CLINICAL MICROBIOLOGY
KRONOBERG AND BLEKINGE
SWEDISH NRL FOR PHENOTYPIC AST
EUCAST DEVELOPMENT LABORATORY

WHO Collaborating Centre
for Standardization of
Antimicrobial Susceptibility Testing

EURL
PUBLIC HEALTH
ANTIMICROBIAL RESISTANCE (AMR)
IN BACTERIA

Scientific support for rapid diagnostics, with focus on rapid AST

NordicAST 2026, Malmö

Oskar Ekelund

Clinical microbiology Kronoberg/Blekinge

Växjö/Karlskrona, Sweden

No single diagnostic test will in itself improve survival of patients

Outline - the more comprehensive version

- How important is the time to adequate treatment in severe bacterial infections?
- The impact of rapid diagnostics on outcome in bloodstream infections
- The impact of rapid AST on outcome in bloodstream infections
- May access to rapid AST affect our choice of empirical therapy?

- Is rapid AST worth the effort?
- If so, when and how?

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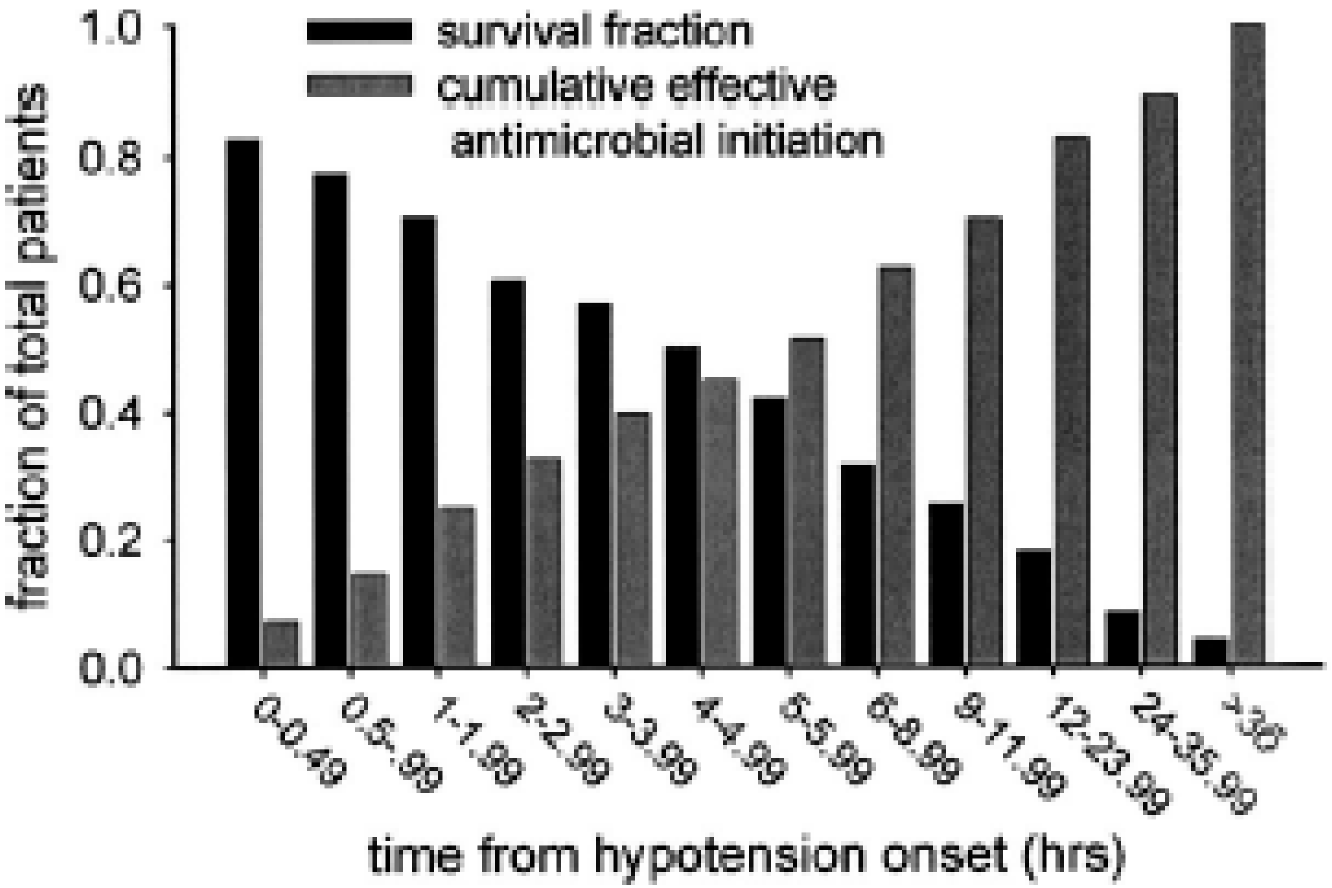
The need for early targeted therapy in sepsis



Kumar A et al. Crit Care Med. 2006 Jun;34(6):1589-96.

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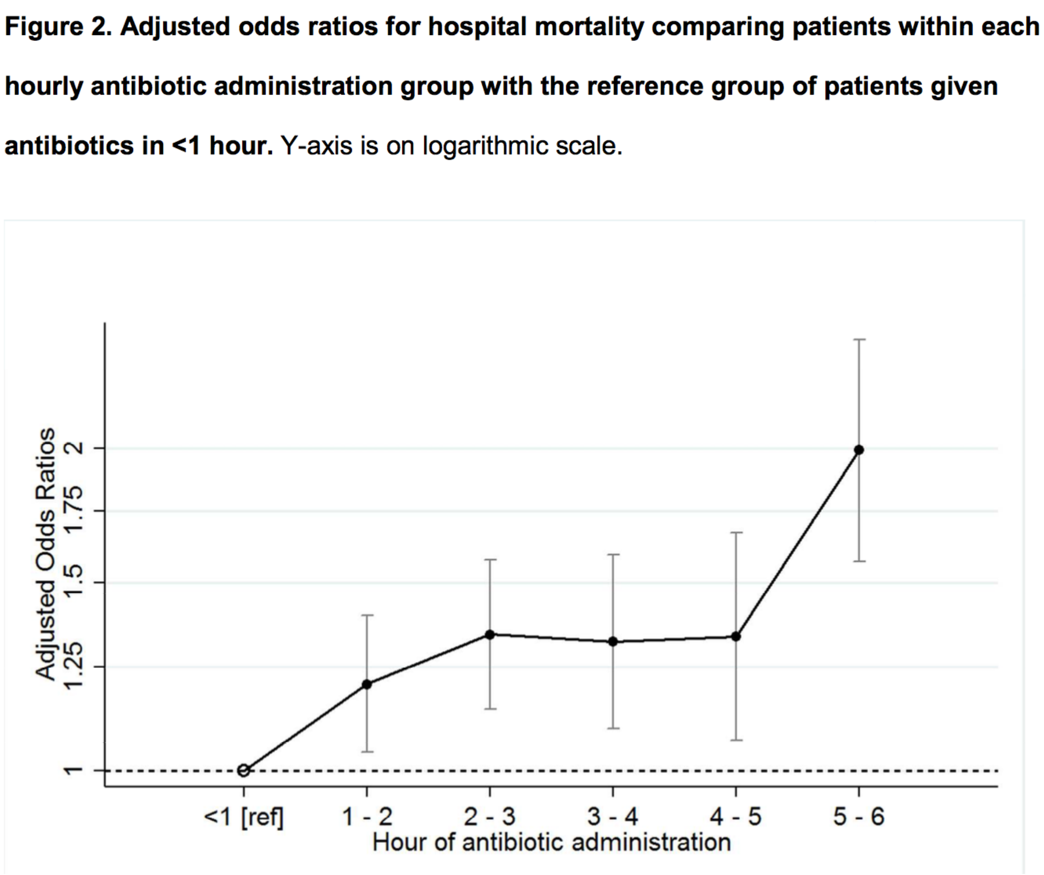
The need for early targeted therapy in sepsis

Retrospective study of 35 000 patients with septicemia, severe septicemia (n=18210) and septic shock (n=4 668) Absolute increase in mortality per hour delay:

0,3% septicemia

0,4% severe septicemia

1,8% septic shock



Liu VX, et al. Am J Respir Crit Care Med. 2017 Oct 1;196(7):856-863.

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Clinical Infectious Diseases

MAJOR ARTICLE

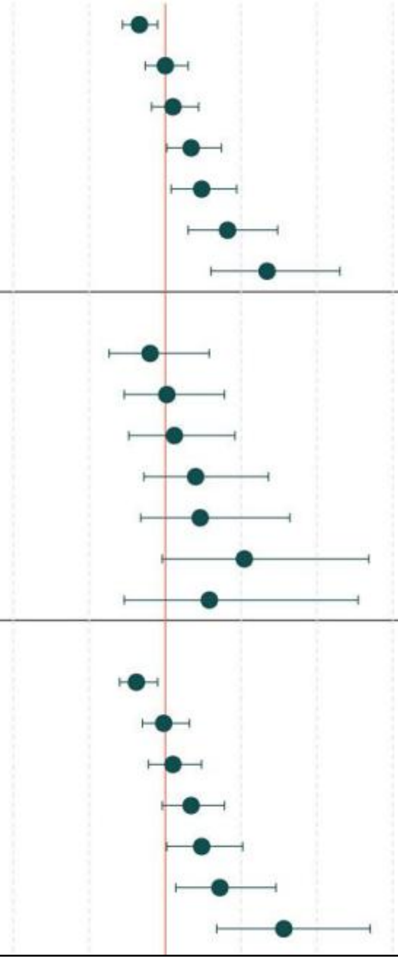
IDSA Infectious Diseases Society of America hivma hiv medicine association OXFORD

Associatio… Treatment… Bloodstrea…

Jasper Van Heuverswyn,[1,a] …

Results. We in… mortality was 11.8%. No association in favo… t the 1, 3 and 6 hours landmark after blo… reatment (adjusted odds ratio 1.17 [95% co… 72 hours. Stratifying by high or low SOFA s…

Landmark time	Inappropriate therapy Events (Episodes)	Appropriate therapy Events (Episodes)	Risk of mortality Adjusted odds ratio (95% CI)
Total cohort			
1 hour	750 (7022)	447 (3266)	0.83 (.72 - .95)
3 hours	530 (4699)	631 (5346)	1.00 (.87 - 1.15)
6 hours	392 (3404)	730 (6458)	1.05 (.91 - 1.22)
12 hours	323 (2594)	752 (7129)	1.17 (1.01 - 1.37)
24 hours	227 (1755)	776 (7837)	1.24 (1.04 - 1.47)
48 hours	150 (1092)	784 (8461)	1.41 (1.15 - 1.74)
72 hours	99 (657)	768 (8908)	1.67 (1.30 - 2.15)
Low SOFA score			
1 hour	133 (2716)	49 (957)	0.90 (.63 - 1.29)
3 hours	100 (1858)	79 (1721)	1.01 (.73 - 1.39)
6 hours	78 (1374)	96 (2151)	1.06 (.76 - 1.46)
12 hours	66 (1009)	108 (2479)	1.20 (.86 - 1.68)
24 hours	43 (617)	120 (2823)	1.23 (.84 - 1.82)
48 hours	33 (385)	124 (3064)	1.52 (.98 - 2.34)
72 hours	18 (239)	129 (3230)	1.29 (.73 - 2.27)
High SOFA score			
1 hour	617 (4306)	398 (2309)	0.81 (.70 - .95)
3 hours	430 (2841)	552 (3625)	0.99 (.85 - 1.16)
6 hours	314 (2030)	634 (4307)	1.05 (.89 - 1.24)
12 hours	257 (1585)	644 (4650)	1.17 (.98 - 1.39)
24 hours	184 (1138)	656 (5014)	1.24 (1.01 - 1.51)
48 hours	117 (707)	660 (5397)	1.36 (1.07 - 1.73)
72 hours	81 (418)	639 (5678)	1.78 (1.34 - 2.35)



Clin Infect Dis. 2023 Feb 8;76(3):469-478. doi: 10.1093/cid/ciac727.

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Mortality impact of further delays in active targeted antibiotic therapy in bacteraemic patients that did not receive initial active empiric treatment: results from the prospective, multicentre cohort PROBAC.

Sandra De la Rosa Riestra , Pedro María Martínez Pérez-Crespo ,
María Teresa Pérez Rodríguez , Adrián Sousa ,
Josune Goikoetxea , José María Reguera Iglesias ,
Carlos Armiñanzas , Inmaculada López-Hernández ,
Luis E. López-Cortés , Jesús Rodríguez-Baño , the PROBAC group

Delay in active therapy	Adjusted OR for mortality	P value
Day 3 or after	1.53	0.006
Day 4 or after	2.26	<0.001
Day 5 or after	4.33	<0.001
Day 6 or after	11.38	<0.001

We conclude that delayed administration of active targeted antibiotic treatment in patients is associated with a deleterious impact in the prognosis of patients; these results reinforce the importance of rapid reporting of blood culture results and of specialized advice in the management of BSI.

DOI: https://doi.org/10.1016/j.ijid.2024.107072

Time indeed seems to be of importance

↓

Can we shorten time to targeted treatment and improve clinical outcome by introducing rapid diagnostics?

AMERICAN SOCIETY FOR MICROBIOLOGY | Clinical Microbiology Reviews

Check for updates

16 June 2025

The American Society for Microbiology's evidence-based laboratory medicine practice guidelines for the diagnosis of bloodstream infections using rapid tests: a systematic review and meta-analysis

Donna M. Wolk,[1] J. Scott Parrott,[2] N. Esther Babady,[3] A. Brian Mochon,[4,5] Ryan Tom,[6] Christen Diel,[7] Jennifer Dien Bard,[8] Amanda Harrington,[9] D. Jane Hata,[10] Amity L. Roberts,[11] Lindsay Boyce,[12] J. Kristie Johnson[13]

<u>Endpoints:</u>

1. Time to targeted therapy
2. Length of stay (total / ICU / infection-related)
3. Mortality

https://doi.org/10.1128/cmr.00137-24

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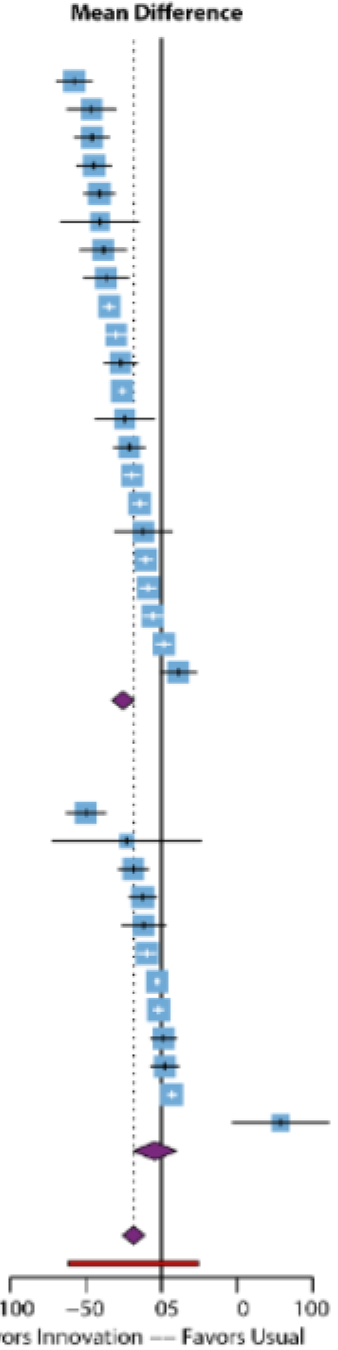
Time to targeted therapy

Δ – 18.4 h (p<0.001)

Study	Experimental Total	Experimental Mean	Experimental SD	Control Total	Control Mean	Control SD	MD	95%-CI	Weight
Chaintype = Comprehensive									
Perez 2014	96	23.20	19.9000	128	80.90	63.0000	−57.70	[−69.32; −46.08]	3.0%
Banerjee 2015	113	9.92	15.0188	122	56.22	87.8836	−46.30	[−62.14; −30.46]	2.8%
Perez 2013	86	29.00	17.0000	79	75.00	48.0000	−46.00	[−57.18; −34.82]	3.0%
Neuberger et al 2008	42	39.36	24.0000	42	84.00	28.8000	−44.64	[−55.98; −33.30]	3.0%
Lockwood 2016	241	30.00	30.0000	149	71.00	59.0000	−41.00	[−51.20; −30.80]	3.0%
Heil 2012	21	14.40	32.8262	61	55.20	86.0721	−40.80	[−66.56; −15.04]	2.3%
Niwa et al 2019	186	53.30	55.0000	180	91.70	88.7000	−38.40	[−53.58; −23.22]	2.8%
MacVane & Hurst 2016	23	22.69	8.1969	45	59.35	48.7158	−36.66	[−51.28; −22.04]	2.9%
Bhavsar et al 2018	137	23.70	11.7000	210	58.40	25.0000	−34.70	[−38.61; −30.79]	3.2%
Bhowmick et al 2018	130	20.15	17.9381	55	50.09	23.0064	−29.94	[−36.76; −23.13]	3.1%
Neuner 2016	107	48.00	41.0000	155	75.00	46.0000	−27.00	[−37.62; −16.38]	3.0%
Idelevich 2015	74	21.40	4.3188	76	47.50	8.4745	−26.10	[−28.24; −23.96]	3.2%
Nagel 2014	32	34.40	29.9000	46	58.70	56.4000	−24.30	[−43.61; −4.99]	2.6%
Eby et al 2018	120	10.60	19.8400	106	31.80	50.1600	−21.20	[−31.39; −11.01]	3.0%
Tafelski et al 2015	41	18.80	5.6000	37	38.30	14.5000	−19.50	[−24.48; −14.52]	3.2%
Felsenstein et al 2016	189	50.20	23.2000	194	64.50	22.2000	−14.30	[−18.85; −9.75]	3.2%
Pardo 2016	23	28.77	23.1737	69	40.85	68.8944	−12.09	[−30.90; 6.73]	2.7%
MacVane & Nolte 2016	145	8.69	13.9277	115	19.08	20.2005	−10.39	[−14.72; −6.06]	3.2%
Avdic et al 2017	137	16.57	21.7280	127	25.43	18.7308	−8.86	[−13.74; −3.97]	3.2%
Roshdy et al 2015	66	4.50	14.4000	54	10.20	19.8000	−5.70	[−12.02; 0.62]	3.2%
Tseng et al 2018	100	53.99	20.6619	103	52.41	12.4863	1.58	[−3.13; 6.29]	3.2%
Sothoron 2015	67	49.30	48.6527	59	38.15	6.3826	11.15	[−0.61; 22.91]	3.0%
Random effects model	**2176**			**2212**			**−25.43**	**[−32.79; −18.08]**	**65.8%**
Heterogeneity: $I^2 = 94.5\%$, $\tau^2 = 276.9239$, $p < 0.0001$									
Chaintype = T est Focused									
Rodrigues et al 2019	19	10.33	4.9652	25	60.35	32.1770	−50.02	[−62.83; −37.21]	2.9%
Gray et al 2018	34	19.35	30.3163	63	42.30	194.1049	−22.95	[−71.95; 26.06]	1.3%
Forrest et al 2008	95	25.58	24.0017	129	44.19	49.2777	−18.61	[−28.39; −8.84]	3.1%
Nicolsen 2013	22	44.30	17.9000	33	56.50	13.6000	−12.20	[−21.00; −3.40]	3.1%
Vlek et al 2012	89	31.00	39.9438	164	42.79	76.6720	−11.79	[−26.16; 2.59]	2.9%
Delport 2016	33	68.76	10.7670	37	78.33	13.2676	−9.57	[−15.21; −3.93]	3.2%
Cattoir et al 2011	49	1.50	1.3850	48	4.39	4.6930	−2.90	[−4.28; −1.52]	3.2%
Carreno 2016	104	8.54	14.9760	115	10.49	9.4171	−1.95	[−5.30; 1.41]	3.2%
Beuving 2015	114	28.20	32.5000	109	26.90	30.1000	1.30	[−6.92; 9.52]	3.1%
Turner et al 2017	166	42.07	57.3975	409	39.85	25.1442	2.22	[−6.85; 11.28]	3.1%
Frye 2012	110	62.30	11.8100	134	55.30	9.6650	7.00	[4.25; 9.75]	3.2%
Carreno et al 2019	61	146.92	119.4195	157	68.08	65.7876	78.84	[47.15; 110.52]	2.0%
Random effects model	**896**			**1423**			**−4.40**	**[−18.63; 9.83]**	**34.2%**
Heterogeneity: $I^2 = 92.6\%$, $\tau^2 = 571.3975$, $p < 0.0001$									
Random effects model	**3072**			**3635**			**−18.44**	**[−25.76; −11.12]**	**100.0%**
Prediction inter val								**[−61.42; 24.54]**	
Heterogeneity: $I^2 = 96.9\%$, $\tau^2 = 432.3399$, $p < 0.0001$									
Test for subgroup differences: $\chi^2_1 = 6.62$, df = 1 ($p = 0.0101$)									



Δ – 25.4 h (p<0.001)

Δ – 4.4 h (n.s.)

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TABLE 4 Characteristics of outlier studies for time to targeted therapy outcomes[a]

Studies	Intervention chain type	Comments
Overperforming studies		
Banerjee et al. (48)	Comprehensive	Active antimicrobial stewardship program
Bhavsar et al. (55)	Comprehensive	Active antimicrobial stewardship program
Lockwood et al. (51)	Comprehensive	Active antimicrobial stewardship program
Neuberger et al. (50)	Comprehensive	Positive results were called to the physician
Perez et al. (49)	Comprehensive	Active antimicrobial stewardship program
Perez et al. (47)	Comprehensive	Active antimicrobial stewardship program
Rodrigues et al. (69)	Test focused	Active antimicrobial stewardship program in place before the intervention
Underperforming studies		
Beuving et al. (77)	Test focused	The test only resulted in changes in antibiotics in 12 patients.
Carreno et al. (76)	Test focused	Only septic patients were included. Inconsistent communication
Carreno et al. (46)	Test focused	No power calculations; low numbers
Cattoir et al. (75)	Test focused	No power calculations; small sample size
Frye et al. (79)	Test focused	Only positive intervention was called to the provider by the laboratory
Sothoron et al. (68)	Comprehensive	Most patients in both arms were placed on effective antibiotic(s) shortly after blood collection.
Tseng et al. (67)	Comprehensive	Changes were only made on Gram stain or AST.
Turner et al. (78)	Test focused	No active antimicrobial stewardship program

[a]Additional details are included in the Narrative Summary Table (Table S1).

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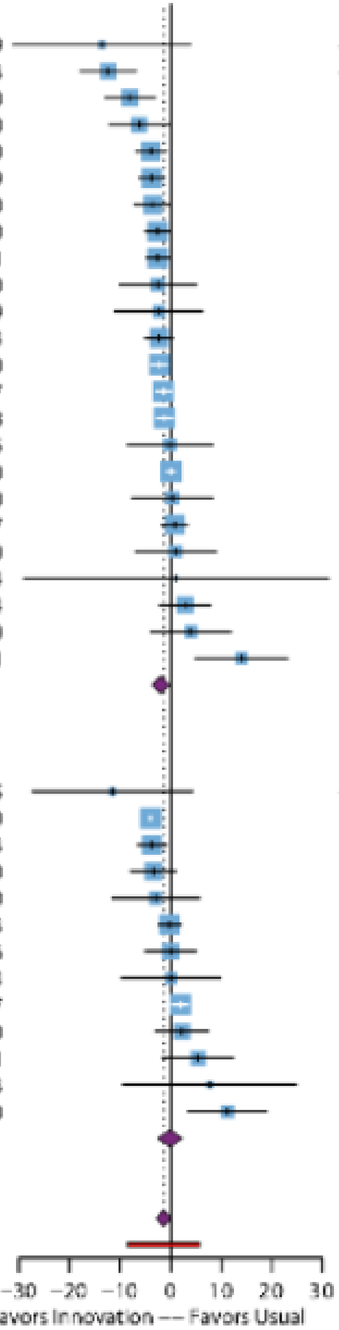
Study	Experimental Total	Experimental Mean	Experimental SD	Control Total	Control Mean	Control SD	MD	95%-CI	Weight
Chaintype = Comprehensive									
MacVane & Hurst 2016	17	22.52	20.0151	29	36.09	40.4969	−13.57	[−31.12; 3.97]	0.6%
Gray et al 2018	13	9.86	3.6998	63	22.23	20.8843	−12.37	[−17.91; −6.84]	2.6%
Perez 2014	103	15.30	17.3000	128	23.30	21.6000	−8.00	[−13.02; −2.98]	2.8%
Bauer 2010	82	15.30	14.1000	74	21.50	22.8000	−6.20	[−12.22; −0.18]	2.4%
Pardo 2016	84	10.06	6.4493	252	14.02	21.2220	−3.95	[−6.91; −0.99]	3.7%
Box 2015	64	7.45	8.1441	103	11.20	7.6539	−3.76	[−6.24; −1.27]	3.9%
Farfour et al 2019	41	9.10	6.5247	42	12.64	9.9240	−3.54	[−7.14; 0.07]	3.4%
Perez 2013	101	9.30	7.6000	100	11.90	9.3000	−2.60	[−4.95; −0.25]	3.9%
Tseng et al 2018	100	6.70	5.6373	103	9.28	10.2651	−2.58	[−4.85; −0.31]	3.9%
Idelevich 2015	74	40.40	25.3000	76	42.90	22.0000	−2.50	[−10.10; 5.10]	1.9%
Heil 2012	21	22.52	20.0151	61	24.93	3.7549	−2.42	[−11.03; 6.20]	1.7%
Avdic et al 2017	137	12.54	10.3973	127	14.86	12.4434	−2.32	[−5.10; 0.46]	3.7%
Bhavsar et al 2018	137	8.30	7.0000	210	10.50	7.6000	−2.20	[−3.76; −0.64]	4.2%
Koncelik 2016	18	3.44	2.4298	27	4.89	2.5937	−1.45	[−2.94; 0.04]	4.2%
Niwa et al 2019	186	15.36	5.8315	180	16.54	8.4058	−1.18	[−2.67; 0.31]	4.2%
Felsenstein 2016	184	32.29	22.3339	184	32.41	53.6605	−0.12	[−8.52; 8.28]	1.7%
Lockwood 2016	214	6.40	4.0000	132	6.40	3.5000	0.00	[−0.80; 0.80]	4.3%
Romero-Gomez et al 2017	94	28.62	28.7500	133	28.27	32.1500	0.35	[−7.63; 8.33]	1.8%
Banerjee 2015	212	12.48	15.2372	207	11.69	11.5567	0.79	[−1.79; 3.38]	3.8%
Nagel 2014	32	15.00	14.0000	46	14.00	22.0000	1.00	[−7.00; 9.00]	1.8%
Tafelski et al 2015	41	62.70	44.5713	37	61.67	83.3904	1.03	[−29.11; 31.16]	0.2%
MacVane & Nolte 2016	145	18.50	26.9540	115	15.67	13.8254	2.82	[−2.24; 7.88]	2.8%
Neuner 2016	213	25.00	45.0000	300	21.00	45.0000	4.00	[−3.90; 11.90]	1.8%
Cosgrove 2016	77	39.38	26.4425	79	25.38	31.0681	14.00	[4.96; 23.05]	1.6%
Random effects model	**2390**			**2808**			**−2.01**	**[−3.69; −0.32]**	**66.9%**
Heterogeneity: I^2 = 66.1%, τ^2 = 11.1366, $p < 0.0001$									
Chaintype = T est Focused									
Delport 2016	22	12.28	16.9894	37	23.81	43.8085	−11.53	[−27.33; 4.27]	0.7%
Bhat 2016	185	15.00	1.2000	183	19.00	1.7000	−4.00	[−4.30; −3.70]	4.4%
Nguyen et al 2010	94	7.47	7.7646	85	11.17	10.9863	−3.69	[−6.51; −0.88]	3.7%
Nicolsen 2013	22	10.00	5.0000	33	13.40	11.5000	−3.40	[−7.85; 1.05]	3.0%
Alvarez 2012	48	18.30	21.4000	54	21.30	23.4000	−3.00	[−11.70; 5.70]	1.6%
Carreno 2016	104	12.58	8.1441	115	12.77	8.1543	−0.19	[−2.35; 1.97]	4.0%
Beuving 2015	114	11.00	14.0019	109	11.00	23.0216	0.00	[−5.03; 5.03]	2.8%
Seo et al 2018	103	24.44	44.9682	196	24.37	32.6554	0.07	[−9.75; 9.88]	1.4%
Turner et al 2017	130	12.29	8.4432	343	10.43	4.9787	1.86	[0.32; 3.40]	4.2%
Holtzman et al 2011	99	20.90	21.0000	100	18.70	16.5000	2.20	[−3.05; 7.45]	2.7%
Forrest et al 2008	95	20.44	32.1166	129	15.09	16.2741	5.34	[−1.70; 12.39]	2.1%
Rodrigues et al 2019	19	29.66	32.6559	25	21.97	22.3923	7.68	[−9.42; 24.79]	0.6%
Carreno et al 2019	61	22.07	30.3556	157	10.89	9.1510	11.18	[3.43; 18.93]	1.9%
Random effects model	**1096**			**1566**			**−0.14**	**[−2.58; 2.30]**	**33.1%**
Heterogeneity: I^2 = 87.3%, τ^2 = 11.6948, $p < 0.0001$									
Random effects model	**3486**			**4374**			**−1.39**	**[−2.79; 0.02]**	**100.0%**
Prediction inter val								**[−8.46; 5.69]**	
Heterogeneity: I^2 = 84.3%, τ^2 = 11.6654, $p < 0.0001$									
Test for subgroup differences: χ^2_1 = 1.52, df = 1 (p = 0.2174)									



Length of stay

1. **Total n.s.**
2. **ICU n.s.**

3. **Infection-related**

Δ – 1.8 d (p<0.001), only if comprehensive approach

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TABLE 5 Characteristics of outlier studies for length of stay outcomes[a]

Studies	Intervention chain type	Comments
Hospital LOS		
Overperforming studies		
Bhat et al. (87)	Test-focused	This was a controlled interventional study in a pediatric patient population using a laboratory-developed test that performed significantly better than the conventional microbiology methods.
Rivard et al. (92)	Comprehensive	The molecular result triggered a real-time electronic message to the antimicrobial stewardship team.
Underperforming studies		
Carreno et al. (46)	Comprehensive	The antimicrobial stewardship team received reports of molecular results twice daily (8 a.m. and 1 p.m.). They saw improved clinical response times but no LOS, TTT, or mortality change. The authors believe the intervention group was more complex than the comparator group.
Cosgrove et al. (86)	Comprehensive	This was a controlled interventional study. The authors shortened the manufacturer's test protocol by 60 minutes but saw no impact on LOS.
Gray et al. (70)	Comprehensive	The study saw no difference in the LOS, but they did see a significant decrease in the LOS, though in the ICU setting. Testing was performed on *Enterococcus* species only.
Turner et al. (78)	Test-focused	In the absence of an antimicrobial stewardship program, the use of molecular testing alone did not impact the LOS. However, the study was not powered enough to evaluate LOS properly.

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Recommendations for the use of rapid diagnostic tests to decrease TTT

Recommendation 1

To decrease TTT in patients with a positive blood culture, the panel recommends that clinical laboratories implement rapid diagnostics (Evidence quality: Moderate; Recommendation strength: Strong) in combination with a comprehensive plan to actively communicate the actionable test result(s) (Evidence quality: Strong; Recommendation strength: Strong).

Remarks

The panel does NOT recommend using rapid diagnostics tests alone, without active communication, to improve TTT.

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Do these results also apply to rapid AST?

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[Intervention Review]

Rapid versus standard antimicrobial susceptibility testing to guide treatment of bloodstream infection

Vanesa Anton-Vazquez[1], Paul Hine[2], Sanjeev Krishna[1], Marty Chaplin[2], Timothy Planche[3]

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Main results

We included six trials, with 1638 participants. For rapid antimicrobial susceptibility testing compared to conventional methods, there was little or no difference in mortality between groups (RR 1.10, 95% CI 0.82 to 1.46; 6 RCTs, 1638 participants; low-certainty evidence). In subgroup analysis, for rapid genotypic or molecular antimicrobial susceptibility testing compared to conventional methods, there was little or no difference in mortality between groups (RR 1.02, 95% CI 0.69 to 1.49; 4 RCTs, 1074 participants; low-certainty evidence). For phenotypic rapid susceptibility testing compared to conventional methods, there was little or no difference in mortality between groups (RR 1.37, 95% CI 0.80 to 2.35; 2 RCTs, 564 participants; low-certainty evidence).

Authors' conclusions

The theoretical benefits of rapid susceptibility testing have not been demonstrated to directly improve mortality, time-to-discharge, or time-to-appropriate antibiotic in these randomized studies. Future large prospective studies should be designed to focus on the most clinically meaningful outcomes, and aim to optimize blood culture pathways.

Cochrane Database of Systematic Reviews 2021, Issue 5. Art. No.: CD013235.
DOI: 10.1002/14651858.CD013235.pub2.

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A closer look at the Cochrane metaanalysis

- 4 of 6 trials focused on targeted genotypic testing in Gram-

We need trials on rapid AST in bloodstream infections
1) due to Gram-negative pathogens
2) in areas where resistance rates are significant
3) in combination with functioning AMS programs

- **Rapid species ID + rapid AST + AMS program: *"...may have played a role in reducing time-to-appropriate antibiotics..."***

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JAMA | Original Investigation

Fast Antimicrobial Susceptibility Testing for Gram-Negative Bacteremia
The FAST Randomized Clinical Trial

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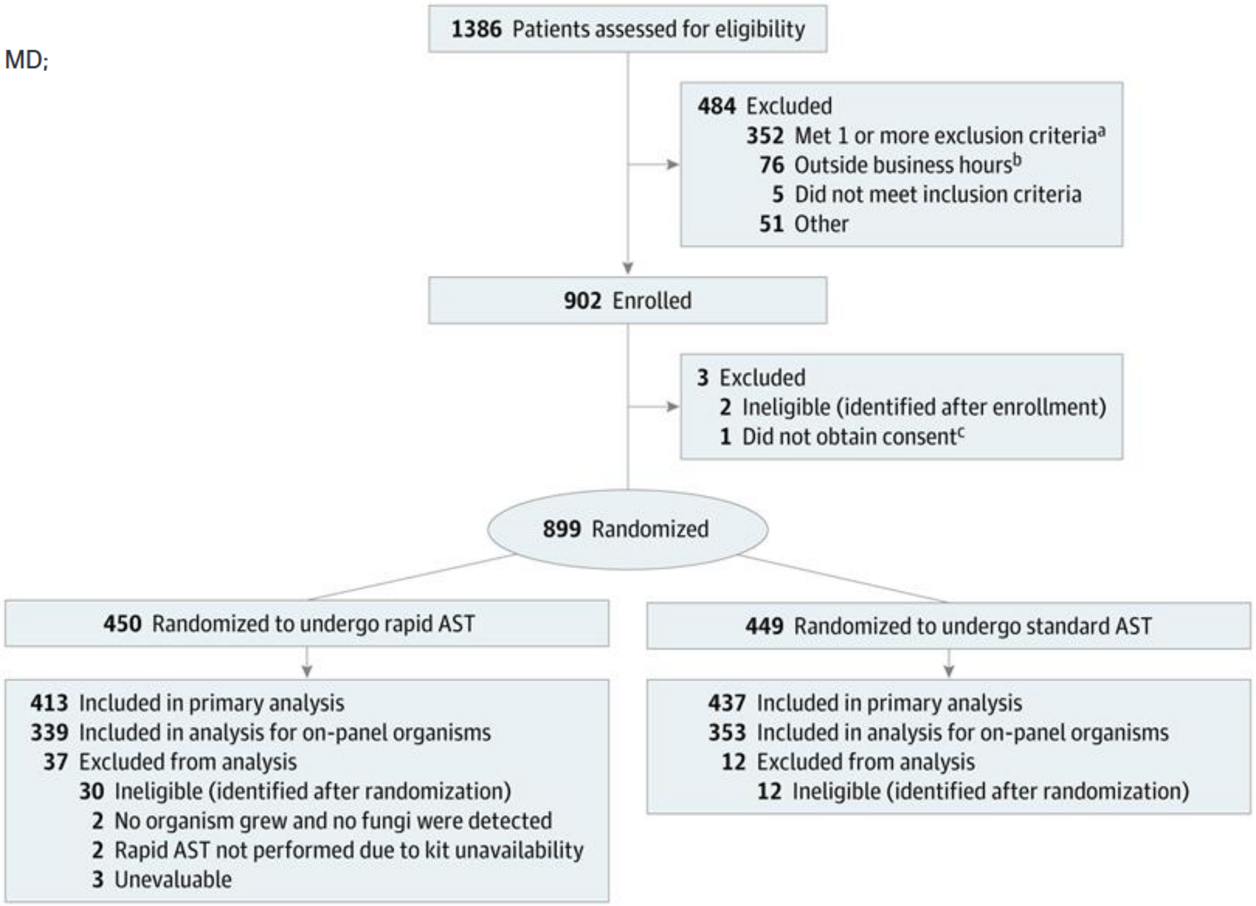
Seven medical centres in countries with a high prevalence of resistance, 18 months:

Spain	(n=1)
Greece	(n=3)
India	(n=1)
Israel	(n=2)

Intervention:
Introduction on VITEK Reveal rapid AST

Primary endpoint:
Desirability of outcome ranking (DOOR) at day 30 after randomization



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JAMA

QUESTION Does rapid antimicrobial susceptibility testing (AST) improve clinical outcomes compared with standard AST among individuals with bloodstream infections caused by gram-negative bacilli (GNB)?

CONCLUSION Rapid blood culture AST for GNB was not superior to standard AST in achieving a more desirable outcome among patients with bloodstream infections, but the subgroup with carbapenem-resistant infections had a greater proportion discharged at 30 days.

POPULATION

486 Males
364 Females

Patients of any age with GNB in blood cultures and hospitalized at the time of the blood culture result

Median age: **72** years

LOCATIONS

7
Medical centers worldwide

INTERVENTION

899 Patients randomized
850 Patients analyzed

413
Rapid AST
Blood culture organism identification performed using rapid AST

437
Standard AST
Blood culture organism identification performed using standard AST

PRIMARY OUTCOME

Desirability of outcome ranking (DOOR), the probability that a patient in the rapid AST group would achieve a more desirable outcome than a patient in the standard AST group, at day 30; superiority was concluded if the lower limit of the 95% CI exceeded 50%

FINDINGS

Patients alive at 30 days

	Rapid AST	Standard AST
Alive without deleterious events	47%	49%
Alive with ≥1 deleterious events	28%	28%

Rapid AST did not demonstrate superiority over standard AST:

DOOR probability, 48.8%
(95% CI, 45.3% to 52.4%)

Banerjee R, Komarow L, Li Y, et al; Antibacterial Resistance Leadership Group. Fast antimicrobial susceptibility testing for gram-negative bacteremia: the FAST randomized clinical trial. *JAMA*. Published online April 18, 2026. doi:10.1001/jama.2026.5487

eTable 4. Antibiotics administered within three days of randomization by country, as randomized population

Antibiotic	Greece (N=406)	India (N=91)	Israel (N=291)	Spain (N=62)	Total (N=850)
Amikacin	76 (19)	6 (7)	69 (24)	1 (2)	152 (18)
Amoxicillin intravenous or oral	0	0	6 (2)	0	6 (1)
Amoxicillin/clavulanate	0	1 (1)	11 (4)	8 (13)	20 (2)
Ampicillin	1 (0)	0	22 (8)	0	23 (3)
Ampicillin/sulbactam	18 (4)	0	0	0	18 (2)
Aztreonam	10 (2)	1 (1)	0	0	11 (1)
Cefazolin	0	0	21 (7)	0	21 (2)
Cefepime	8 (2)	1 (1)	0	3 (5)	12 (1)
Cefiderocol	3 (1)	0	0	0	3 (0)
Cefoperazone/sulbactam	0	8 (9)	0	0	8 (1)
Cefotaxime	1(0)	2 (2)	0	3 (5)	6 (1)
Cefoxitin	2 (0)	0	0	0	2 (0)
Ceftaroline	3 (1)	0	0	0	3 (0)
Ceftazidime	5 (1)	0	5 (2)	1 (2)	11 (1)
Ceftazidime/avibactam	52 (13)	1 (1)	1 (0)	1 (2)	55 (6)
Ceftizoxime	0	1 (1)	0	0	1 (0)
Ceftolozane/tazobactam	6 (1)	0	1 (0)	1 (2)	8 (1)
Ceftriaxone	35 (9)	21 (23)	93 (32)	25 (40)	174 (20)
Cefuroxime	1 (0)	0	60 (21)	0	61 (7)
Chloramphenicol	0	0	6 (2)	0	6 (1)
Ciprofloxacin intravenous or oral	26 (6)	1 (1)	27 (9)	4 (6)	58 (7)
Colistin	88 (22)	1 (1)	2 (1)	0	91 (11)
Ertapenem	4 (1)	0	22 (8)	28 (45)	54 (6)
Fosfomycin	0	1 (1)	0	0	1 (0)
Gentamicin	3 (1)	0	28 (10)	1 (2)	32 (4)
Imipenem	1 (0)	0	3 (1)	2	6 (1)
Imipenem/cilastatin	1 (0)	0	0	0	1 (0)
Imipenem/cilastatin/relebactam	3 (1)	0	0	0	3 (0)
Levofloxacin intravenous or oral	16 (4)	0	2 (1)	0	18 (2)
Meropenem	169 (42)	28 (31)	26 (9)	18 (29)	241 (28)
Meropenem/vaborbactam	11 (3)	0	0	0	11 (1)
Moxifloxacin	4 (1)	0	0	0	4 (0)
Piperacillin	0	0	4 (1)	0	4 (0)
Piperacillin/tazobactam	178 (44)	23 (25)	85 (29)	16 (26)	302 (36)
Polymyxin B	0	1 (1)	0	0	1 (0)
Tigecycline	36 (9)	2 (2)	0	0	38 (4)
Trimethoprim/sulfamethoxazole intravenous or oral	7 (2)	0	7 (2)	2 (3)	16 (2)

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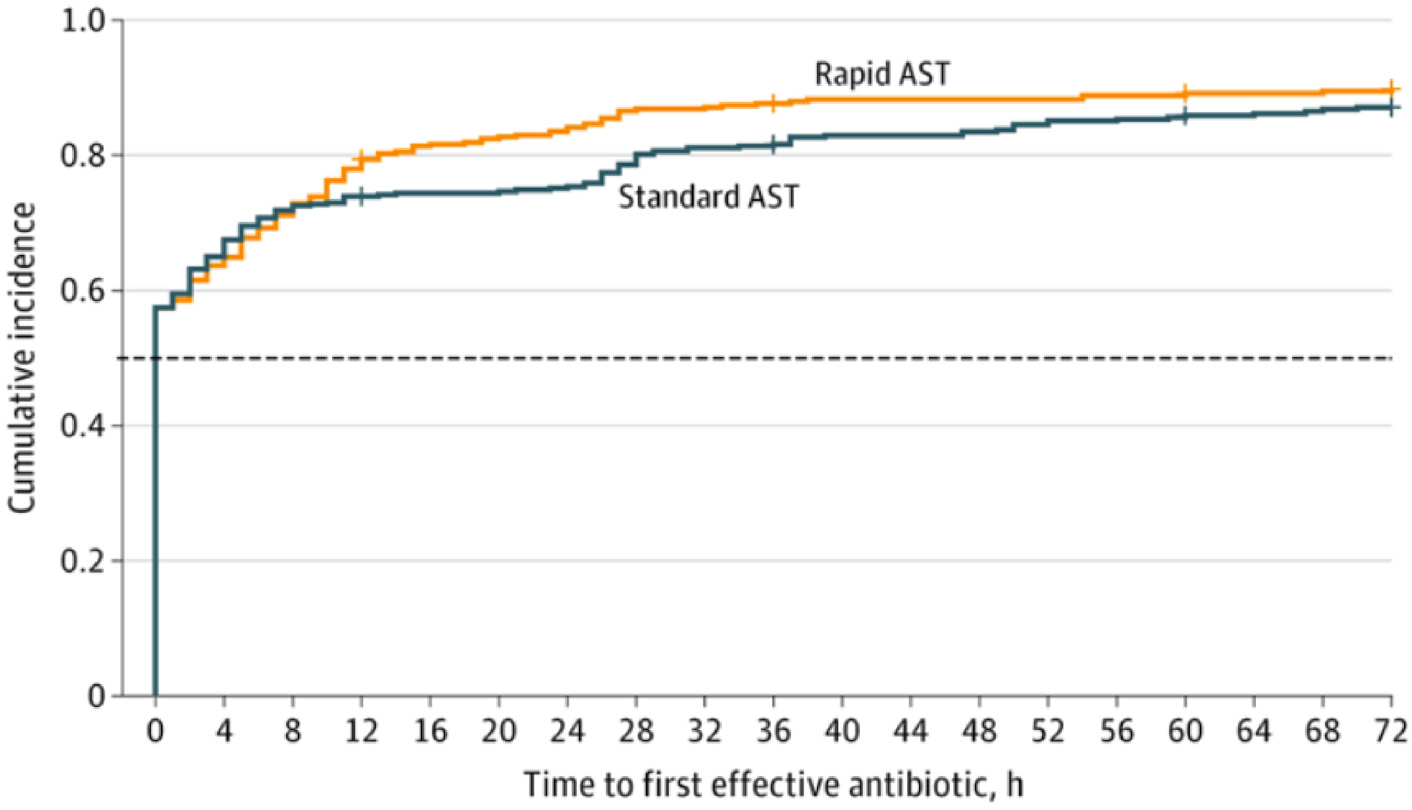
Figure 3. Survival Curves of Cumulative Incidence of Time to Receipt of First Effective Antibiotic Within 3 Days After Gram Stain Result

A As-randomized population



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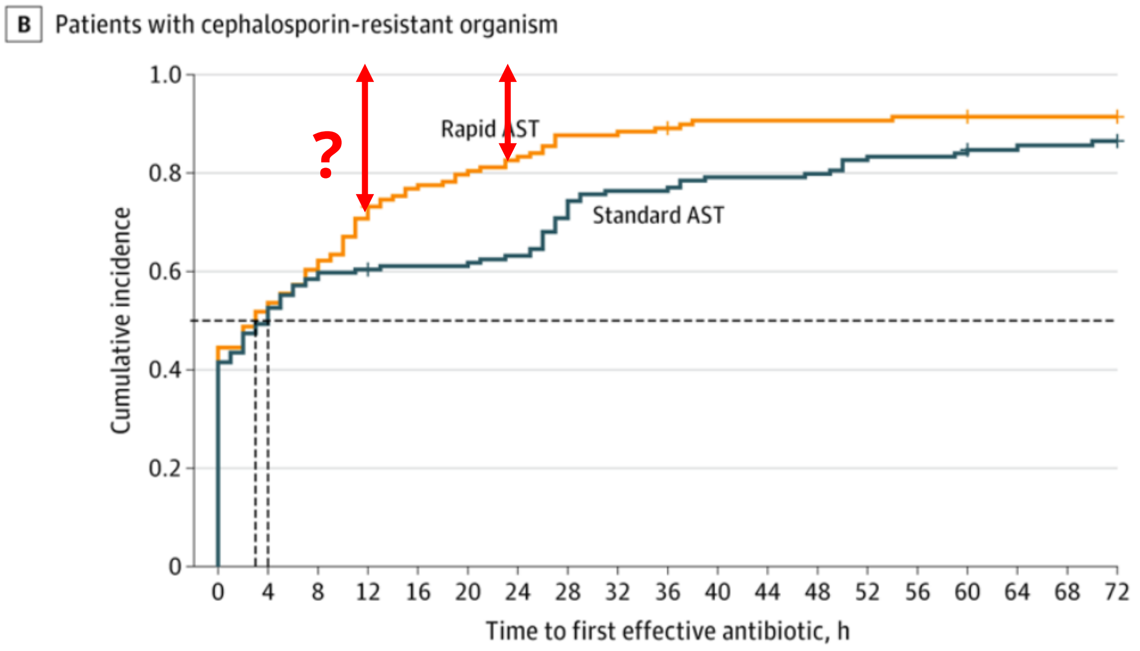
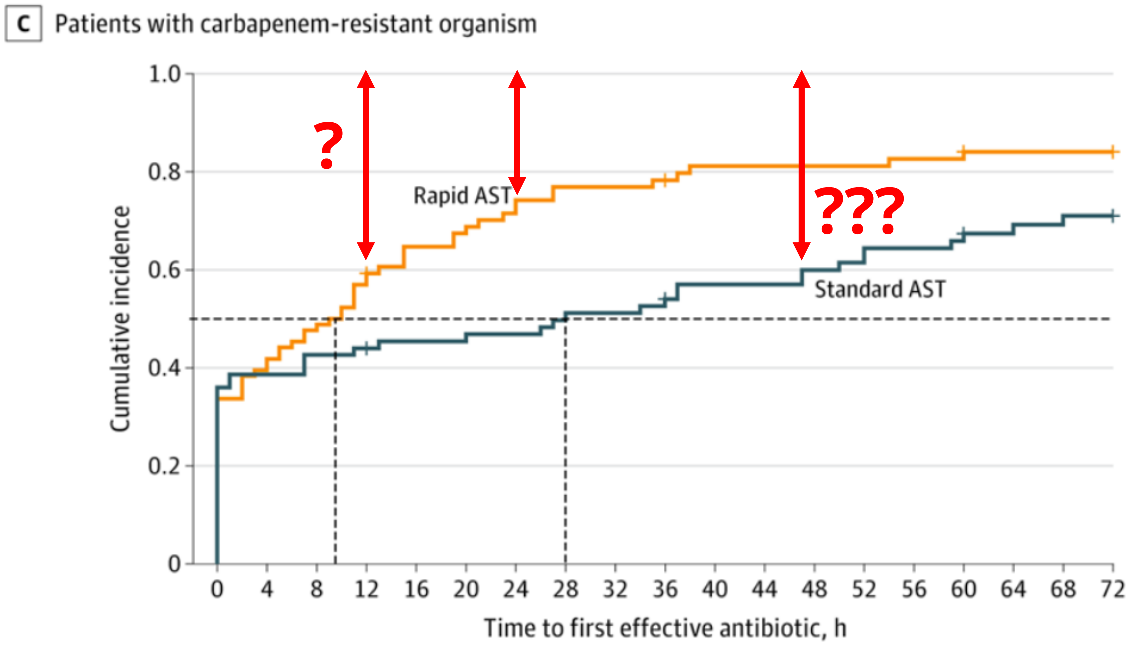


Cephalosporin-resistant pathogens:

% inadequate Rx

	R-AST	S-AST
At 12 h:	29%	40%
At 24 h:	15%	34%
At 36 h:	9%	22%



Carbapenem-resistant pathogens:

% inadequate Rx

	R-AST	S-AST
At 12 h:	43%	56%
At 24 h:	24%	49%
At 36 h:	19%	44%

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Observations from reading this paper

Large proportion of patients were not given adequate therapy in spite of availability to AST results – why?

AMS team only available office hours (not weekends)

Unavailability of some important antibiotics:

Greece:	Aztreonam not available (for months) - NDMs
Greece/India:	Sulbactam/durlobactam not approved

10-15% of patients classified as receiving ”appropriate” antibiotics were on colistin/polymyxin based regimens (newer BL/BLI antibiotics not available)

Technical observations

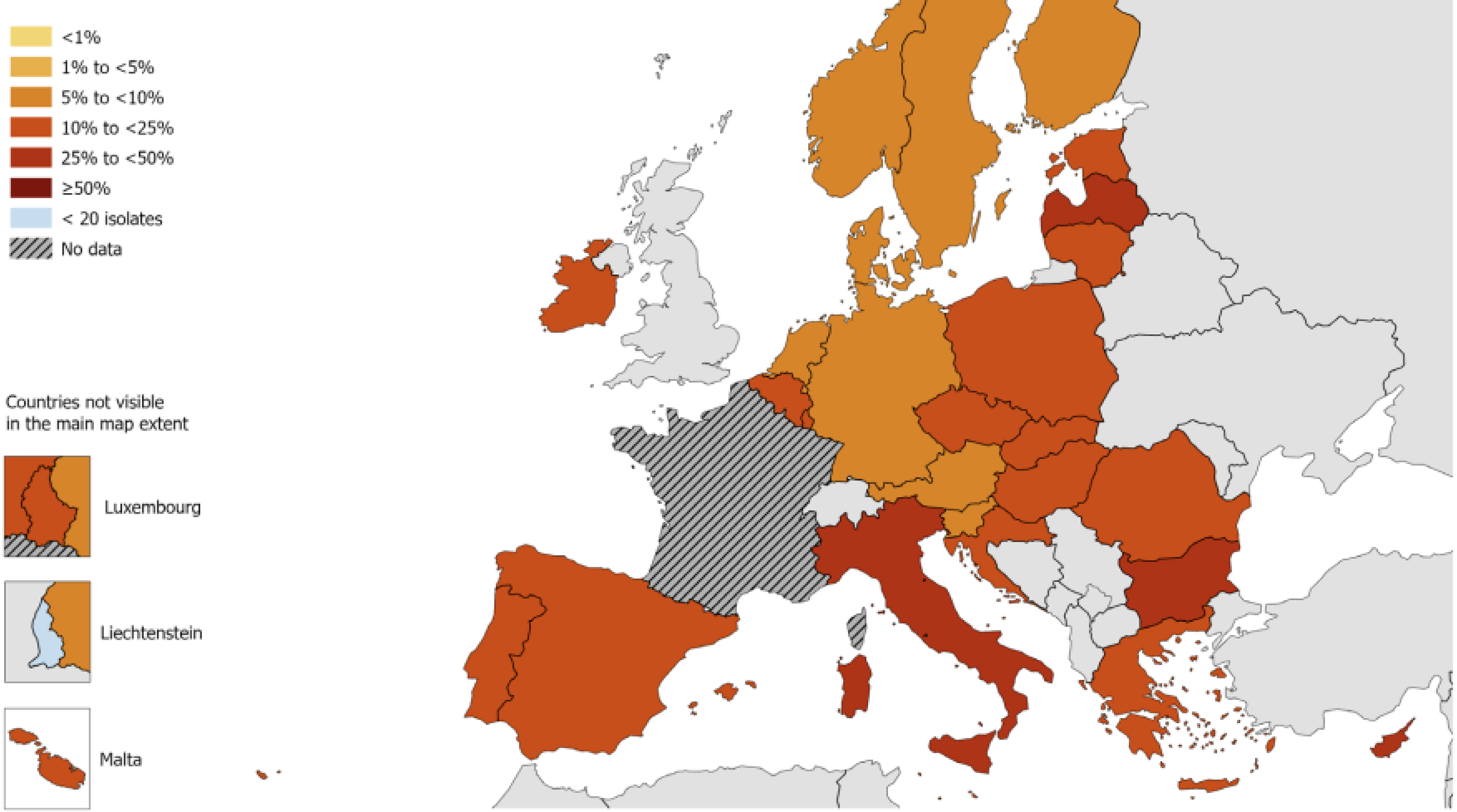
Direct MALDI only performed in 1 of 7 centres

→ Rapid AST in some centres initiated only after MALDI from sub-cultured colonies

No information on preanalytical logistics (time to incubation?)

May access to rapid AST affect our choice of empirical therapy?

Figure 2. ***Escherichia coli*****. Percentage of invasive isolates resistant to third-generation cephalosporins (cefotaxime/ceftriaxone/ceftazidime), by country, EU/EEA, 2023**



Administrative boundaries: © EuroGeographics. The boundaries and names shown on this map do not imply official endorsement or acceptance by the European Union. Map produced by ECDC on 13 September 2024

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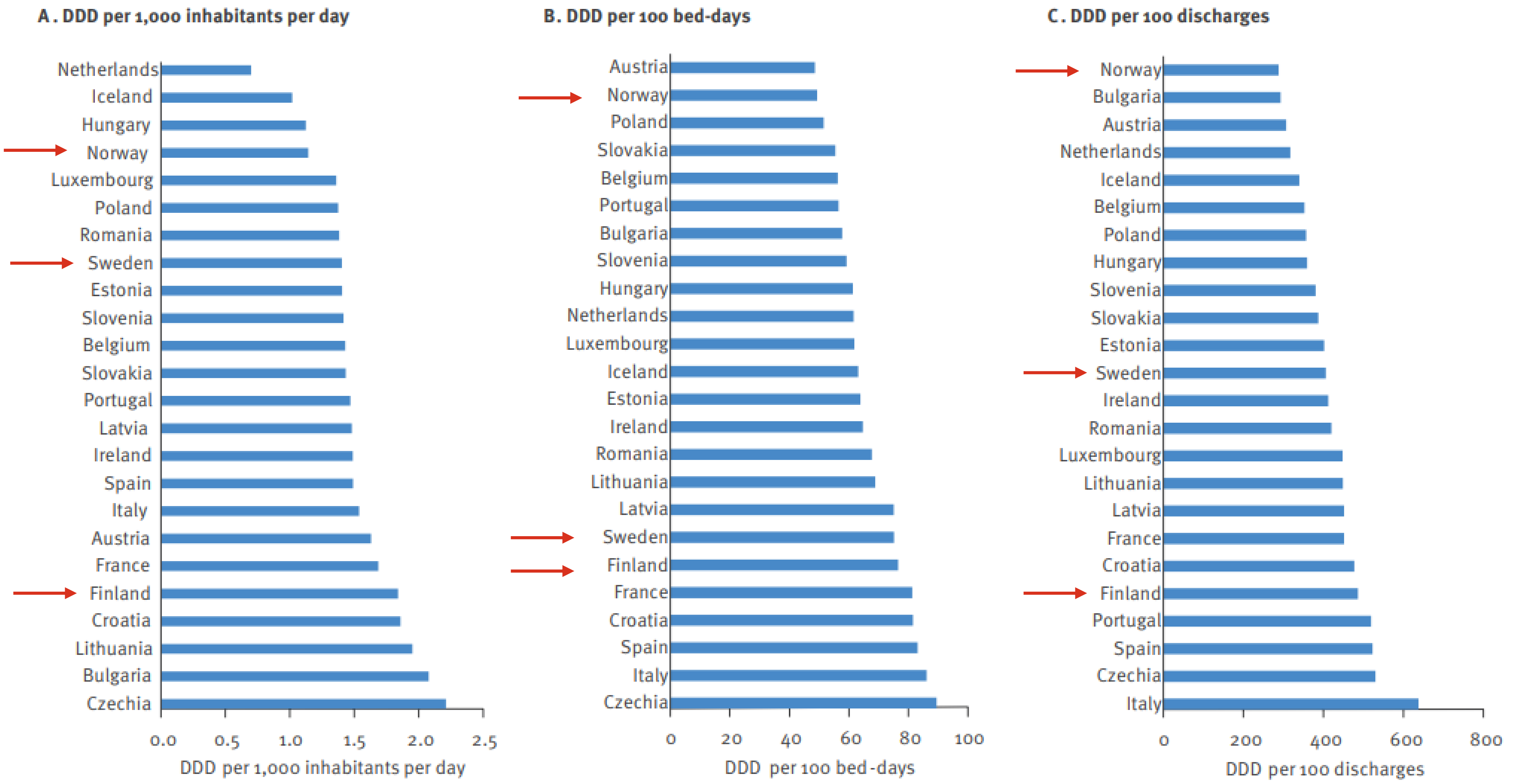
Figure 1

Hospital sector antibiotic consumption rates expressed and ranked according to defined daily doses per (A) 1,000 inhabitants per day, (B) 100 bed-days and (C) 100 discharges, 24 EU/EEA countries, 2021



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High clinical severity

Co-morbidities

High prevalence of antimicrobial resistance

Short expected time to etiological diagnosis, including AST results

Broader

Narrower

EMPIRICAL TREATMENT

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Sampling/transportation 1h-eternity

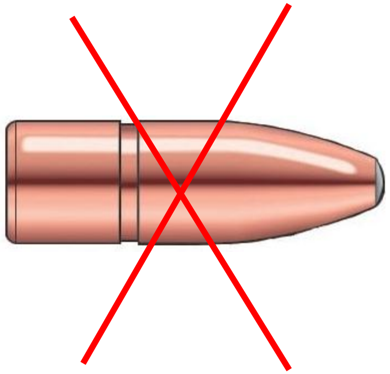
Enrichment 6-48 h

Species ID 0.5-24 h

AST 3-20 h

Arion vulgaris
0.048 km/h

RAPID BSI DIAGNOSTICS, INCL. LOGISTICS, RAPID AST, COMMUNICATION ETC.



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When do we need rapid AST in the Nordics?

When we intend to use the results of it

When we have adequate logistics in place

24/7 cabinets, transportation time etc.

When we have ensured effective means of communication of AST results

When we combine it with an ambitious antimicrobial stewardship program

When we are serious about keeping empirical therapy as narrow as posssible

...then we need rapid AST

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WHO Collaborating Centre
for Standardization of
Antimicrobial Susceptibility Testing

CLINICAL MICROBIOLOGY
KRONOBERG AND BLEKINGE
SWEDISH NRL FOR PHENOTYPIC AST
EUCAST DEVELOPMENT LABORATORY

EURL
PUBLIC HEALTH
ANTIMICROBIAL RESISTANCE (AMR)
IN BACTERIA

Thank you for your attention!

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