Incentives for clinicians and CHWs

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Conflict of interest declaration

I have the following potential conflicts of interest to report

Type of Affiliation / Financial Interest	Name of Commercial Company
Receipt of grants / research supports:	Cepheid, STAT Dx (Qiagen), Astra-Zeneca, ABAC Therapeutics, Shionogi
Receipt of honoraria or consultation fees:	Roche Diagnostics, Siemens, Grifols, Quantum Dx, DeepUll
Participation in a company sponsored speaker's bureau	MSD, Gilead, Becton-Dickinson

Financial incentives based on objectives

Rapid and accurate microbiological diagnosis

1. Need of rapid microbiology diagnosis

2. Rapid test to diagnose severe infections

3. Clinical Microbiology Laboratory 24/7

1. Need of rapid microbiology diagnosis

Delay in the administration of adequate empiric antibiotic treatment (Sepsis)

ANTIMICROBIAL AGENTS AND CHEMOTHERAPY, Nov. 2010, p. 4851–4863 Vol. 54, No. 11
0066-4804/10/$12.00 doi:10.1128/AAC.00627-10

Systematic Review and Meta-Analysis of the Efficacy of Appropriate Empiric Antibiotic Therapy for Sepsis▽†

Mical Paul,[1]* Vered Shani,[2] Eli Muchtar,[2] Galia Kariv,[2] Eyal Robenshtok,[2] and Leonard Leibovici[2]

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Empiric Antibiotic Treatment Reduces Mortality in Severe Sepsis and Septic Shock From the First Hour: Results From a Guideline-Based Performance Improvement Program*

Ricard Ferrer, MD, PhD[1]; Ignacio Martin-Loeches, MD, PhD[2]; Gary Phillips, MAS[3]; Tiffany M. Osborn, MD, MPH[4]; Sean Townsend, MD[5]; R. Phillip Dellinger, MD, FCCP, FCCM[6]; [illegible] MD, PhD[2]; Christa Schorr, RN, MSN[6]; Mitchell M. Levy, MD, FCCP, FCCM[7]

Rapid diagnosis

Marquet et al. Critical Care (2015) 19:63
DOI 10.1186/s13054-015-0795-y

CRITICAL CARE

RESEARCH Open Access

Incidence and outcome of inappropriate in-hospital empiric antibiotics for severe infection: a systematic review and meta-analysis

Kristel Marquet[1,2*], An Liesenborgs[2], Jochen Bergs[3], Arthur Vleugels[1,4] and Neree Claes[1,5]

Increased Time to Initial Antimicrobial Administration Is Associated With Progression to Septic Shock in Severe Sepsis Patients

Bristol B. Whiles, BS[1]; Amanda S. Deis, MS[1]; Steven Q. Simpson, MD[2]

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al of Infection (2017) 74, 131–141

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www.elsevierhealth.com/journals/jinf

BIAM British Infection Association

Attributable mortality of ICU-acquired bloodstream infections: Impact of the source, causative micro-organism, resistance profile and antimicrobial therapy

CrossMark

Kadri SS et al: Inappropiate empirical antibiotic therapy for bloodstream infections based on discordant in-vitro susceptibilities: a retrospective cohort analysis of prevalence, predictors, and mortality risk in US hospitals

Lancet Infectious Diseases 2021; 21: 241

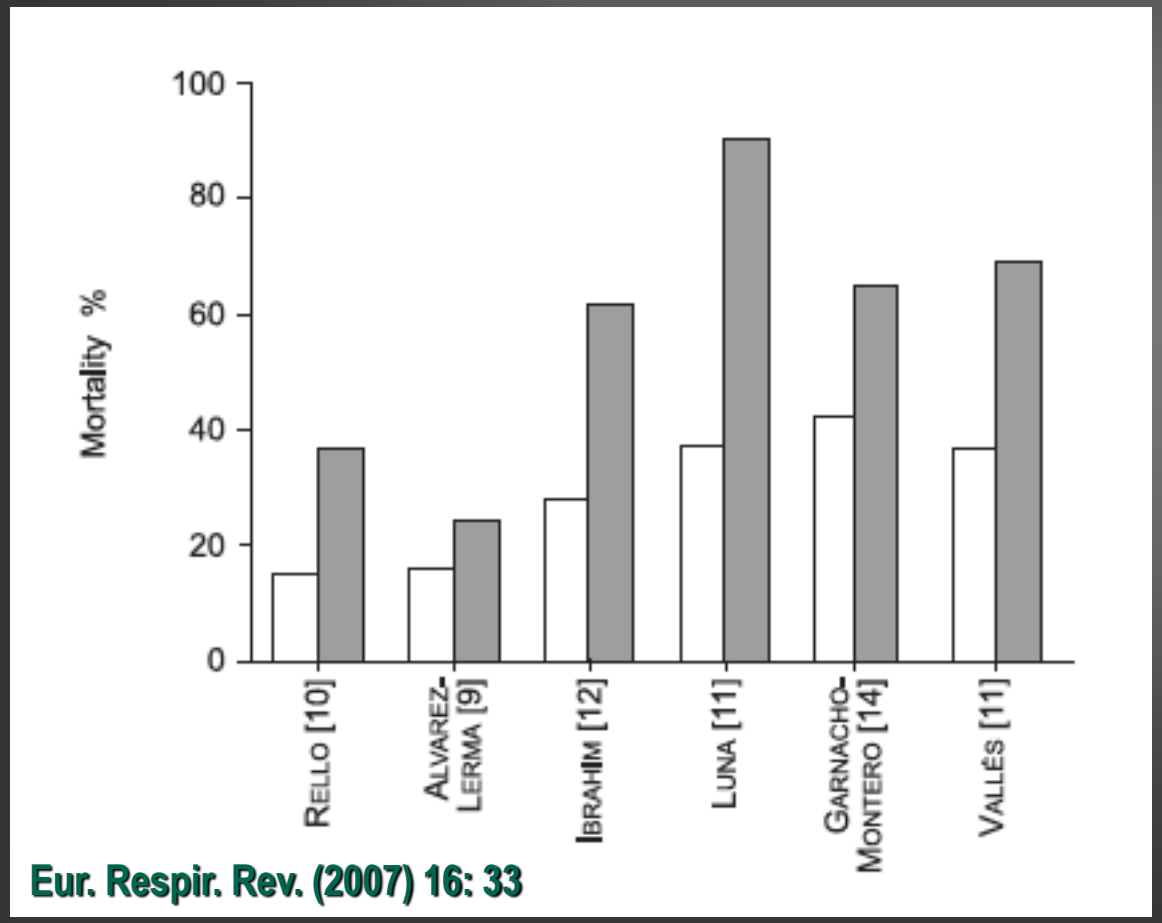
131 hospitals in the USA

21608 patients with bloodstream infectiions received empirical antibiotic therapy on the day of first blood culture collection

	Concordant empirical antibiotic therapy (n=17 443)	Discordant empirical antibiotic therapy (n=4165)	
Year of admission			
2005–08	4824 (28%)	1041 (25%)	17.7%
2009–11	5943 (34%)	1384 (33%)	18.8%
2012–14	6676 (38%)	1740 (42%)	20.6%

Receiving discordant empirical antibiotic therapy was associated with increased odds of mortality overall, even in patients without sepsis.

Delay in the administration of adequate empiric antibiotic treatment (Hospital pneumonia)



Eur. Respir. Rev. (2007) 16: 33

Rapid diagnosis

Impact of the rapid test on therapeutic decisions

- Current value of rapid ID and AST or resistance determinants
  - Earlier appropriate treatment
  - Treatment with more narrow spectrum antibiotics
  - Reduce antibiotic consumption
  - Identify resistance trends to better prevent growth and spread of resistance
  - To decide if the patient needs to be isolated
  - Decreased the cost of the hospital

1. Need of rapid microbiology diagnosis

2. Rapid test to diagnose severe infections

Blood

Reduces the time to ID in 22.8 h

Reduces the time to effective treatment in 11.6 h

Impact of MALDI-TOF will be highly dependent on the clinician

- Mortality reduction of 23%
- Mortality reduction of 35% together w/ ASP

Microb Biotechnol (2022) 15: 2667

Blood culture bottle

6 – 72 hours

Negative culture

Positive culture

Gram stain

Preparation for MALDI-ToF MS

30 min.

15 min - 2 hours

10 min.

Resistance
- Bioch. Tests
- LF
- PCR / LAMP
- MALDI

Identification

Direct antibiogram

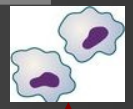
Detection of the microorganism by MALDI-ToF directly from urine samples

Urine

Culture

Determine the count of bacteria
(Flow cytometry)

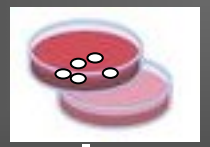
Centrifugation
low speed

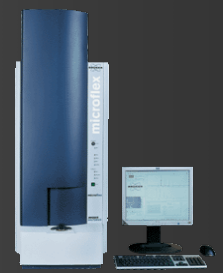


Centrifugation
High speed

Main infections causing sepsis:

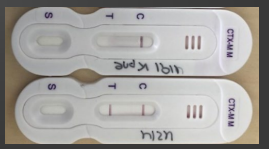
- Urinary tract infections
- Pneumonia
- Intrabdominal infections





Direct AST

Resistance
- LF
- PCR / LAMP



Zboromyrska Y, et al. CMI (2016) 22: 561.e1-6

Fernandez-Pittol, et al. JCM (2024) 62: e0113623

Zboromyrska Y et al: Implementation of a new protocol for direct identification from urine in the routine microbiological diagnosis

Antibiotics 2022; 11: 582

Regarding the 54 cases reliably and positively identified by culture, in 38 cases (70.3%), the patient received adequate empirical therapy and the treatment was not modified, while in 16 cases (29.7%) the treatment was modified, according to the results of direct identification and detection or not of ESBL and/or carbapenemases.

In relation to the empirical treatment in ten cases of the ESBL-producing strains, in four patients ceftriaxone was changed to ertapenem after receiving the results from the Microbiology Department. Two of these four patients were immunosuppressed (a heart transplant patient and a HIV patient) and presented bacteremia from a urinary focus, with the same strain being isolated in the blood culture.

Vila J, et al. Perspectivas de futuro de la espectrometría de masas
Enfer. Infec. Microb. Clin. 2016; 34 (supl.2): 53

Direct detection of bacteria from a clinical sample

SAMPLE	GRAM STAIN	DIRECT MALDI-TOF MS ID	CONVENTIONAL CULTURE
Amniotic fluid	GNB	*Capnocytophaga sputigena*	*Capnocytophaga sputigena*
Amniotic fluid	GPB	*L. monocytogenes*	*Listeria monocytogenes*
Amniotic fluid	GPB	*L. monocytogenes*	*Listeria monocytogenes*
Cerebrospinal fluid	Not performed	*P. aeruginosa*	*Pseudomonas aeruginosa*
Cerebrospinal fluid	GNB	*P. aeruginosa*	*Pseudomonas aeruginosa*
Cerebrospinal fluid	GNB	*P. aeruginosa*	*Pseudomonas aeruginosa*
Amniotic fluid	GNB	*P. mirabilis*	*Proteus mirabilis*
Amniotic fluid	Streptococci	*S. agalactiae*	*Streptococcus agalactiae*
Amniotic fluid	Streptococci	*S. agalactiae*	*Streptococcus agalactiae, Prevotella bivia*
Amniotic fluid	Staphylococci	*S. aureus*	*Staphylococcus aureus*
Synovial fluid	Streptococci	*S. pneumoniae*	*Streptococcus pneumoniae*
Amniotic fluid	GNB	*E. coli*	*Escherichia coli*
Bile	Streptococci	*E. faecium*	*Enterococcus faecium*
Amniotic fluid	Staphylococci	*S. epidermidis*	*Staphylococcus epidermidis*
Amniotic fluid	Streptococci	*S. oralis*	*Streptococcus oralis*
Cerebrospinal fluid	No microorganisms	NP	*Staphylococcus epidermidis*
Peritoneal fluid	No microorganisms	NP	*Acinetobacter pittii*
Amniotic fluid	Yeast cells	NP	*Candida albicans*

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Impact of the rapid test on therapeutic decisions

The Effect of Molecular Rapid Diagnostic Testing on Clinical Outcomes in Bloodstream Infections: A Systematic Review and Meta-analysis

Clinical Infectious Diseases (2017) 64: 15

Enferm Infecc Microbiol Clin (Engl Ed). 2022 Jan;40(1):1-4

Fidalgo B et al: Information delay of significant bloodstream isolates and patient mortality: A retrospective análisis of 6,225 adult patients with bloodstream infection

Clinical Infectious Diseases 2023; 77: 680

- The aim of this study was to evaluate the clinical and prognostic impact of communicating microbiological information in real time in adult patients with a bloodstream infection

- We have retrospectively reviewed 6,225 clinical episodes of bacteraemia in a 700-bed tertiary teaching hospital from January 2013 to December 2019. Bacteraemia associated mortality was compared between periods where blood culture result was relayed to the infectious disease specialist [IDS] in real time and those periods where information was delayed to the following morning

Bacteraemia aetiology	Dead/Alive	Real-time information Dead/Alive	Delayed Information Dead/Alive	OR	(95% CI)	P-value
All	625/5600	193/1937	432/3663	1.18	(0.99, 1.42)	0.06
Enterobacterales	262/2867	58/957	204/1910	1.76	(1.30, 2.38)	0.00
Pseudomonas aeruginosa	65/466	21/156	44/310	1.05	(0.61, 1.83)	0.85
Staphylococcus aureus	72/430	21/137	51/293	1.14	(0.66, 1.96)	0.65
Enterococcus (E.faecalis and E.faecium)	94/625	32/231	62/394	1.14	(0.72, 1.79)	0.58

The need for a 24/7 hospital coverage for a clinical microbiologist and/or an ID specialist should be revisited in view of the important prognostic implications

CONCLUSIONS

- There is clinical evidence that rapid identification and determination of the antimicrobial susceptibility of sepsis or pneumonia helps in the implementation of appropriate antimicrobial therapy and, therefore, in reducing mortality
- The use of MALDI-ToF mass spectrometry together with the detection of resistant determinants from positive blood or urine cultures has a clinical impact on sepsis and urosepsis
- This rapid diagnostic approach will have a greater impact on mortality if the information is provided to the ASP team
- A 24/7 microbiological service is essential for the diagnosis of serious infections and microbiologists, physicians and administrators should make joint efforts to establish this service

Thanks

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