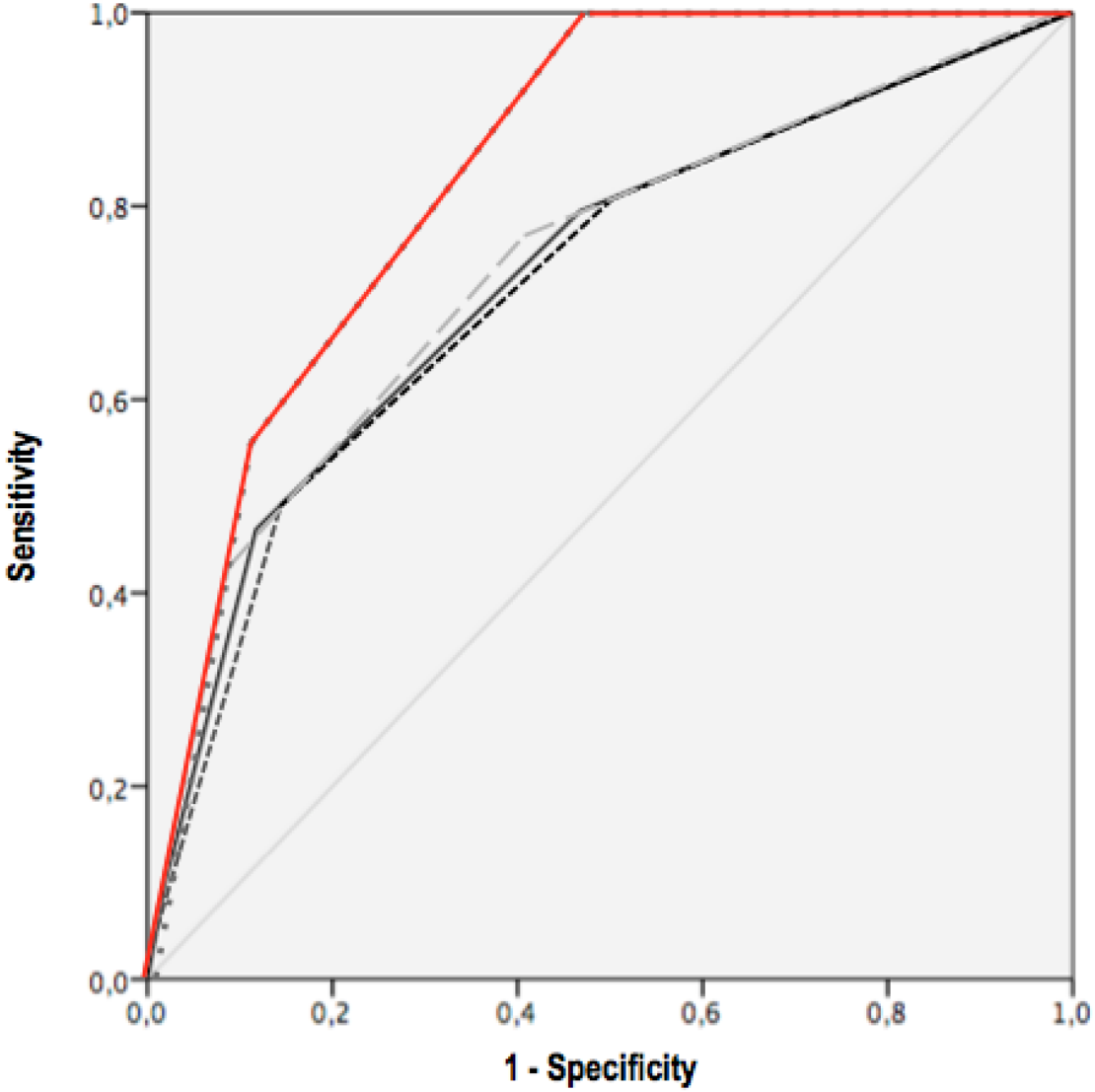


All: AUC 0.725 (0.682-0.768) p<0.001

Respiratory: AUC 0.722 (0.668-0.776) p<0.001

Non resp.: AUC 0.724 (0.653-0.796) p<0.001

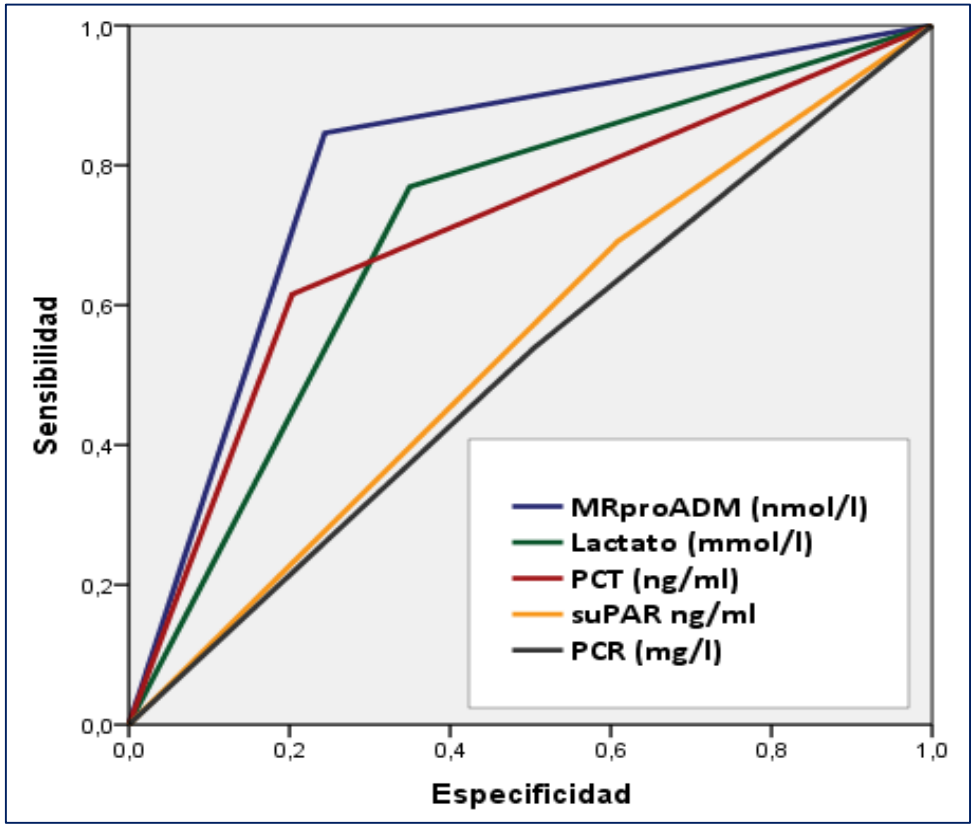
Urinary: AUC 0.841 (0.781-0.902) p<0.001

Reference

Comparison of the ROC curve and area under curve (AUC) of qSOFA to predict 30-day mortality: Respiratory versus non respiratory, p = 0.915; Respiratory versus urinary, p < 0.001.

Estella A et al. Eur J Intern Med. 2018

Accuracy of biomarkers to predict 30-day mortality in patients aged ≥ 75 years treated in the emergency department for infection



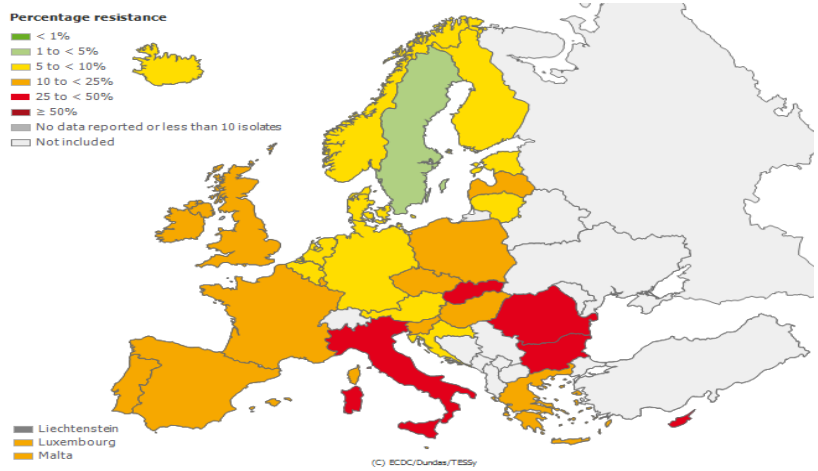
	AUC-ROC (IC 95%)	p value
MRproADM	0,801 (0,678-0,924)	< 0,001
Lactato	0,710 (0,567-0,853)	0,013
PCT	0,706 (0,545-0,868)	0,015
suPAR	0,541 (0,380-0,703)	0,625
CRP	0,517 (0,352-0,683)	0,839

MRproADM (≥ 1,55 nmol/L); Lactato (≥ 2 mmol/L); PCT: procalcitonin (≥ 1,55 nmol/L); suPAR: (≥ 7,1 ng/ml); CRP (≥ 68 mg/L)

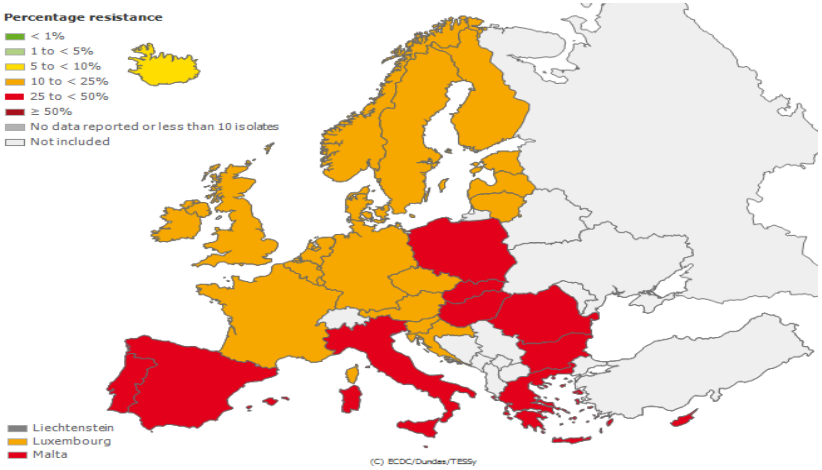
Julián Jimenz A, et al. Enferm Infecc Microbiol Clin. 2017 Dec 27

Problems of resistances

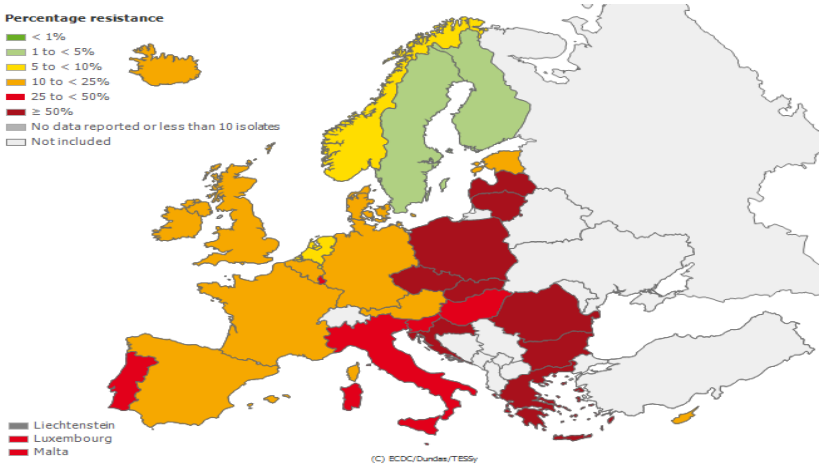
The burden of infection and antibiotic prescription in the ER: where it all begins!



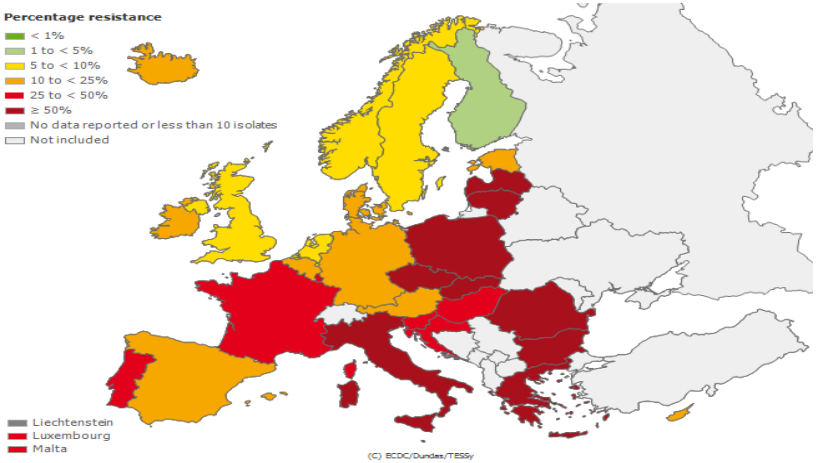
E. Coli resistance to Ceftriaxone



E. Coli resistance to Quinolones



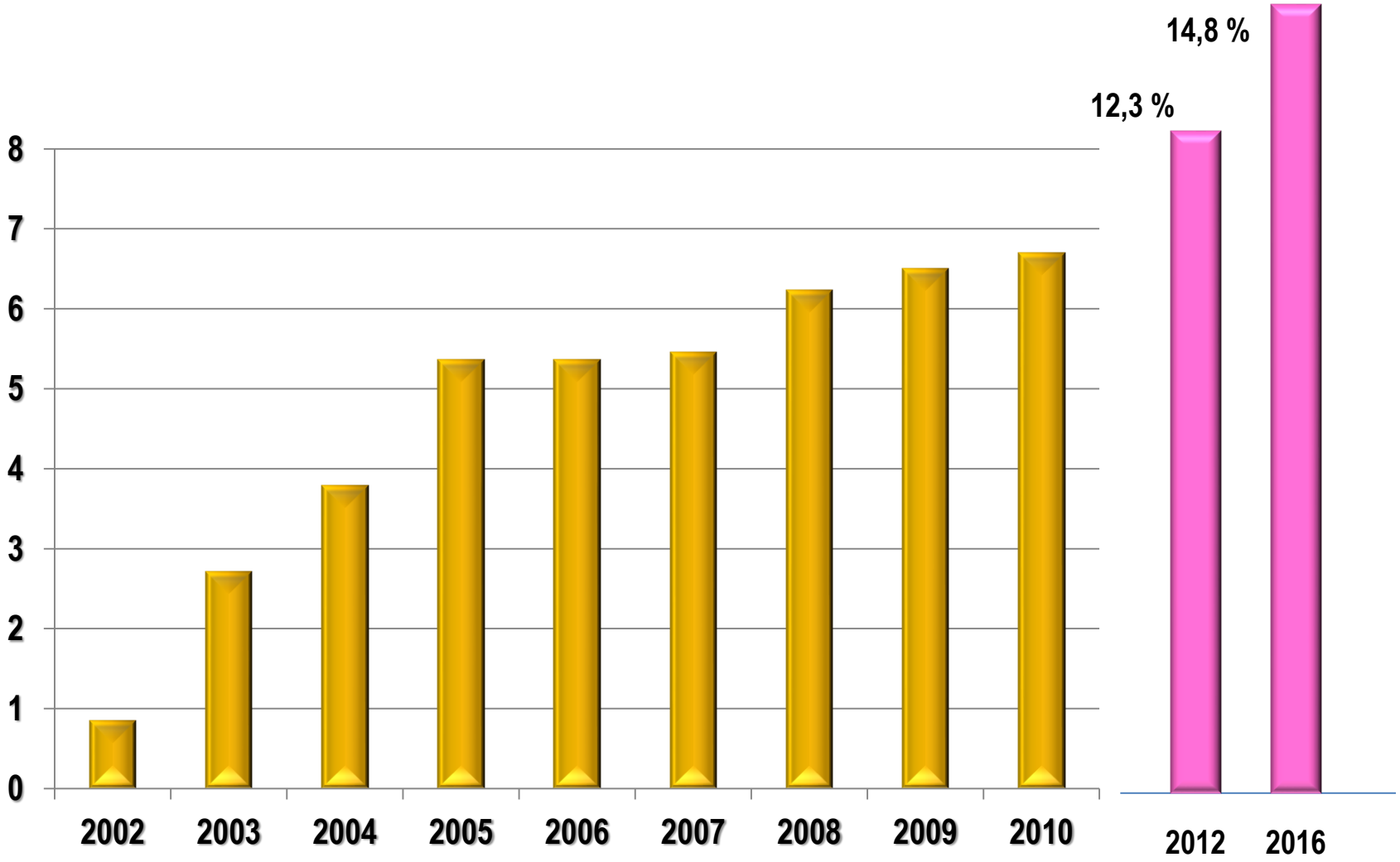
Klebsiella resistance to Ceftriaxone



Klebsiella resistance to Quinolones

Problems of resistances

The burden of infection and antibiotic prescription in the ER: where it all begins!



Servicio de Microbiología Clínica. Hospital Clínico San Carlos. Madrid.

Problems of resistances

The burden of infection and antibiotic prescription in the ER: where it all begins!

December 2017	Primary care	Outpatient clinic	Hospital
Ceftazidima	8%	8%	25%
Piperacilina-tazobactam	9%	9%	21%
Ciprofloxacino	26%	32%	44%
Gentamicina	18%	23%	33%
Amikacina	12%	18%	23%
Imipenem	19%	24%	39%
Colistina	5%	4%	4%

Problems of resistances

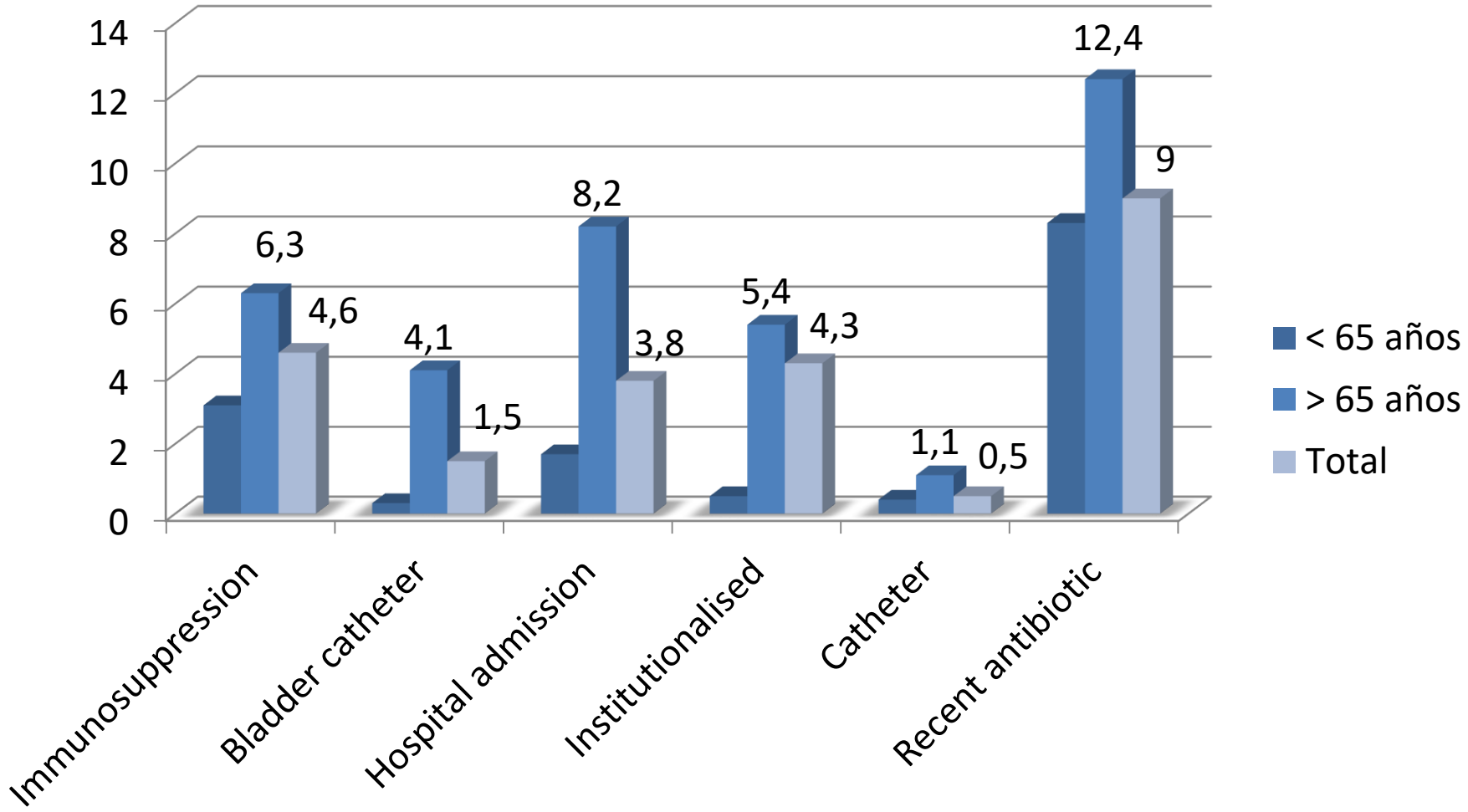
The burden of infection and antibiotic prescription in the ER: where it all begins!

	BLEE	SAMR	EPC	ERV	Pseudomona Aeruginosa
Tratamiento frecuente antibiótico	●	●	●	●	●
Procedencia de Residencia	●	●	●		
Alta dependencia en ABVD	●		●		
Compleja comorbilidad			●	●	
Hospitalización previa reciente	●	●	●		
Sondaje urinario	●		●		
Reciente cirugía o técnica invasiva	●		●	●	
Inmunosupresión				●	●
Estancia en UCI		●	●	●	●

BLEE: *Enterobacterias Betalactamasas de espectro extendido.* ***SAMR:*** *Staphylococcus Aureus Meticilin Resistente. Enterobacterias Productoras de Carbapenemasas.* ***ERV:*** *Enterococos Resistentes a la Vancomicina.*

Problems of resistances

The burden of infection and antibiotic prescription in the ER: where it all begins!



Emergencias. 2013;25:368-78

What are de consequences of inappropriate antibiotic treatment?

The burden of infection and antibiotic prescription in the ER: where it all begins!

Reference	% Pacients with Antibiotic	% Appropiate Antibiotics
Castel JAMA 1977;237	34	36
Kunin Ann Intern Med 1973;79	28	49
Stevens Arch Intern Med 1981;141	36	31
Moss Lancet 1981;2	28	71
Martínez- Luengas Rev Clin Esp 1987;180	37	42
Kisuule J Hosp. Med 2008	ND	43

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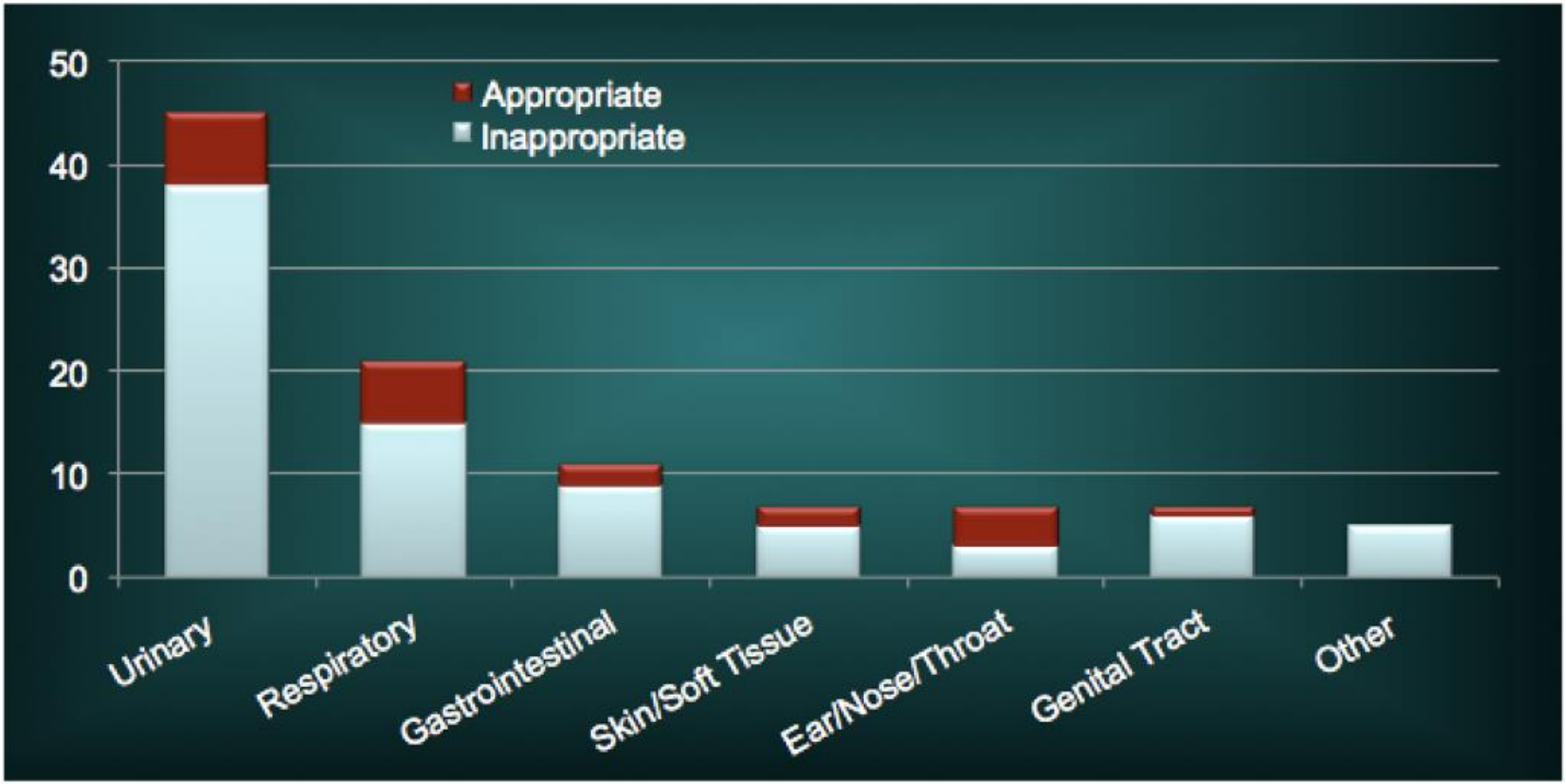

Lautenbach, *Arch Intern Med* 2003;163:601

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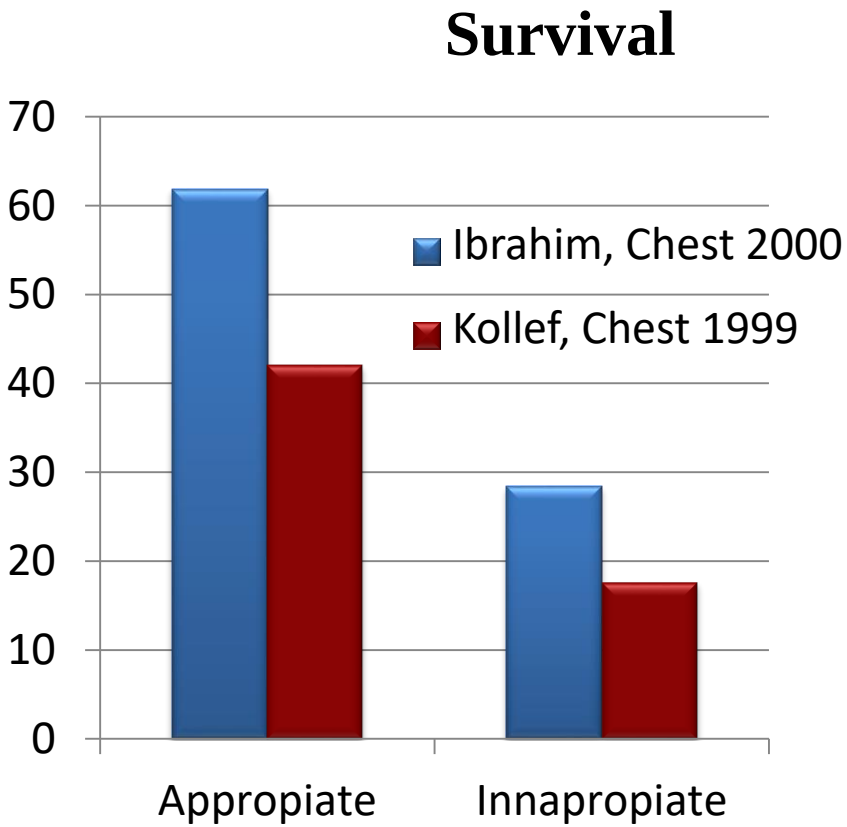

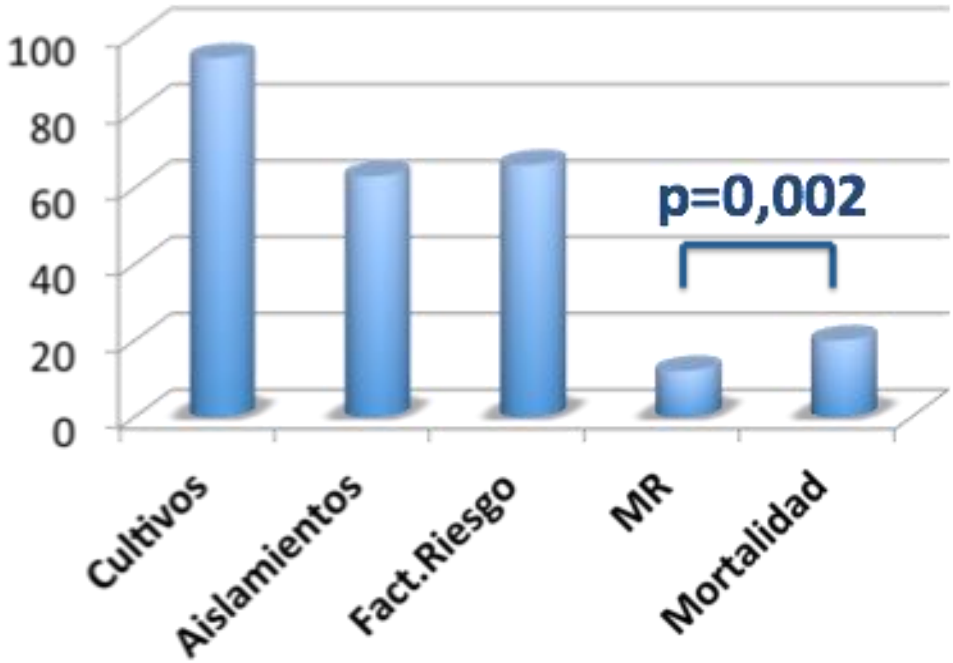

González Del Castillo J. J Emerg Med. 2016;51:e63-4

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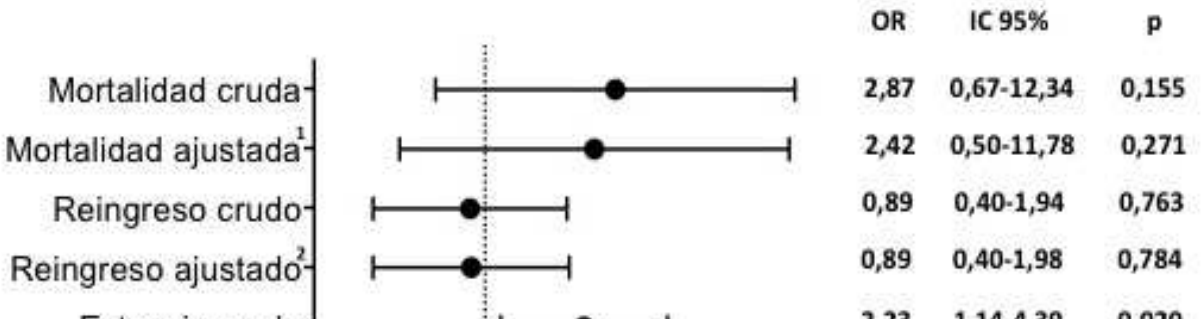
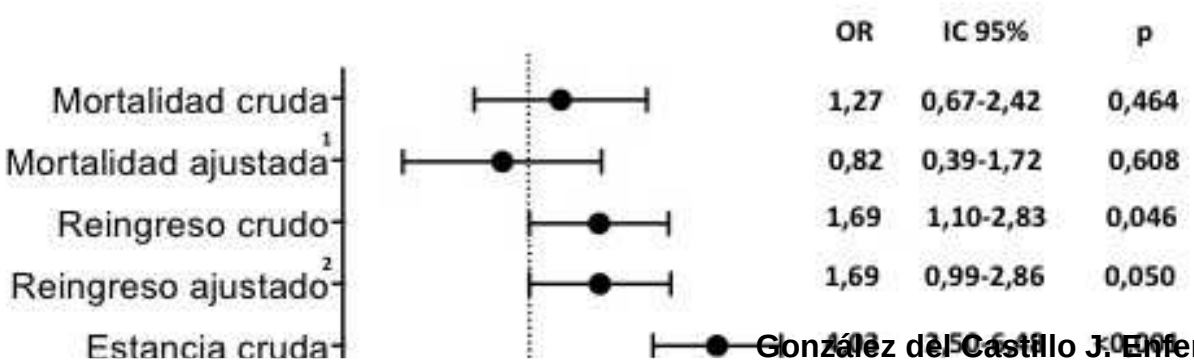
Innapropiate Treatment



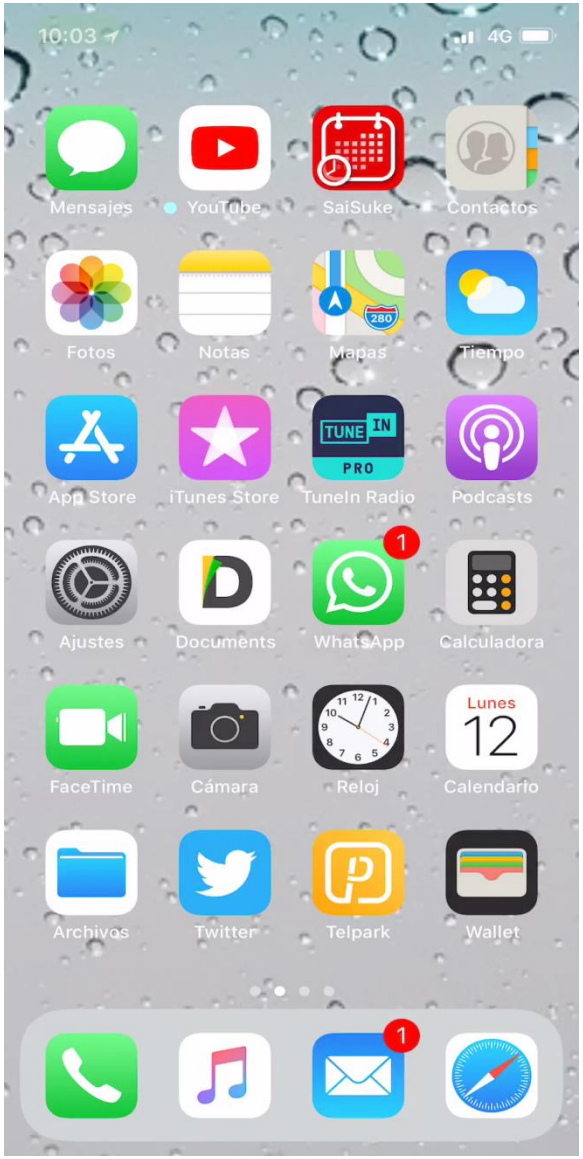
Inadequate Treatment



González del Castillo J. Enferm Infecc Microbiol Clin. 2017;35:208-213

Solutions

The burden of infection and antibiotic prescription in the ER: where it all begins!



Solutions

The burden of infection and antibiotic prescription in the ER: where it all begins!

1.- Increased difficult population

2.- Difficult envoirement

3.- Select population to have infection by multi-drug resistance microorganism based on a risk predict model

4.- Select a population on high risk of poor outcome in which inappropriate antibiotic would have consequences in terms of increases mortality

5.- Apply a quick microbiological diagnosis (RT-PCR assay)

Solutions

The burden of infection and antibiotic prescription in the ER: where it all begins!

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Muchas gracias