Intraabdominelle Infektionen – Update zur chirurgischen und antimikrobiellen Therapie

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Disclosures

- Research grants, advisor/consultant, speaker/chairman:
  - Angelini, Menarini, Merck, Nabriva, Pfizer, Shionogi
  - ECDC, WHO, ESCMID, ISAC

World Health Organization

ESCMID EUROPEAN SOCIETY OF CLINICAL MICROBIOLOGY AND INFECTIOUS DISEASES

AG-Leitung / Mitarbeit in folgenden Leitlinien:

- S2k-LL parenterale Antibiotikatherapie
- S3– LL Divertikelkrankheit
- S3 - LL perioperative Medizin
- S3 – LL perioperative Antibiotikaprophylaxe (PAP)
- ESCMID guideline PAP in patients colonized with resistant bacteria
- ECDC project for optimizing PAP
- WHO guideline PAP

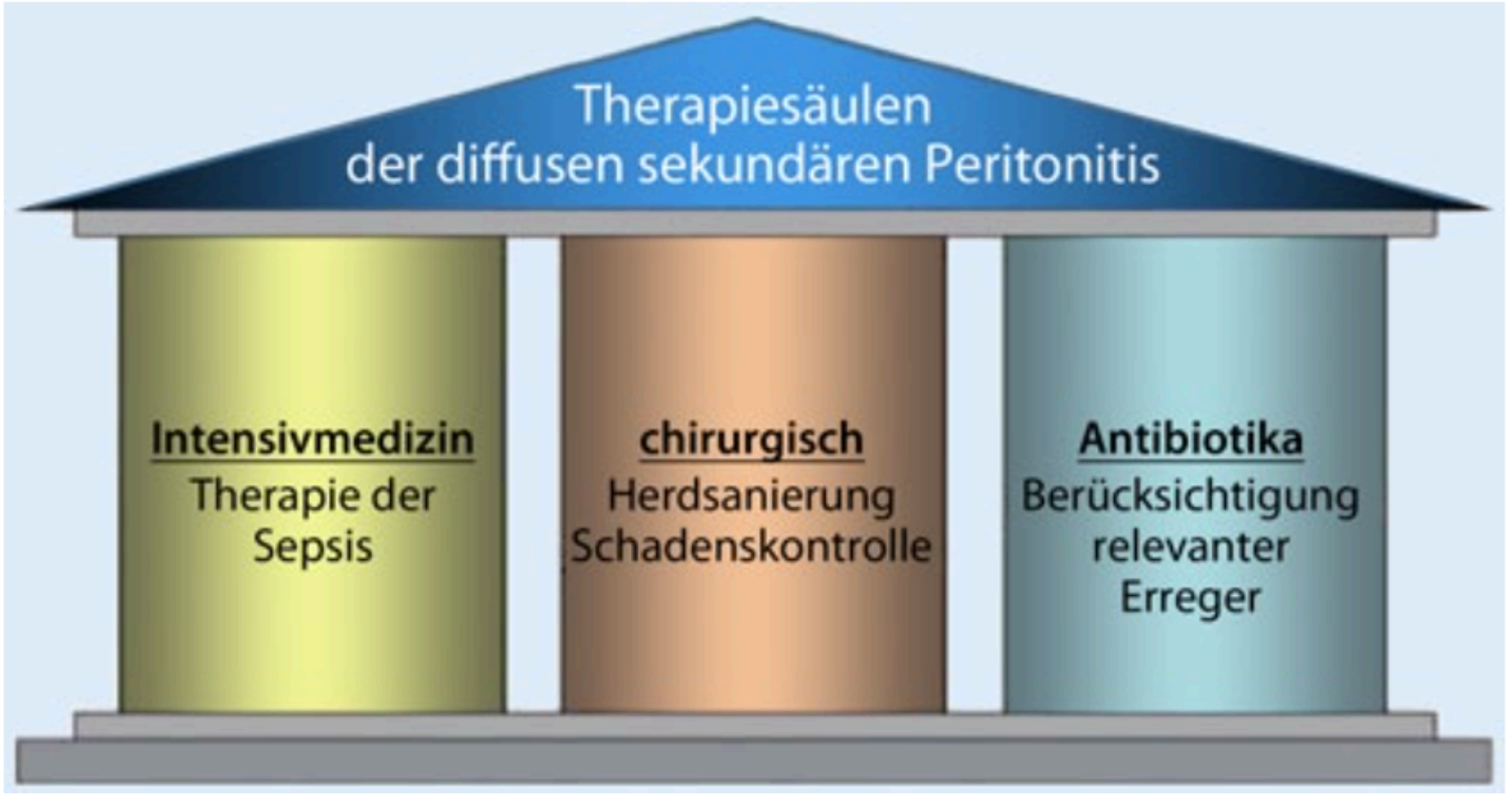
ecdc EUROPEAN CENTRE FOR DISEASE PREVENTION AND CONTROL

Peritonitisformen - klinische Einteilung

Peritonitisform	Definition	Chirurgische Therapie erforderlich	Erregerspektrum
Primär	Infektion von Aszites durch Translokation ohne Organperforation	Primär nein	Monoinfektion (meist *E. coli*)
Sekundär – ambulant erworben	Organperforation im ambulanten Bereich ohne Voroperation	Ja	Mischinfektion meist ohne resistente Erreger (grampositiv, gramnegativ, Anaerobier)
Sekundär – postoperativ postinterventionell posttraumatisch[a]	Organperforation nach operativem Eingriff/ Intervention/Trauma	Ja	Mischinfektion mit resistenten Erregern (u. a. VRE, ESBL-Bildner, seltener *Pseudomonas* spp.)
Tertiär[a]	Rekurrierende Infektion nach chirurgischer Herdsanierung ohne aktuelle Organperforation	Primär nein	Mischinfektion mit resistenten Erregern (u. a. MRSA, VRE, ESBL-Bildner (3MRGN), *Pseudomonas* spp., *Candida* spp)

Eckmann C. Chirurg 2016;87:26-33

Diffuse Peritonitis - Drei-Säulen-Modell der Therapie



Eckmann C. Chirurg 2016

Timing of surgery/antibiotics in GI perforation and impact on survival in ICU patients

Table 3 Time to antimicrobial therapy and source control according to survival

	Survivors	Nonsurvivors	*P* value
Time to antimicrobial therapy (hours)			
28-day survival	2.0 (0.6 to 5.6) ($n = 659$)	2.5 (1.0 to 6.6) ($n = 352$)	0.112
ICU survival	2.0 (0.7 to 5.4) ($n = 667$)	2.8 (0.9 to 7.0) ($n = 329$)	0.023
Hospital survival	2.0 (0.6 to 5.1) ($n = 581$)	2.8 (0.9 to 7.0) ($n = 329$)	0.020
Time to source control (hours)			
28-day survival	2.0 (–0.5 to 10.1) ($n = 286$)	5.7 (0.4 to 18.0) ($n = 139$)	0.004
ICU survival	2.0 (–0.6 to 9.1) ($n = 286$)	6.0 (0.5 to 19.9) ($n = 132$)	<0.001
Hospital survival	2.0 (–0.5 to 9.3) ($n = 249$)	5.5 (0.4 to 18.9) ($n = 166$)	0.001

Bloos et al et al. *Crit Care* 2014;18:R42.

Fazit - Chirurgische Therapie der diffusen Peritonitis im Wandel

Merkmal	**Traditionell (20. Jahrhundert)**	**Evidenzbasiert (21. Jahrhundert)**
Operationszeitpunkt	Intensive präoperative Konditionierung, dann OP	Sofortige OP
Standardverfahren	Repetitive Laparotomien	Eine Index-OP, Relaparotomie on demand
Verfahrenswahl	Immer offenes Vorgehen	MIC (lokale Peritontis) DCS (Extremsituation)
Spülung der Bauchhöhle	Sehr große Spülvolumina Antiseptische Substanzen	Limitiertes Spülvolumen Physiologische Substanzen
Offenes Abdomen	Abdomen weit offen lassen	VAC-Verfahren Faszientraktion/ -verschluß

Antibiotikatherapie der Peritonitis
S2k- Leitlinie AWMF – Stufe 1 und 2

Paul-Ehrlich-Gesellschaft
für Chemotherapie e.V.
www.p-e-g.org

Klaus-Friedrich Bodmann | Béatrice Grabein | Michael Kresken
Hartmut Derendorf | Ralf Stahlmann | Sebastian R. Ott | Bernhard Olzowy | Christian Eckmann
Florian Wagenlehner | Cord Sunderkötter | Mathias Voßen | Pascal M. Dohmen | Pramod M. Shah
Reinier Mutters | Peter Walger | Michael Wilke für die Expertenkommission

KALKULIERTE PARENTERALE INITIALTHERAPIE BAKTERIELLER ERKRANKUNGEN BEI ERWACHSENEN – UPDATE 2018

PEG S2k Leitlinie
(AWMF-Registernummer 082-006)

		Moxifloxacin	1x 0,4 g		A

Eckmann C et al. GMS Infect Dis 2020;8;12-22 (open access)

Antibiotikatherapie der Peritonitis
S2k- Leitlinie AWMF – Stufe 1 und 2

Diagnose	Häufige Erreger	Therapieempfehlung	Tagesdosis	Therapiedauer	EG
Ambulant erworben	Enterobacteriaceae	Cefuroxim + Metronidazol	3x 1,5g + 3x 0,5 g	1 Tag (Stufe 1)	A
keine Perforation	Anaerobier	Cefotaxim + Metronidazol	3x 2 g + 3x 0,5 g		A
minimale Peritonitis	Enterokokken	Ceftriaxon + Metronidazol	1x 2 g + 3x 0,5 g		A
kreislaufstabil		Ciprofloxacin + Metronidazol	2x 0,4 g + 3x 0,5 g		A
kein MRE-Risiko		Levofloxacin + Metronidazol	1x 0,5 g + 3x 0,5 g		A
Bsp.: Phlegmonöse		Ampicillin/Sulbactam	3x 3 g		A
Appendizitis		Amoxicillin/Clavulansäure	3x 2,2 g		A
		Moxifloxacin	1x 0,4 g		A
Ambulant erworben	Enterobacteriaceae	Cefuroxim + Metronidazol	3x 1,5 g + 3x 0,5 g	3 Tage (Stufe 2)	A
frische Perforation	Anaerobier	Cefotaxim + Metronidazol	3x 2g + 3x 0,5 g		A
lokalisierte Peritonitis	Enterokokken	Ceftriaxon + Metronidazol	1x 2g + 3x 0,5 g		A
kreislaufstabil		Ciprofloxacin + Metronidazol	2x 0,4 g + 3x 0,5 g		A
kein MRE-Risiko		Levofloxacin + Metronidazol	1x 0,5 g + 3x 0,5 g		A
(Bsp.: Perforierte Cholezystitis)		Ampicillin/Sulbactam	3x 3 g		A
		Amoxicillin/Clavulansäure	3x 2,2 g		A
		Moxifloxacin	1x 0,4 g		A

Eckmann C et al. GMS Infect Dis 2020;8;12-22 (open access)

Antibiotikatherapie bei cIAI
Cefazolin, Cefuroxim oder Ceftriaxon?

Cassier P et al. Clin Microbiol Infect 2011;17:1746-1751

Präparat	Cephalosporin-Generation	Grampositive Wirkung	Gramnegative Wirkung	Resistenz-entwicklung gramnegativ
Cefazolin	1	+++	-	-
Cefuroxim	2	++	++	-

Antibiotikatherapie nach Appendektomie Cefazolin oder Cefuroxim? Klinische Daten

Surat G et al. Antibiotics 2022;11:501

- Design: single center quality improvement study
- Kollektiv: IAI ohne Sepsis, 2016-2019 (n=587)
- Cefuroxim (2016-2017) bzw. Cefazolin (ab 2017)
- Propensity Score matching (jeweils n=196)

- SSI-Rate:
- 7,1% Cefazolin vs. 3,6% Cefuroxim, p=0,117

- Andere Infektionen:
- 8,7% Cefazolin vs. 2% Cefuroxim, p=0,004)

Antibiotikatherapie der Peritonitis
S2k- Leitlinie AWMF – Stufe 3

Ambulant erworben	Enterobacteriaceae	Piperacillin/Tazobactam	3x 4,5 g	5 Tage (Stufe 3)	A
ältere Perforation	Anaerobier	Ertapenem	1x 1–2 g		A
diffuse Peritonitis	Enterokokken	Tigecyclin	2x 0,05 g*		A
kreislaufstabil		Moxifloxacin	1x 0,4 g		A
individuelles MRE-Risiko		Ceftolozan/Tazobactam	3x 1,5 g		B
(Bsp.: frei perforierte Sigamdivertikulitis)		+ Metronidazol	+ 3x 0,5 g		

Eckmann C et al. GMS Infect Dis 2020;8;12-22 (open access)

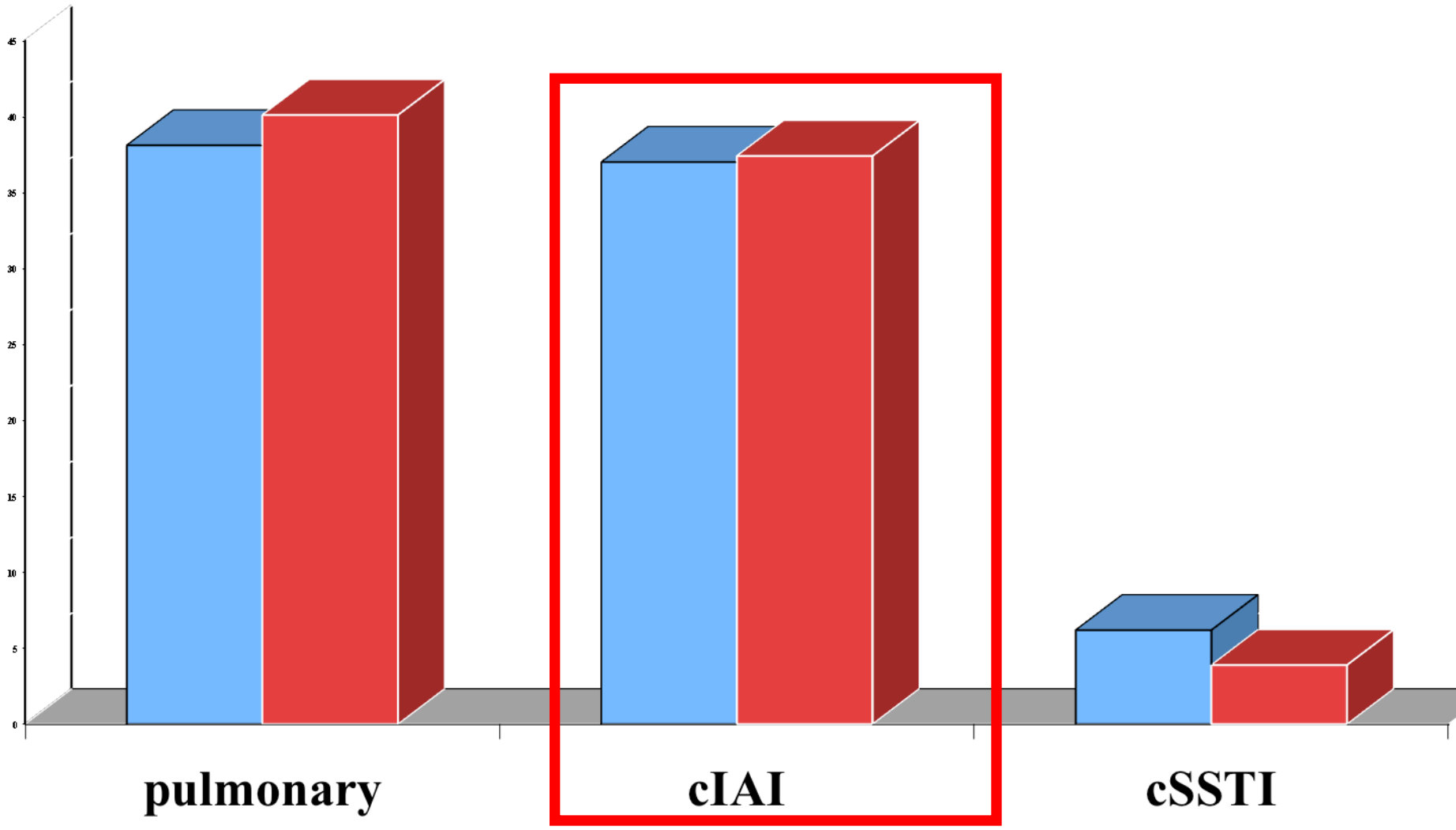
“Kurzzeit”-Antibiotika bei cIAI (STOP IT trial)

Sawyer RG et al N Eng J Med 2015;372:1996-2005

Table 2. Primary and Major Secondary Outcomes.*

Variable	Control Group (N=260)	Experimental Group (N=257)	P Value
Primary outcome: surgical-site infection, recurrent intraabdominal infection, or death — no. (%)	58 (22.3)	56 (21.8)	0.92
Surgical-site infection	23 (8.8)	17 (6.6)	0.43
Recurrent intraabdominal infection	36 (13.8)	40 (15.6)	0.67
Death	2 (0.8)	3 (1.2)	0.99
Time to event — no. of days after index source-control procedure			
Diagnosis of surgical-site infection	15.1±0.6	8.8±0.4	<0.001
Diagnosis of recurrent intraabdominal infection	15.1±0.5	10.8±0.4	<0.001
Death	19.0±1.0	18.5±0.5	0.66
Duration of outcome — days			
Antimicrobial therapy for index infection			<0.001
Median	8	4	
Interquartile range	5–10	4–5	

Epidemiologie der septischen Schocks



Blau=Levosimendan, rot=Placebo; n=519

Epidemiologie der abdominellen Sepsis – AbSeS trial

Blot S et al. Intensive Care Med 2019;45:170 3-1714

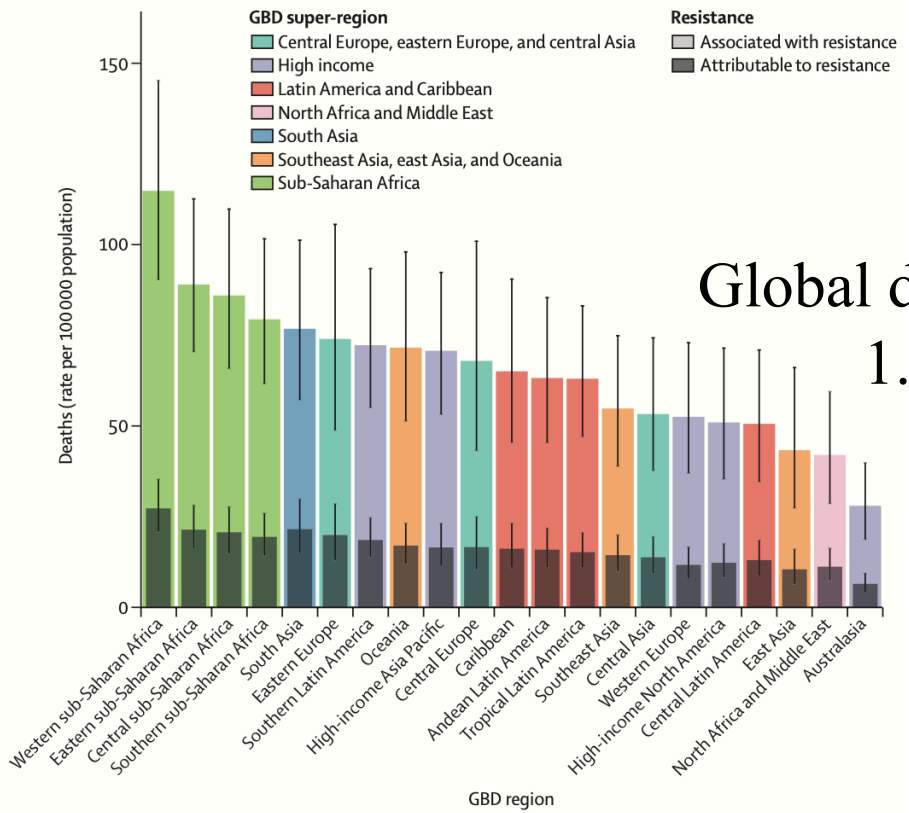
- Rationale: Update Epidemiologie der abdominellen Sepsis
- Kollektiv : multinationale, prospektive Kohorte (nur ITS)
- Anzahl: 2621 P., 309 ITS, 42 Länder
- Verteilung: 21,6% ambulant erworben, 68,4% nosokomial
- Erreger: Gram negativ (58,6%) grampositiv (39,4%), Anaerobier 11,7%, Pilze (13%); multiresistente Erreger n=522 Patienten (26,3%)
- Mortalität: 29,1% (752/2588 Patienten); 23,7% (amb. erw.) vs. 33,9% (nosokom., $p<0,001$).

Epidemiology of abdominal sepsis – AbSeS trial

Blot S, ...Eckmann C et al. Intensive Care Med 2019;45:170 3-1714

- rationale: Update on epidemiology of abdominal sepsis
- collective : multinational, prospective cohort (only ITS)
- numbers: 2621 pts., 309 ICU, 42 countries
- distribution: 21,6% com. acquired, 68,4% nosocomial
- pathogens: Gram-negative (58,6%) gram-positive (39,4%), Anaerobes 11,7%, yeasts (13%); multiresistant bacteria n=522 patients (26,3%)
- mortality: 29,1% (752/2588 pts.); 23,7% (com. acq.) vs. 33,9% (nosocom., p<0,001).

Global burden of antimicrobial resistance attributable and associated death by region



Global deaths in 2019 due to AMR: 1.5 Million patients (!)

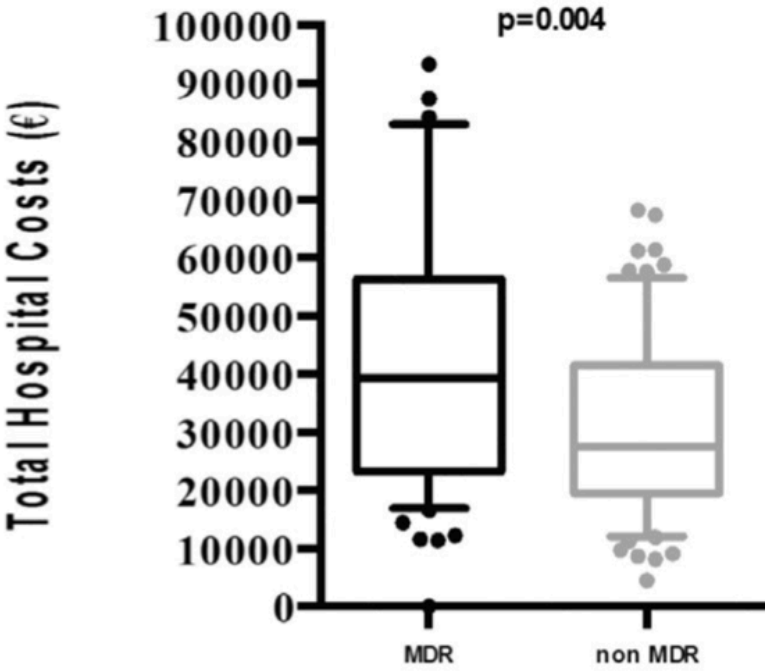
Naghavi M et al. Lancet 2022;399:629-55

Abdominelle Sepsis und resistente Spp. – geographische Unterschiede

Blot S et al. Intensive Care Med 2019;45:170 3-1714

Antibiotic-resistant pathogen	Total cohort (*n* = 1982)	Geographic region							
		Western Europe (*n* = 601)	Southern Europe (*n* = 558)	Eastern and South-East Europe (*n* = 151)	Central Europe (*n* = 99)	North Africa and Mid-dle-East (*n* = 172)	Latin America (*n* = 249)	North America (*n* = 22)	Asia–Pacific (*n* = 123)
Difficult-to-treat resist-ant Gram-negative bacteria	85 (4.3)	2 (0.3)	38 (6.8)	9 (6)	0	15 (8.7)	16 (6.4)	0	5 (4.1)
Any resistant Gram-negative bacteria*	480 (24.2)	54 (9)	140 (25.1)	59 (39.1)	20 (20.2)	82 (47.7)	90 (36.1)	7 (31.8)	26 (21.1)
ESBL-producing Gram-negative bacteria	326 (16.4)	37 (6.2)	81 (14.5)	37 (24.5)	9 (9.1)	65 (37.8)	69 (27.7)	7 (31.8)	20 (16.3)
Carbap-enem-resistant Gram-negative bacteria	145 (7.3)	3 (0.5)	61 (10.9)	23 (15.2)	1 (1)	23 (13.4)	25 (10)	0	9 (7.3)

Economic burden of MDR infections in abdominal sepsis



Item	MDR	Non MDR	P value
Cost (Median) Euro	39413	27606	0,004
Cost (IQR) Euro	24417-56343	19541-41574	0,004

De Pascale G et al. J Crit Care 2018

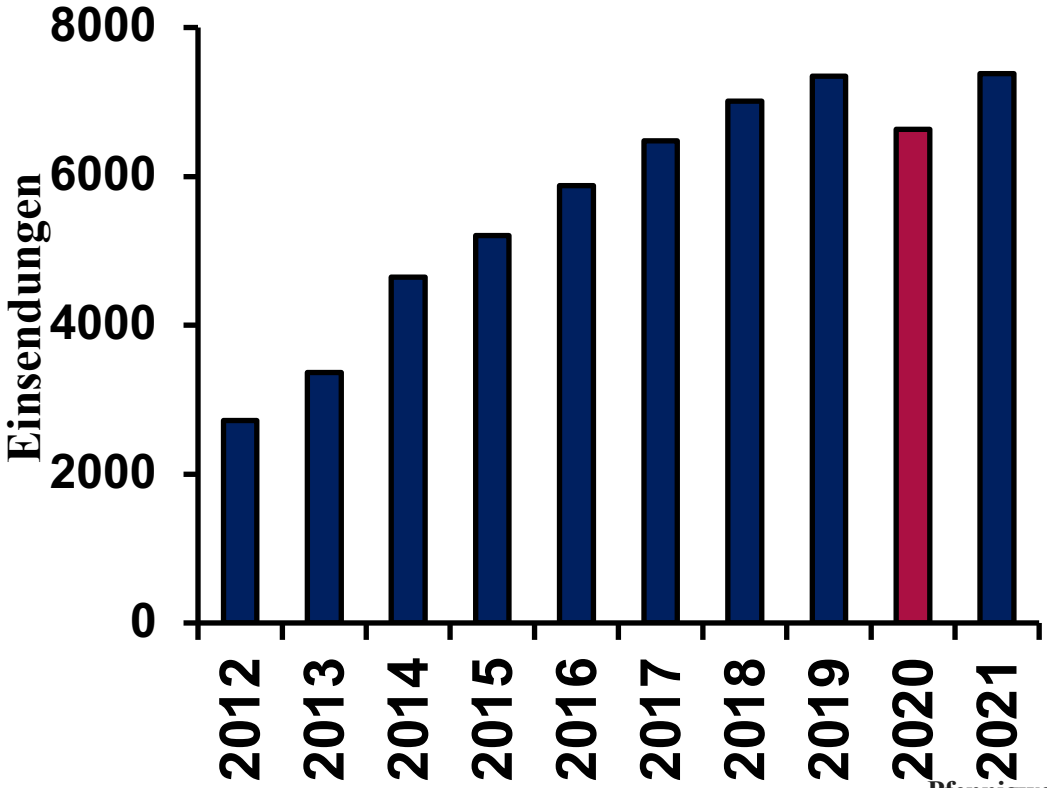
Erhöhtes Risiko resistenter Erreger cIAI

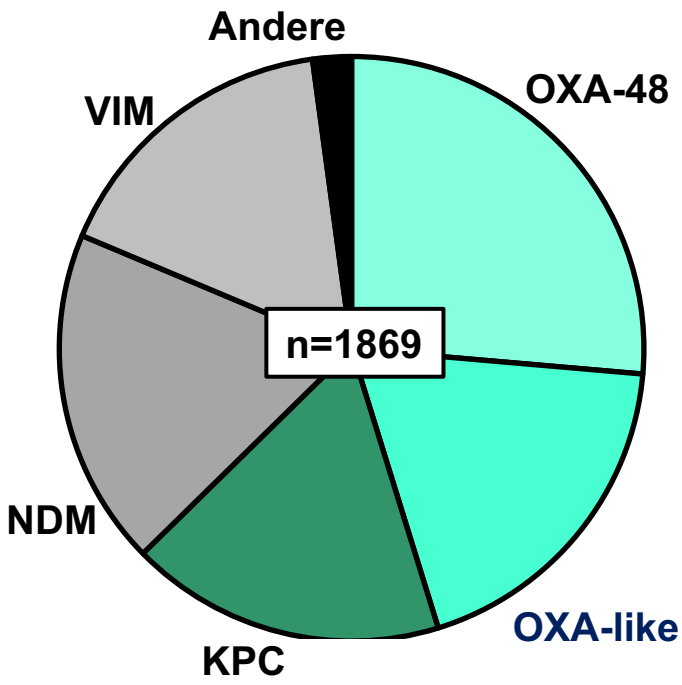
- ✓ Vorangegangener Aufenthalt in Regionen mit erhöhter MRGN-Rate in letzten 6 Monaten
- ✓ Antibiotika-Vortherapie in letzten 6 Monaten
- ✓ Verlängerter KH / Intensivaufenthalt
- ✓ bekannte MRGN-Kolonisation aktuell oder in der Anamnese
- ✓ postoperative oder tertiäre Peritonitis

Eckmann C, Kaffarnick M, Grabein B et al. Chirurg 2017;89:40-49

Zunehmend Carbapenem-resistente Enterobacterales in Deutschland

Nationales Referenzzentrum Bochum 2021





Pfennigwerth et al., P0617, ECCMID 2022; RKI Epidemiol Bull, 12.5.2022

Systematische Review zur Nephrotoxizität bei Therapie mit Polymyxinen

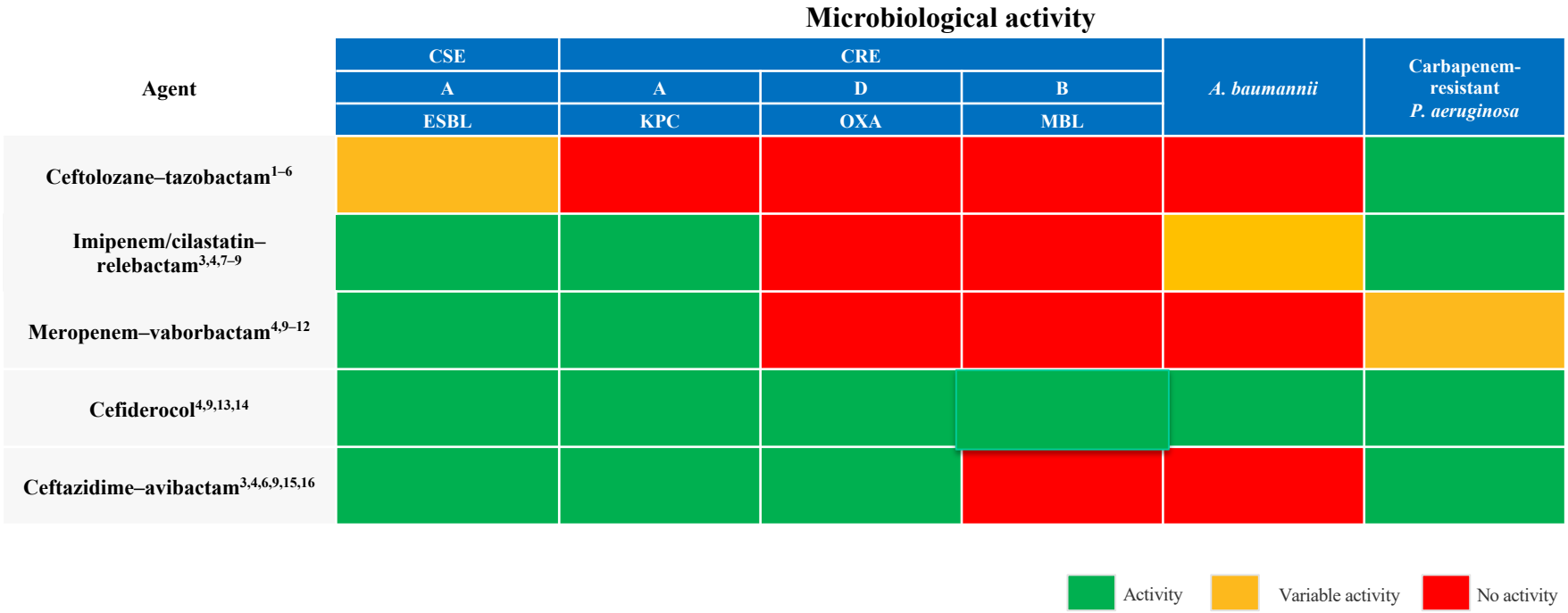
Wagenlehner F, et al. *Clin Microbiol Infect* 2021;671–86

- 237 RCT, cohort and case-control studie
- NT rate in studies using standard criteria for assessing: 0.391
- Odds for NT in polymyxin-based versus non-polymyxin based regimen: OR 2.23 (95% CI 1.58–3.15); p<0.001)
- Severe NT 13.1%
- Recovery rate <50% in 39% of the studies

Subgroup		Number of studies	Number of patients	Event rate (95% CI)	Heterogeneity (I^2)	p value for subgroup effect
Overall		128	13,554	0.391 (0.364–0.419)	89	NA
Severe nephrotoxicity[a]		84	8,787	0.132 (0.114–0.151)	82	NA
Polymyxin	Colistin	110	10,789	0.393 (0.362–0.425)	90	0.728
	Polymyxin B	21	2,354	0.381 (0.324–0.441)	86	
Loading dose	Loading dose	23	1,466	0.391 (0.320–0.467)	85	0.363
	No loading dose	25	2,557	0.438 (0.371–0.508)	90	
Dose[b]	High	18	1,035	0.446 (0.367–0.528)	84	0.001
	Intermediate	15	1,081	0.374 (0.280–0.478)	89	
	Low	18	1,411	0.264 (0.215–0.321)	75	
Setting	ICU	64	12,784	0.356 (0.314–0.401)	89	0.951
	Non-ICU	15	898	0.352 (0.239–0.485)	88	

CI, confidence interval; ICU, intensive care unit; NA, not applicable; NT, nephrotoxicity; OR, odds ratio; RCT, randomised controlled trial.

Rezente Optionen für Gram-negative Infektionen
Spektrum der Aktivität



CRE, carbapenem-resistant Enterobacterales; CSE, carbapenem-susceptible Enterobacterales; ESBL, extended-spectrum β-lactamase; KPC, *Klebsiella pneumoniae* carbapenemase; MBL, metallo-β-lactamase; OXA, oxacillinase.

1. ZERBAXA® (ceftolozane–tazobactam) Summary of Product Characteristics. Merck, 2021; 2. ZERBAXA® (ceftolozane–tazobactam) US Prescribing Information. Merck, 2019; 3. Bush K. *Int J Antimicrob Agents* 2015;46:483–93; 4. Wright H, et al. *Clin Microbiol Infect* 2017;23:704–12; 5. Munita J, et al. *Clin Infect Dis* 2017;65:158–61; 6. Liscio JL, et al. *Int J Antimicrob Agents* 2015;46:266–71; 7. RECARBRIO® (imipenem+cilastatin/relebactam) US Prescribing Information. Merck, 2020; 8. RECARBRIO® (imipenem+cilastatin/relebactam) Summary of Product Characteristics. Merck, 2021; 9. Theuretzbacher U, et al. *J Antimicrob Chemother* 2021;76(Supplement 1):i47–54; 10. VABOMERE® (meropenem–vaborbactam) US Prescribing Information. Melinta Therapeutics, 2017; 11. VABOREM® (meropenem–vaborbactam) Summary of Product Characteristics. Melinta Therapeutics, 2020; 12. Lomovskaya O, et al. *Antimicrob Agents Chemother* 2017;61:e01443-17;
13. FETROJA® (cefiderocol) US Prescribing Information. Shionogi, 2019; 14. FETCROJA® (cefiderocol) Summary of Product Characteristics. Shionogi, 2020; 15. AVYCAZ® (ceftazidime–avibactam) US Prescribing Information. Allergan, 2019; 16. ZAVICEFTA® (ceftazidime–avibactam) Summary of Product Characteristics. Pfizer, 2021.

Inoculum effect to different antibiotics in CRE (change in MIC for inoculum of 10^7 CFU/ml)

Antibiotic	Switch from susceptible to resistant	n	CI
Cefiderocol	88%	30/34	71.6-96.2
Ceftolzane / Tazobactam	75%	3/4	21.9-98.7
Imipenem / Relebactam	72%	13/18	46.4-89.3
Meropenem / Vaborbactam	50%	14/28	31.1-68.9
Ceftazidim/ Avibactam	8,7%	2/23	1.5-29.5

Danjean M et al. Clin Microbiol Infect 2022;28:1503.e1 – 1503.e3

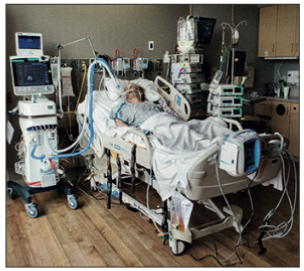
Cefiderocol vs. best available therapy (BAT) CREDIBLE-CR Safety data

Bassetti M, et al. *Lancet Infect Dis.* 2021;21:226-240

Comment

Cefiderocol: the Trojan horse has arrived but will Troy fall?

The global public health crisis of multidrug-resistant Gram-negative organisms underscores the need for antibiotics with novel bacterial targets. Cefiderocol, the first siderophore-conjugated antibiotic to progress beyond phase 1 human trials, was designed to overcome challenges presented by common carbapenem-resistance mechanisms. The drug enters bacterial cells using (given as described for the APEKS-NP study[1]) or best available therapy, 66% of which consisted of colistin-based regimens. 78 (47%) of 150 patients were in the ICU at randomisation, 67 (45%) had pneumonia, 47 (31%) had bloodstream infection (BSI). A high frequency of patients had non-fermenting organisms and 142 (95%) had recently received antibiotics. Clinical

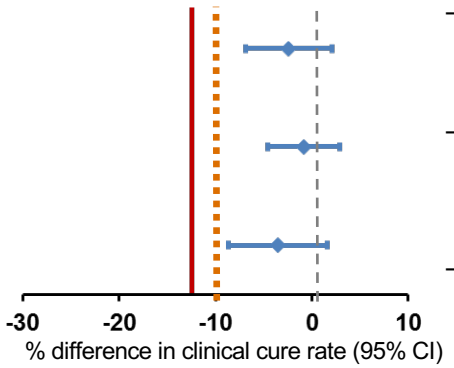


Lancet Infect Dis 2020

RECLAIM 1 & 2 in cIAI

Primary efficacy results: Clinical cure at TOC[1]

Analysis population	n	Clinical cure rate n/N (%) CAZ–AVI + MTZ	Clinical cure rate n/N (%) MER	Between group difference, % (95% CI)
MITT (EMA co-primary analysis population)	1043	429/520 (82.5)	444/523 (84.9)	–2.4 (–6.90, 2.10)
CE at TOC (EMA co-primary analysis population)	826	376/410 (91.7)	385/416 (92.5)	–0.8 (–4.61, 2.89)
mMITT (FDA primary analysis population)	823	337/413 (81.6)	349/410 (85.1)	–3.5 (–8.64, 1.58)



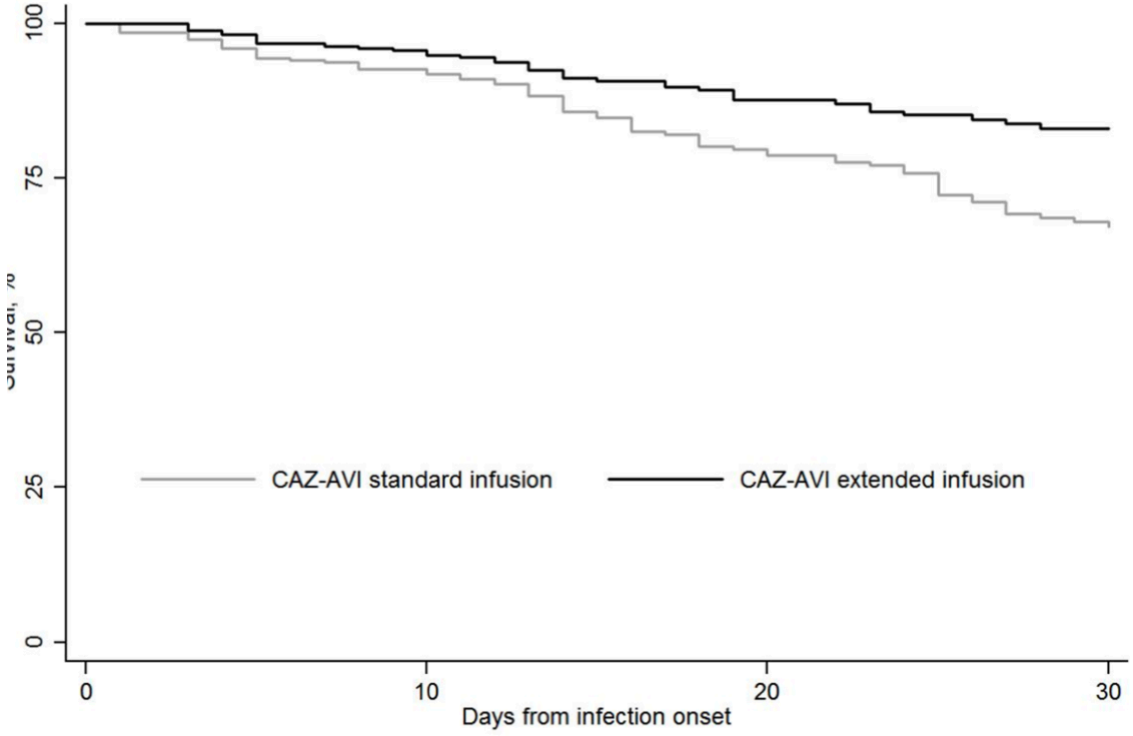
Primary efficacy endpoints: CAZ–AVI was non-inferior to MER in all populations[1]

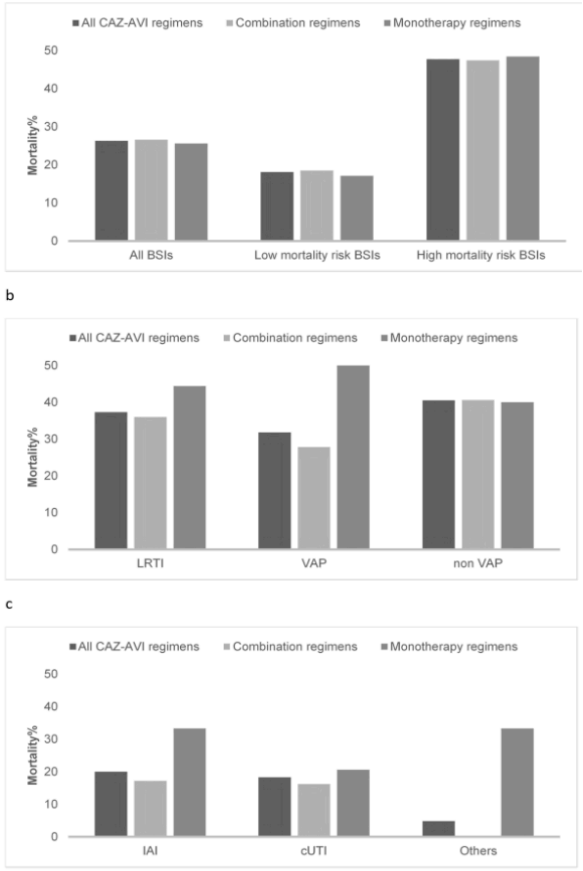
Adapted from Mazuski JE, et al. *Clin Infect Dis*. 2016

Solid line represents sponsor pre-specified NI margin of –12.5% for the lower limit of the 95% CI. Dashed line represents FDA requirement of –10%
AVI, avibactam; CAZ, ceftazidime; CE, clinically evaluable; CI, confidence interval; EMA, European Medicines Agency; EOT, end of treatment; FDA, Food and Drug Administration; LFU, late follow-up; MER, meropenem; MITT, modified intent-to-treat; mMITT, microbiological modified intent-to-treat; MTZ, metronidazole; NI, non-inferiority; TOC, test of cure.

1. Mazuski JE, et al. *Clin Infect Dis*. 2016;62:1380–1389.

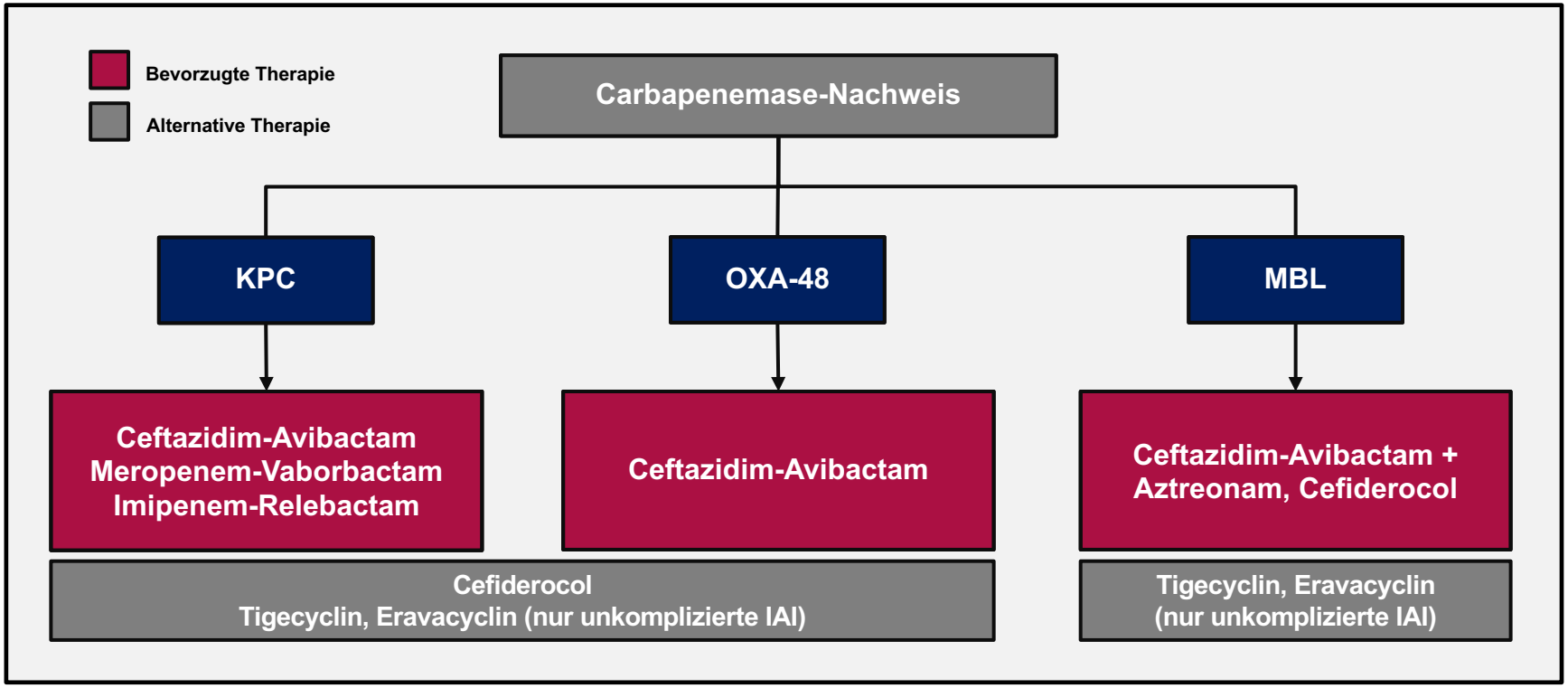
Ceftazidim/Avibactam use for KPC-Kp infections
a retrospective observational multicentre study





Tumbarello M et al. Clin Infect Dis 2022

IDSA Guidance
Carbapenem-resistente Enterobacterales



Tamma, ME125, ECCMID 2022; Paul, ME125, ECCMID 2022; Tamma et al., Clin Infect Dis, 19.4.2022

Antibiotikatherapie der Peritonitis
S2k- Leitlinie AWMF – Stufe 4

Nosokomial (postoperativ/tertiär) diffuse Peritonitis kreislaufinstabil hohes MRE-Risiko (Bsp.: Nahtleckage nach Rektumresektion)	Enterobacteriaceae (inkl. ESBL-Bildner) Enterokokken (inkl. VRE) Anaerobier *Pseudomonas* spp. Staphylokokken (inkl. MRSA)	Tigecyclin* Meropenem (+ Linezolid) Imipenem (+ Linezolid) Ceftolozan/Tazobactam + Metronidazol (+ Linezolid) Ceftazidim/Avibactam + Metronidazol (+ Linezolid) Fosfomycin (keine Monotherapie)	2x 0,05–0,1 g* 3x 2 g (+ 2x 0,6 g) 3x 1 g (+ 2x 0,6 g) 3x 1,5–3 g + 3x 0,5 g (+ 2x 0,6 g) 3x 2,5 g + 3x 0,5 g (+ 2x 0,6 g) 3x 4–8 g	7–10 Tage (Stufe 4)	A A A B A B

Eckmann C et al. GMS Infect Dis 2020;8;12-22 (open access)

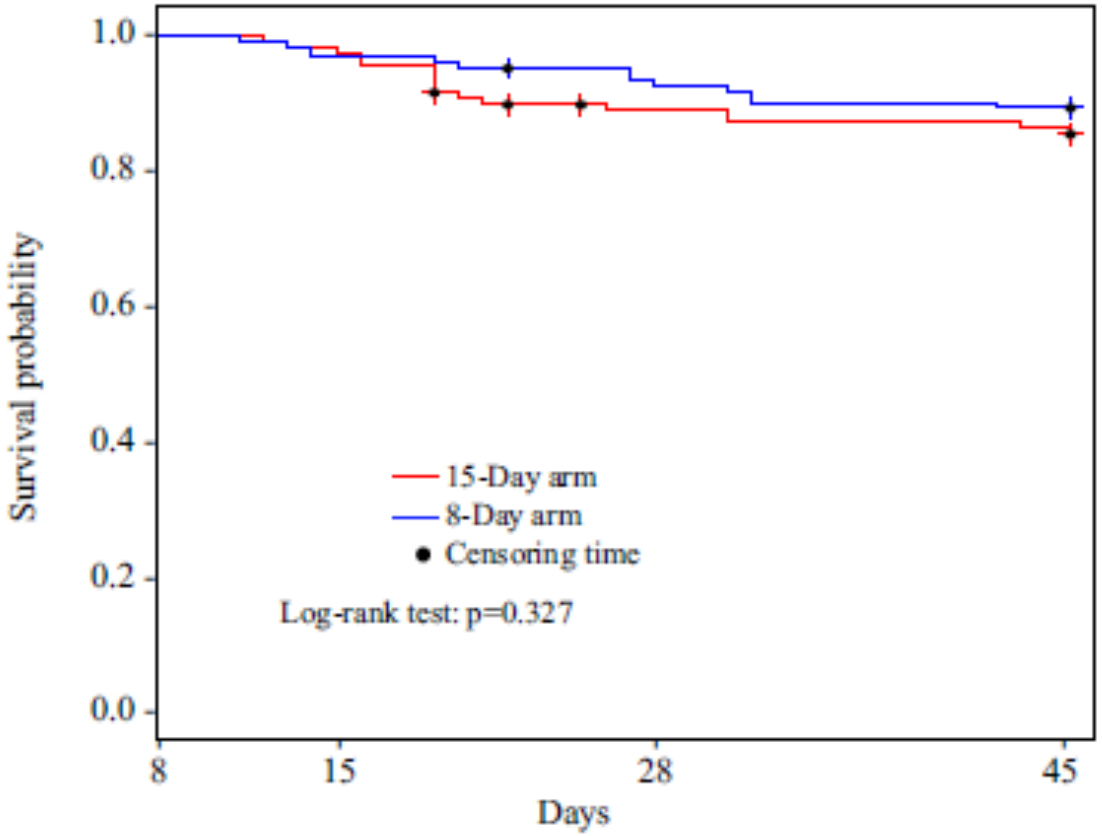
Reduction of antibiotic exposure in cIAI
Value of Procalcitonin (PCT)

Table 4 Clinical endpoints stratified by type of infection

	Control group	PCT group	Adjusted OR or difference (95% CI)[a], *p* value
Subgroup by type of infection (suspected infection site)			
Respiratory	1101	1102	
Antibiotic therapy (days)	9.9 ± 7.8	8.5 ± 7.8	−1.36 (−1.99 to −0.73), $p < 0.001$
30-day mortality	262 (23.8%)	243 (22.1%)	0.92 (0.79 to 1.07), $p = 0.299$
Length of hospital stay (days)	28.2 ± 27.7	27.7 ± 24.7	−0.21 (−2.36 to 1.94), $p = 0.849$
Length of ICU stay (days)	15.1 ± 16.6	15.3 ± 17.5	0.19 (−1.24 to 1.61), $p = 0.798$
Urinary	129	118	
Antibiotic therapy (days)	12.5 ± 12.4	11.0 ± 12.2	−1.62 (−4.6 to 1.36), $p = 0.286$
30-day mortality	21 (16.3%)	11 (9.3%)	0.59 (0.3 to 1.16), $p = 0.128$
Length of hospital stay (days)	29.5 ± 25.4	25.1 ± 21.7	−4.08 (−9.7 to 1.54), $p = 0.154$
Length of ICU stay (days)	14.3 ± 20.5	11.2 ± 13.6	−2.49 (−6.68 to 1.7), $p = 0.244$
Abdominal	417	391	
Antibiotic therapy (days)	10.5 ± 10.6	11.0 ± 11.9	0.55 (−0.96 to 2.06), $p = 0.477$
30-day mortality	109 (26.1%)	89 (22.8%)	0.87 (0.68 to 1.11), $p = 0.266$
Length of hospital stay (days)	30.5 ± 27.7	32.1 ± 27.8	1.62 (−2.18 to 5.41), $p = 0.404$
Length of ICU stay (days)	15.1 ± 15.3	15.7 ± 16.4	0.42 (−1.76 to 2.6), $p = 0.704$

Wirtz et al. Crit Care 2018

8 vs 15 days of antibiotics in postoperative peritonitis (DURAPOP trial)



Number at risk (number censored)				
8-Day arm	120 (0)	118 (0)	111 (1)	107 (100)
15-Day arm	116 (0)	114 (0)	101 (3)	97 (92)

Montravers P et al. *Intensive Care Med* 2019

Fazit für Klinik und Praxis

- Abdominelle Sepsis ist häufig und verläuft häufig tödlich
- Chirurgisch findet ein evidenzbasierter Paradigmenwechsel statt
- MRE-Infektionen stellen global ein enormes Problem dar
- Aktuelle Empfehlungen favorisieren den Einsatz neuer Antibiotika bei schweren MRE-Infektionen