ANTIMICROBIAL STEWARDSHIP
YEAR IN REVIEW

Jan J. De Waele

Jan.DeWaele@UGent.be

@CriticCareDoc

Faculty/Presenter Disclosure

- Faculty: Jan DE WAELE

- Relationships with commercial interests:
  - Grants/Research Support: None
  - Speakers Bureau/Honoraria: MSD, Pfizer, ThermoFisher (fees and honoraria paid to institution)
  - Consulting Fees: None

- Other:
  - Sr. Clinical Researcher, FWO Flanders Research Foundation FWO
  - Surviving Sepsis Campaign Panel Member
  - President-Elect European Society of Intensive Care Medicine

Research Foundation Flanders
Opening new horizons

ESICM
EUROPEAN SOCIETY OF INTENSIVE CARE MEDICINE
The Intensive Connection

Year in review -

Focus on clinically relevant research, international guidelines

Pubmed search

Bias inevitable ;-)

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Guidelines

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Intensive Care Med
https://doi.org/10.1007/s00134-021-06506-y

GUIDELINES

Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021

Laura Evans[1*], Andrew Rhodes[2], Waleed Alhazzani[3], Massimo Antonelli[4], Craig M. Coopersmith[5], Craig French[6], Flávia R. Machado[7], Lauralyn Mcintyre[8], Marlies Ostermann[9], Hallie C. Prescott[10], Christa Schorr[11], Steven Simpson[12], W. Joost Wiersinga[13], Fayez Alshamsi[14], Derek C. Angus[15], Yaseen Arabi[16], Luciano Azevedo[17], Richard Beale[9], Gregory Beilman[18], Emilie Belley-Cote[19], Lisa Burry[20], Maurizio Cecconi[21,22], John Centofanti[23], Angel Coz Yataco[24], Jan De Waele[25], R. Phillip Dellinger[11], Kent Doi[26], Bin Du[27],

Antibiotic Timing

	Shock is present	Shock is absent
Sepsis is definite or probable	Administer antimicrobials **immediately**, ideally within 1 hour of recognition	
Sepsis is possible	Administer antimicrobials **immediately**, ideally within 1 hour of recognition	Rapid assessment* of infectious vs noninfectious causes of acute illness Administer antimicrobials **within 3 hours** if concern for infection persists

*Rapid assessment includes history and clinical examination, tests for both infectious and non-infectious causes of acute illness and immediate treatment for acute conditions that can mimic sepsis. Whenever possible this should be completed within 3 hours of presentation so that a decision can be made as to the likelihood of an infectious cause of the patient's presentation and timely antimicrobial therapy provided if the likelihood is thought to be high.

Contents lists available at ScienceDirect

Clinical Microbiology and Infection

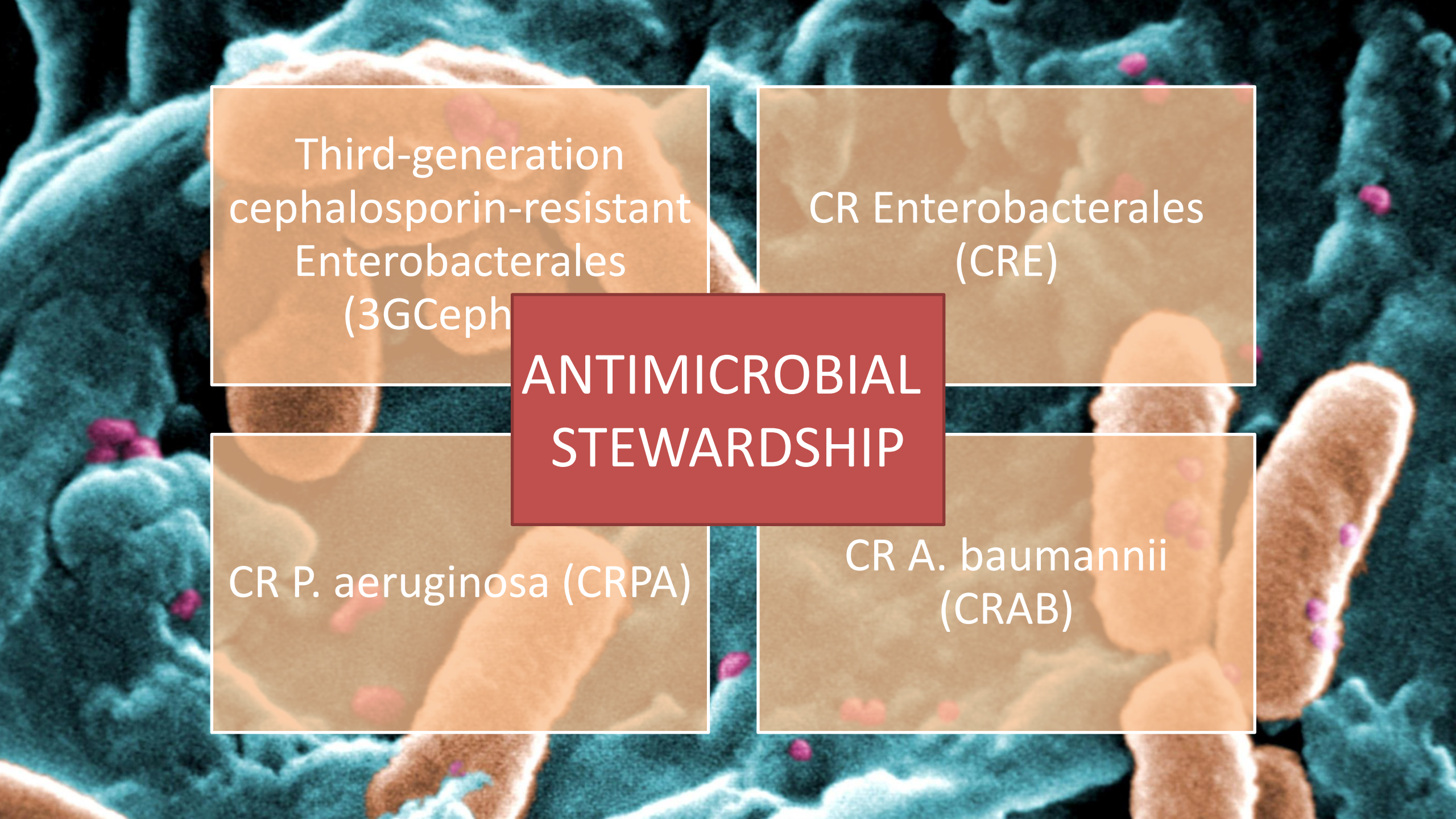
journal homepage: www.clinicalmicrobiologyandinfection.com

Guidelines

European Society of Clinical Microbiology and Infectious Diseases (ESCMID) guidelines for the treatment of infections caused by multidrug-resistant Gram-negative bacilli (endorsed by European society of intensive care medicine)

Mical Paul [1, 2, §], Elena Carrara [3, §], Pilar Retamar [4, 5], Thomas Tängdén [6], Roni Bitterman [1, 2], Robert A. Bonomo [7, 8, 9], Jan de Waele [10], George L. Daikos [11], Murat Akova [12], Stephan Harbarth [13], Celine Pulcini [14, 15], José Garnacho-Montero [16], Katja Seme [17], Mario Tumbarello [18], Paul Christoffer Lindemann [19], Sumanth Gandra [20], Yunsong Yu [21, 22, 23], Matteo Bassetti [24, 25], Johan W. Mouton [26, †], Evelina Tacconelli [3, 27, 28, *, §], Jesús Rodríguez-Baño [4, 5, §]

[1] *Infectious Diseases Institute, Rambam Health Care Campus, Haifa, Israel*
[2] *Faculty of Medicine, Technion — Israel Institute of Technology, Haifa, Israel*


Third-generation cephalosporin-resistant Enterobacterales (3GCeph
CR Enterobacterales (CRE)
ANTIMICROBIAL STEWARDSHIP
CR P. aeruginosa (CRPA)
CR A. baumannii (CRAB)

Evidence based medicine: what it is and what it isn't

It's about integrating individual clinical expertise and the best external evidence

Evidence based medicine, whose philosophical origins extend back to mid-19th century Paris and earlier, remains a hot topic for clinicians, public health practitioners, p
planners, and the public. There are now frequent w
in how to practice and teach it (one sponsored by
will be held in London on 24 April); undergrad
postgraduate[2] training programmes are incorporating it[3] (or pondering how to do so); British centres for evidence based practice have been established or planned in adult medicine, child health, surgery, pathology, pharmacotherapy, nursing,

BMJ VOLUME 312 13 JANUARY 1996

arrogant to serve cost cutters and suppress clinical freedom. As evidence based medicine continues to evolve and adapt,
at it is and
xplicit, and
decisions
about the care of individual patients. The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research. By individual clinical expertise we mean the

what it is not.

Evidence based medicine is the conscientious, explicit, and judicious use of current best evidence in making decisions about the care of individual patients. The practice of evidence based medicine means integrating individual clinical expertise with the best available external clinical evidence from systematic research. By individual clinical expertise we mean the proficiency and judgment that individual clinicians acquire

poration of the best available evidence can practice evidence based medicine.

Evidence based medicine is not "cookbook" medicine. Because it requires a bottom up approach that integrates the best external evidence with individual clinical expertise and patients' choice, it cannot result in slavish, cookbook approaches to individual patient care. External clinical evidence can inform, but can never replace, individual clinical

COVID-19

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Intensive Care Med
https://doi.org/10.1007/s00134-020-06278-x

WHAT'S NEW IN INTENSIVE CARE

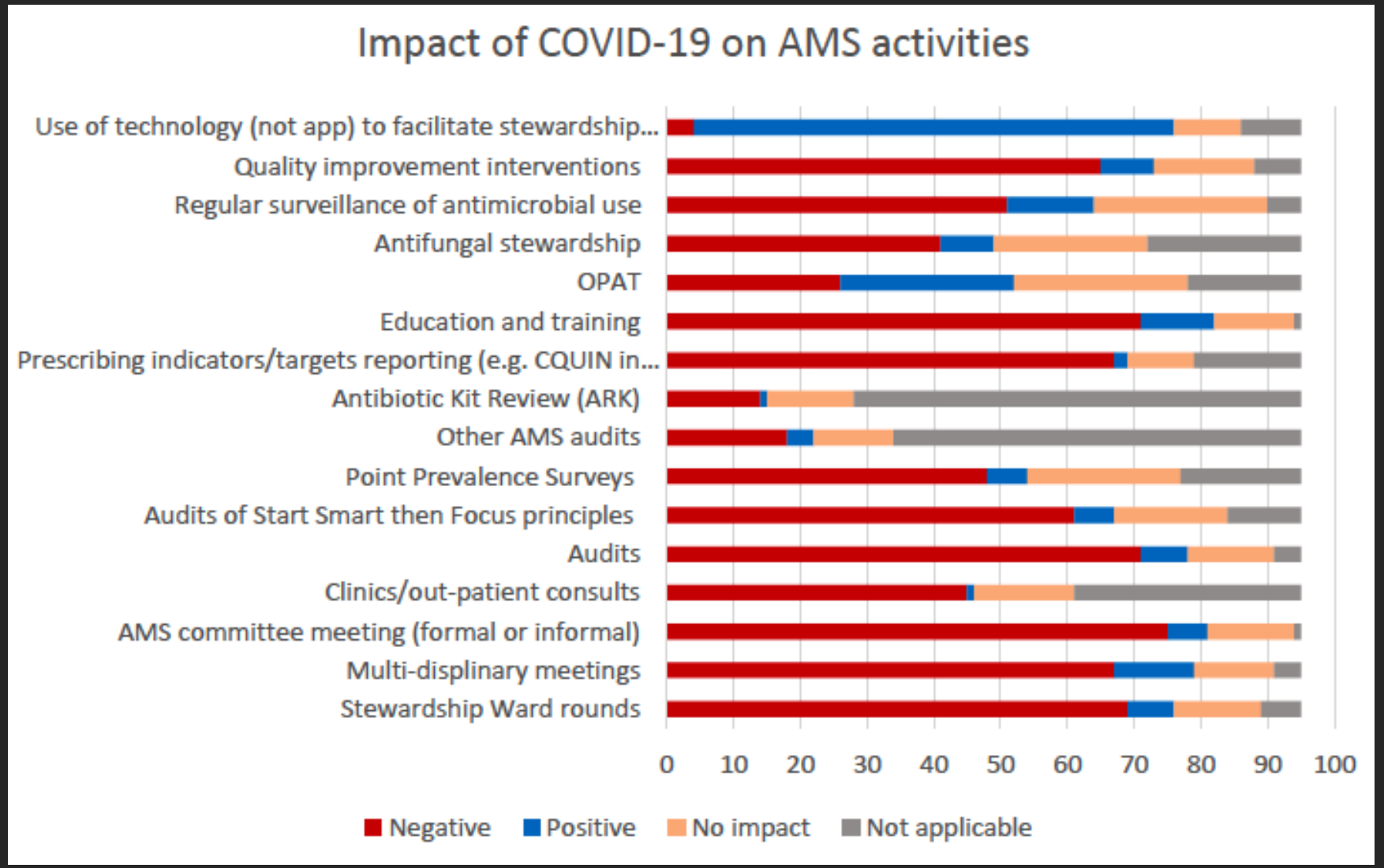
Antimicrobial stewardship in ICUs during the COVID-19 pandemic: back to the 90s?

Jan J. De Waele[1*], Lennie Derde[2,3] and Matteo Bassetti[4]

SARS-CoV-2 infection has arguably been one of the most significant challenges of health care systems around the world in over a century. The coronavirus disease 2019 (COVID-19) lead to a massive increase in demand for acute care beds in many countries [1]. Here, we focus on one of the unintended side effects of the surge in COVID-

develops, this is typically later in the clinical course, presenting as late-onset ventilator-associated pneumonia [5]. A recent meta-analysis found that only 3.5% of all COVID-19 patients present with co-infection, and 14% develop infections at a later stage; in critically ill patients, an estimated 8% developed infections (including co-infection and

Antimicrobial stewardship during the pandemic



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Ashiru-Oredope, D et al. Antibiotics (Basel). 2021 10(2) 110.

RESEARCH Open Access

Co-infection and ICU-acquired infection in COVID-19 ICU patients: a secondary analysis of the UNITE-COVID data set

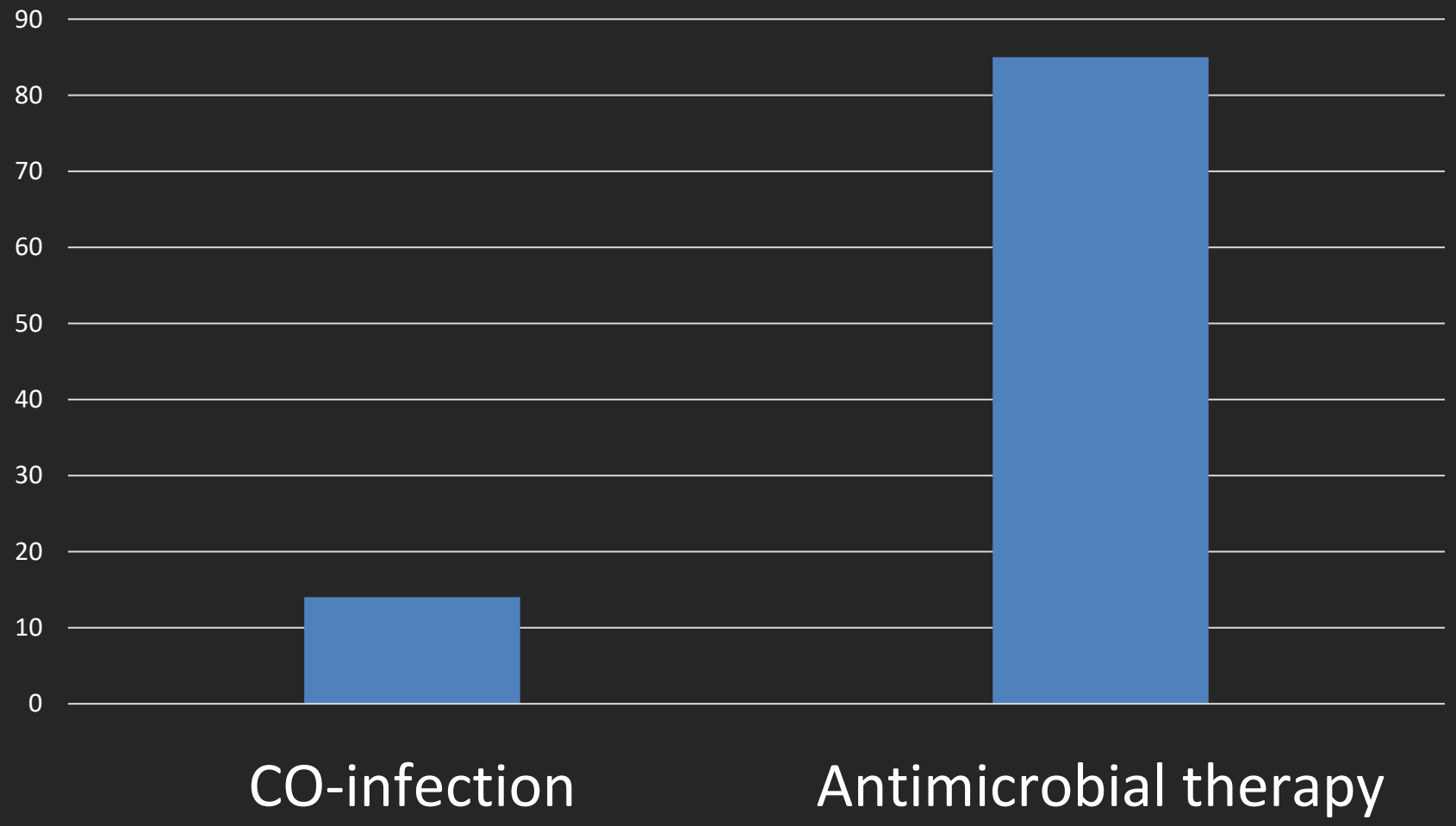
Andrew Conway Morris[1,2,3*†], Katharina Kohler[1†], Thomas De Corte[4,5†], Ari Ercole[1,6], Harm-Jan De Grooth[7,8], Paul W. G. Elbers[7], Pedro Povoa[9,10,11], Rui Morais[11], Despoina Koulenti[12,13], Sameer Jog[14], Nathan Nielsen[15], Alasdair Jubb[1,6], Maurizio Cecconi[16†], Jan De Waele[4,5†] and for the ESICM UNITE COVID investigators

Abstract

Background: The COVID-19 pandemic presented major challenges for critical care facilities worldwide. Infections which develop alongside or subsequent to viral pneumonitis are a challenge under sporadic and pandemic conditions; however, data have suggested that patterns of these differ between COVID-19 and other viral pneumonitides. This secondary analysis aimed to explore patterns of co-infection and intensive care unit-acquired infections (ICU-AI) and the relationship to use of corticosteroids in a large, international cohort of critically ill COVID-19 patients.

Methods: This is a multicenter, international, observational study, including adult patients with PCR-confirmed COVID-19 diagnosis admitted to ICUs at the peak of wave one of COVID-19 (February 15th to May 15th, 2020). Data collected included investigator-assessed co-infection at ICU admission, infection acquired in ICU, infection with

Bacterial co-infection in 5000 COVID patients



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Conway Morris, A et al. Crit Care. 2022 26(1) 236.

KEEP
CALM
AND
ACT
NORMAL

ASP impact

Narrow-spectrum antibiotics for community-acquired pneumonia in Dutch adults (CAP-PACT): a cross-sectional, stepped-wedge, cluster-randomised, non-inferiority, antimicrobial stewardship intervention trial

Valentijn A Schweitzer, Inger van Heijl*, Wim G Boersma, Wouter Rozemeijer, Kees Verduin, Marco J Grootenboers, Sanjay U C Sankatsing, Akke K van der Bij, Winnie de Bruijn, Heidi S M Ammerlaan, Ilse Overdevest, J M Milena Roorda-van der Vegt, Elske M Engel-Dettmers, Florence E Ayuketah-Ekokobe, Michiel B Haeseker, J Wendelien Dorigo-Zetsma, Paul D van der Linden, C H Edwin Boel, Jan J Oosterheert, Cornelis H van Werkhoven, Marc J M Bonten, on behalf of the CAP-PACT Study Group*

Lancet Infect Dis 2022; 22: 274–83

Published Online October 7, 2021 https://doi.org/10.1016/S1473-3099(21)00255-3

See Comment page 159

*Contributed equally

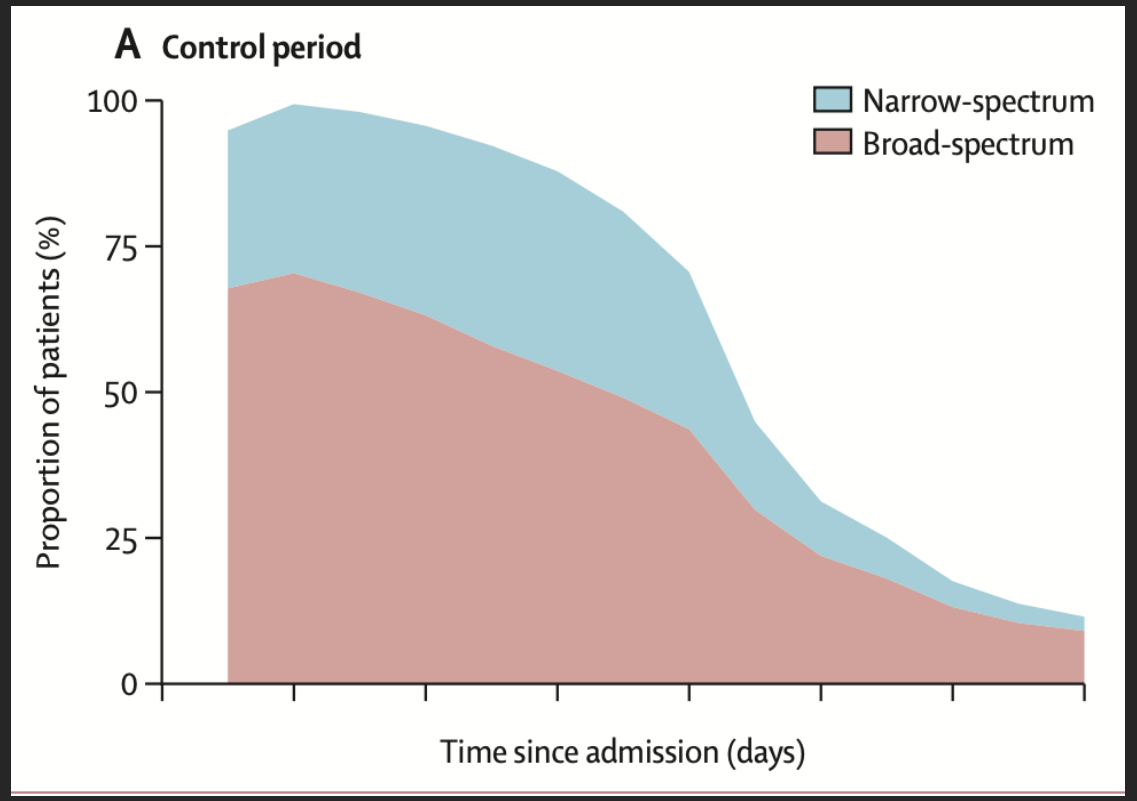
Department of Medical Microbiology (V A Schweitzer MD, C H E Boel MD,

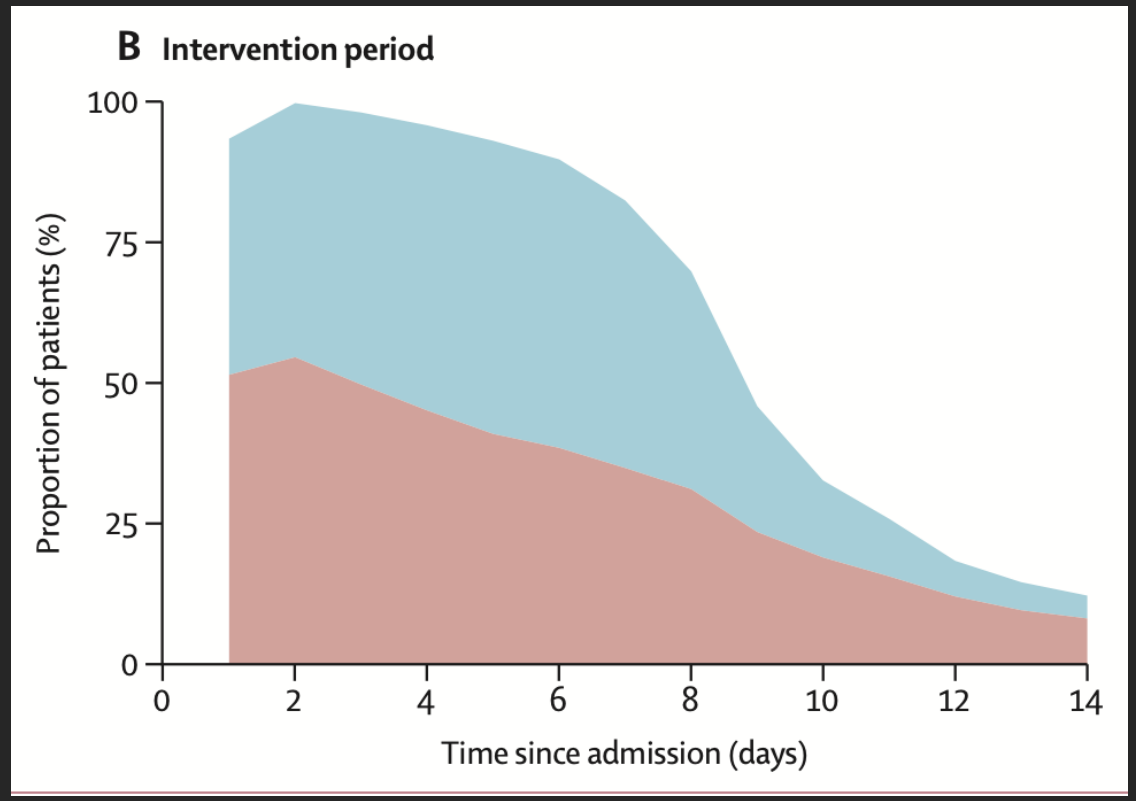
Summary

Background Adults hospitalised to a non-intensive care unit (ICU) ward with moderately severe community-acquired pneumonia are frequently treated with broad-spectrum antibiotics, despite Dutch guidelines recommending narrow-spectrum antibiotics. Therefore, we investigated whether an antibiotic stewardship intervention would reduce the use of broad-spectrum antibiotics in patients with moderately severe community-acquired pneumonia without compromising their safety.

Methods In this cross-sectional, stepped-wedge, cluster-randomised, non-inferiority trial (CAP-PACT) done in 12 hospitals in the Netherlands, we enrolled immunocompetent adults (≥18 years) who were admitted to a non-ICU ward and had a working diagnosis of moderately severe community-acquired pneumonia. All participating hospitals started in a control period and every 3 months a block of two hospitals transitioned from the control to the intervention period, with all hospitals eventually ending in the intervention period. The unit of randomisation was the hospital

CAP-PACT





6.5 ➔ 4.8 days

minus 27%

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Schweitzer, VA et al. Lancet Infect Dis. 2022 22(2) 274.

JAMA Network | Open

Original Investigation | Critical Care Medicine

Effect of Gram Stain–Guided Initial Antibiotic Therapy on Clinical Response in Patients With Ventilator-Associated Pneumonia

The GRACE-VAP Randomized Clinical Trial

Jumpei Yoshimura, MD; Kazuma Yamakawa, MD, PhD; Yoshinori Ohta, MD, PhD; Kensuke Nakamura, MD, PhD; Hideki Hashimoto, MD, PhD; Masahiro Kawada, MD; Hiroki Takahashi, MD; Takeshi Yamagiwa, MD, PhD; Akira Kodate, MD; Kyohei Miyamoto, MD, PhD; Satoshi Fujimi, MD, PhD; Takeshi Morimoto, MD, PhD, MPH

Abstract

IMPORTANCE Gram staining should provide immediate information for detecting causative pathogens. However, the effect of Gram staining on restricting the initial antibiotic choice has not been investigated in intensive care units (ICUs).

OBJECTIVE To compare the clinical response to Gram stain–guided restrictive antibiotic therapy vs guideline-based broad-spectrum antibiotic treatment in patients with ventilator-associated pneumonia (VAP).

DESIGN, SETTING, AND PARTICIPANTS This multicenter, open-label, noninferiority randomized clinical trial (Gram Stain-Guided Antibiotics Choice for VAP) was conducted in the ICUs of 12 tertiary referral hospitals in Japan from April 1, 2018, through May 31, 2020. Patients aged 15 years or older with a VAP diagnosis and a modified Clinical Pulmonary Infection Score of 5 or higher were included. The primary analysis was based on the per-protocol analysis population.

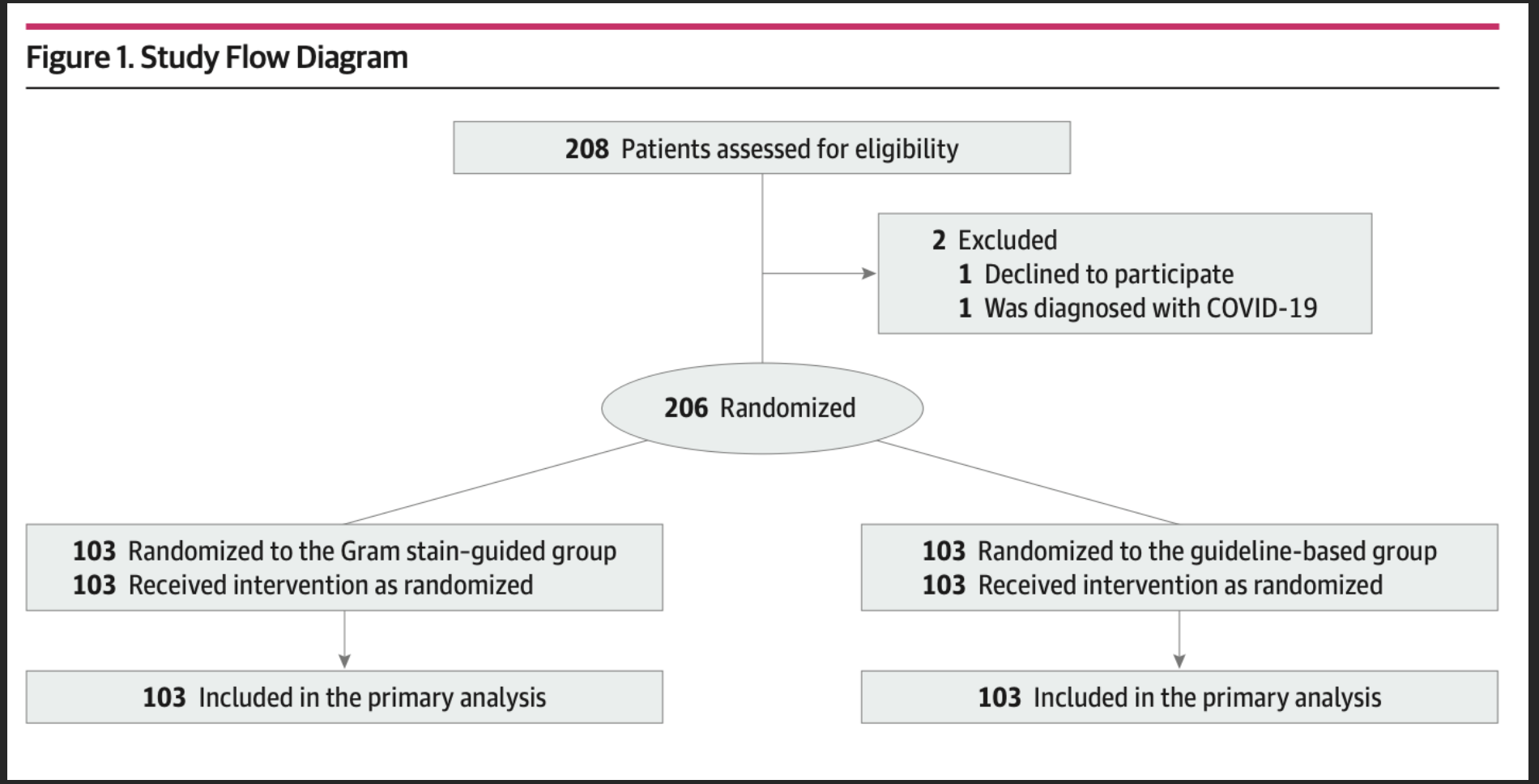
INTERVENTIONS Patients were randomized to Gram stain–guided antibiotic therapy or guideline-based antibiotic therapy (based on the 2016 Infectious Disease Society of America and American

Key Points

Question Does Gram stain–guided antibiotic therapy restrict the administration of broad-spectrum antibiotic agents for ventilator-associated pneumonia without detrimental effects on patient outcomes?

Findings In this randomized clinical trial that included 206 patients with ventilator-associated pneumonia in the intensive care unit, the clinical response to Gram stain–guided antibiotic therapy was noninferior to that of guideline-based antibiotic therapy (76.7% vs 71.8%). Gram stain–guided antibiotic therapy reduced the use of

Study flow diagram



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Yoshimura, J et al. JAMA Netw Open. 2022 5(4) e226136.

Table 2. Primary and Secondary Outcomes

Outcome	No. (%)		*P* value
	Gram stain–guided group (n = 103)	Guideline-based group (n = 103)	
Primary outcome			
Clinical response rate	79 (76.7)	74 (71.8)	<.001[a]
Completion of antibiotic therapy within 14 d[b]	98 (95.1)	94 (91.3)	NA
Improvement or lack of progression of baseline radiographic findings[b]	85 (82.5)	78 (75.7)	NA
Resolution of signs and symptoms of pneumonia[b]	87 (84.5)	85 (82.5)	NA
Lack of antibiotic agent readministration[b]	85 (82.5)	85 (82.5)	NA
Secondary outcomes			
28-d mortality	14 (13.6)	18 (17.5)	.44
28-d ventilator-free days, median (IQR)	22 (15-24)	22 (18-25)	.21
28-d ICU-free days, median (IQR)	19 (15-22)	20 (16-23)	.42
Administration of antibiotic therapy			
Antipseudomonal agents	72 (69.9)	103 (100)	<.001
Anti-MRSA agents	63 (61.2)	103 (100)	<.001
Coverage rate of initial antibiotic therapy	89 (86.4)	95 (92.2)	.18
Escalation[b]	7 (6.8)	1 (1.0)	.03
De-escalation	67 (65.0)	79 (76.7)	.07
Antibiotic therapy days until de-escalation, median (IQR)	3 (2-4)	3 (2-4)	.22
Antibiotic therapy days, median (IQR)	8 (7-11)	8 (7-11)	.09

Yoshimura, J et al. JAMA Netw Open. 2022 5(4) e226136.

JAMA Network Open

Original Investigation | Critical Care Medicine

Effect of Gram Stain–Guided Initial Antibiotic Therapy on Clinical Response in Patients With Ventilator-Associated Pneumonia

The GRACE-VAP Randomized Clinical Trial

Jumpei Yoshimura, MD; Kazuma Yamakawa, MD, PhD; Yoshinori Ohta, MD, PhD; Kensuke Nakamura, MD, PhD; Hideki Hashimoto, MD, PhD; Masahiro Kawada, MD;

CONCLUSIONS AND RELEVANCE Results of this trial showed that Gram stain–guided treatment was noninferior to guideline-based treatment and significantly reduced the use of broad-spectrum antibiotics in patients with VAP. Gram staining can potentially ameliorate the multidrug-resistant organisms in the critical care setting.

pneumonia (VAP).

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Yoshimura, J et al. JAMA Netw Open. 2022 5(4) e226136.

Clinical Microbiology and Infection 27 (2021) 1860.e1–1860.e5

Contents lists available at ScienceDirect

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journal homepage: www.clinicalmicrobiologyandinfection.com

Research note

Effect of discontinuation of an antimicrobial stewardship programme on the antibiotic usage pattern

Wooyoung Jang [1, †], Hyeonjun Hwang [2, †], Hyun-uk Jo [3, 4], Yong-Han Cha [5], Bongyoung Kim [6, *]

[1] School of Medicine, Hanyang University College of Medicine, Seoul, South Korea
[2] Center for Service Industry, Korea Institute for Industrial Economics and Trade, Sejong, South Korea
[3] Department of Urology, Eulji University College of Medicine, Daejeon, South Korea
[4] Department of Urology, Good Munhwa Hospital, Busan, South Korea
[5] Department of Orthopaedics, Eulji University Hospital, Daejeon, South Korea
[6] Department of Internal Medicine, Hanyang University College of Medicine, Seoul, South Korea

ARTICLE INFO

Article history:

ABSTRACT

Objectives: This study aimed to analyse the effect of discontinuation of antimicrobial stewardship pro

Trends after ASP discontinuation

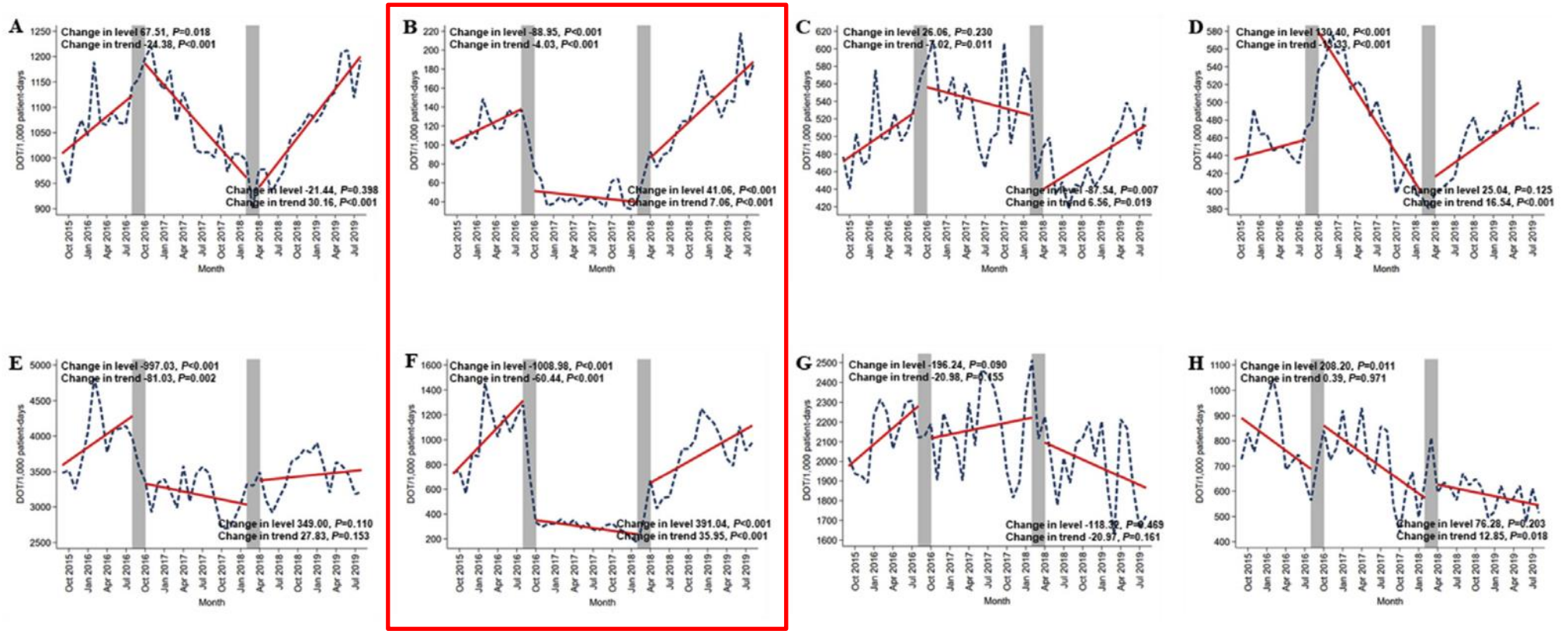

Fig. 1. Changing trends in antibiotic use over time. (A) Total antibiotics in the general ward. (B) Restrictive antibiotics in the general ward. (C) Broad-spectrum antibiotics in the general ward. (D) Non-broad-spectrum antibiotics in the general ward. (E) Total antibiotics in the intensive care unit (ICU). (F) Restrictive antibiotics in the ICU. (G) Broad-spectrum antibiotics in the ICU. (H) Non-broad-spectrum antibiotics in the ICU.

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Jang, W et al. Clin Microbiol Infect. 2021 27(12) 1860.e1.

Clinical Infectious Diseases

MAJOR ARTICLE

Impact of Antibiotic Stewardship Rounds in the Intensive Care Setting: A Prospective Cluster-Randomized Crossover Study

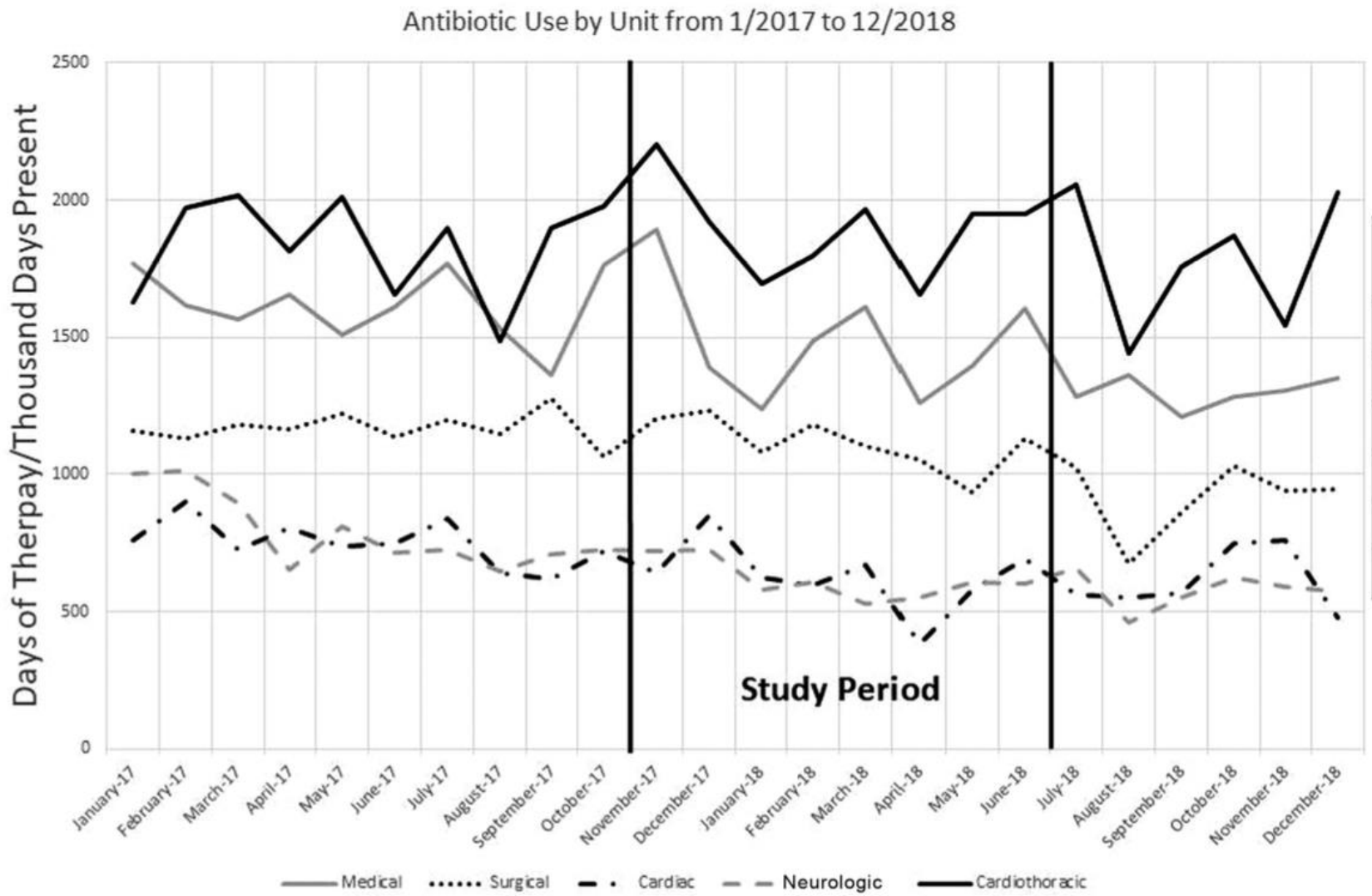
Jessica L. Seidelman,[1,2] Nicholas A. Turner,[1,2] Rebekah H. Wrenn,[1,2] Christina Sarubbi,[3] Deverick J. Anderson,[1,2] Daniel J. Sexton,[1,2] and Rebekah W. Moehring[1,2]

[1]Division of Infectious Diseases, Department of Medicine, Duke University Medical Center, Durham, North Carolina, USA; [2]Duke Center for Antimicrobial Stewardship and Infection Prevention, Durham, North Carolina, USA; and [3]UNC Rex Healthcare, Raleigh, North Carolina, USA

Background. Few groups have formally studied the effect of dedicated antibiotic stewardship rounds (ASRs) on antibiotic use (AU) in intensive care units (ICUs).

Methods. We implemented weekly ASRs using a 2-arm, cluster-randomized, crossover study in 5 ICUs at Duke University Hospital from November 2017 to June 2018. We excluded patients without an active antibiotic order, or if they had a marker of high complexity including an existing infectious disease consult, transplantation, ventricular assist device, or extracorporeal membrane oxygenation. AU during and following ICU stay for patients with ASRs was compared to the controls. We recorded the number of reviews, recommendations delivered, and responses. We evaluated change in ICU-specific AU during and after the study.

Results. Our analysis included 4683 patients: 2330 intervention and 2353 controls. Teams performed 761 reviews during ASRs, which excluded 1569 patients: 60% of patients off antibiotics, and 8% complex patients. Exclusions affected 88% of cardiothoracic ICU (CTICU) patients. The AU rate ratio (RR) was 0.97 (95% confidence interval [CI], .91–1.04). When CTICU was removed, the RR was 0.93 (95% CI, .89–.98). AU in the poststudy period decreased by 16% (95% CI, 11%–24%) compared to AU in the baseline period. Change in AU was differential among units: largest in the neurology ICU (−28%) and smallest in the CTICU (−2%)



Intensive care unit	Antibiotic use change (%)
Cardiothoracic	-2
Medical	-19
Cardiac	-19
Surgical	-23
Neurology	-28
Overall	-16

Figure 2. Antibiotic use measured in days of therapy (DOT) per 1000 days present prior to, during, and after the study period in the 5 study intensive care units.

Seidelman, JL et al. Clin Infect Dis. 2022 74(11) 1986.

Antibiotic optimisation

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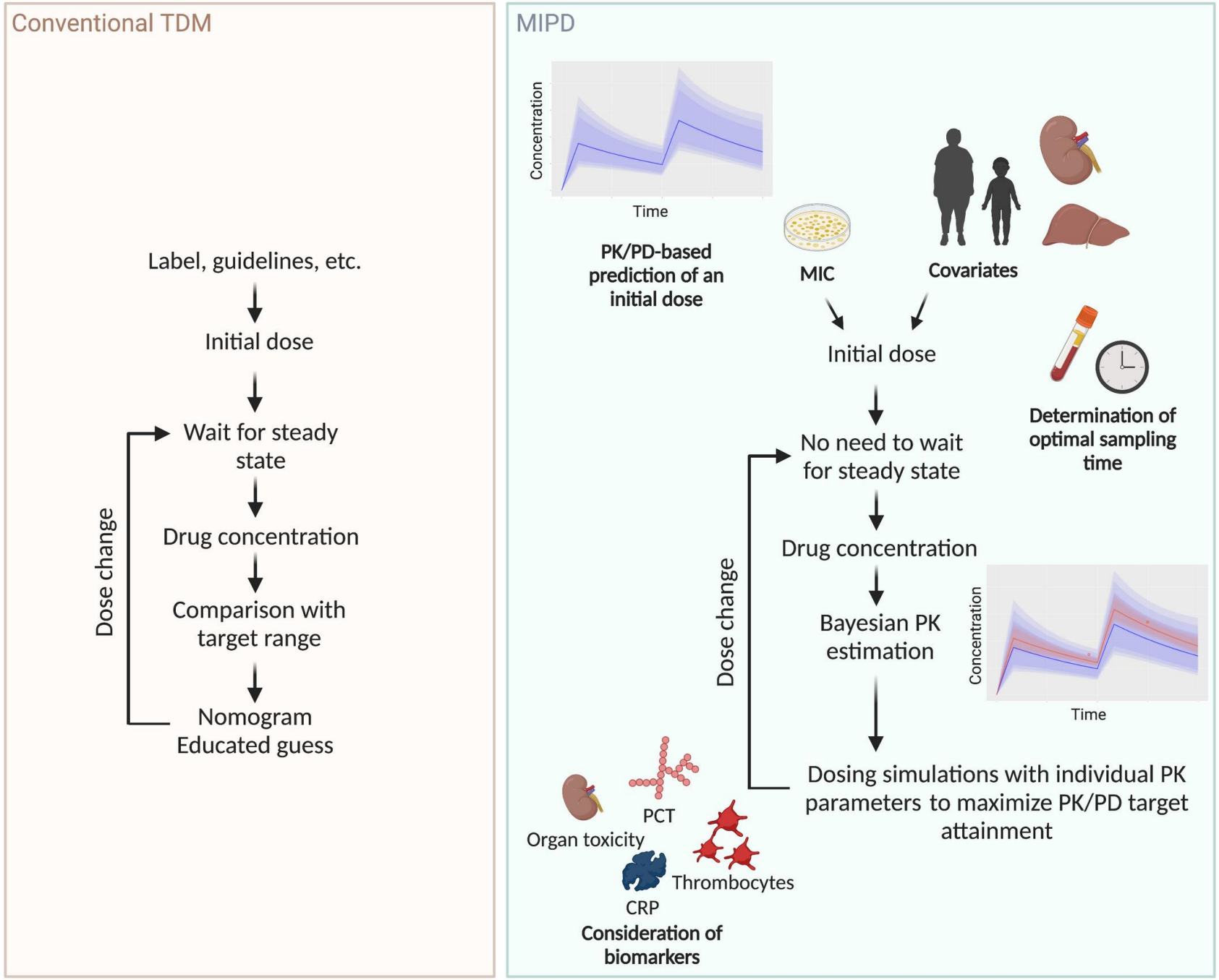
From Therapeutic Drug Monitoring to Model-Informed Precision Dosing for Antibiotics

Sebastian G. Wicha[1,*], Anne-Grete Märtson[2], Elisabet I. Nielsen[3], Birgit C.P. Koch[4], Lena E. Friberg[3], Jan-Willem Alffenaar[5,6,7] and Iris K. Minichmayr[3] on behalf of the International Society of Anti-Infective Pharmacology (ISAP), the PK/PD study group of the European Society of Clinical Microbiology, Infectious Diseases (EPASG)

Therapeutic drug monitoring (TDM) and model-informed precision dosing (MIPD) have evolved as important tools to inform rational dosing of antibiotics in individual patients with infections. In particular, critically ill patients display altered, highly variable pharmacokinetics and often suffer from infections caused by less susceptible bacteria. Consequently, TDM has been used to individualize dosing in this patient group for many years. More recently, there has been increasing research on the use of MIPD software to streamline the TDM process, which can increase the flexibility and precision of dose individualization but also requires adequate model validation and re-evaluation of existing workflows. In parallel, new minimally invasive and noninvasive technologies such as microneedle-based sensors are being developed, which—together with MIPD software—have the potential to revolutionize how patients are dosed with antibiotics. Nonetheless, carefully designed clinical trials to evaluate the benefit of TDM and MIPD approaches are still sparse, but are critically needed to justify the implementation of TDM and MIPD in clinical



Wicha, SG et al. Clin Pharmacol Ther. 2021 109(4) 928.

Intensive Care Med
https://doi.org/10.1007/s00134-021-06609-6

ORIGINAL

Effect of therapeutic drug monitoring-based dose optimization of piperacillin/tazobactam on sepsis-related organ dysfunction in patients with sepsis: a randomized controlled trial

Stefan Hagel[1,2*], Friedhelm Bach[3], Thorsten Brenner[4,5], Hendrik Bracht[6], Alexander Brinkmann[7], Thorsten Annecke[8,9], Andreas Hohn[8,10], Markus Weigand[5], Guido Michels[11], Stefan Kluge[12], Axel Nierhaus[12], Dominik Jarczak[12], Christina König[12], Dirk Weismann[13], Otto Frey[14], Dominic Witzke[3], Carsten Müller[15], Michael Bauer[16], Michael Kiehntopf[17], Sophie Neugebauer[2,17], Thomas Lehmann[18], Jason A. Roberts[19,20,21] and Mathias W. Pletz[1,2] on behalf of the TARGET Trial Investigators

Table 1 Demographics and baseline characteristics

Characteristic	TDM ($n=125$)	No-TDM ($n=124$)
Age, mean (SD), years	67.2 (13.9)	65.3 (13.5)
Male sex, no. (%)	80 (63.5)	92 (72.4)
Body mass index, mean (SD)[a]	28.3 (7.9)	27.4 (7.4)
APACHE II score, mean (SD)[b]	23.2 (6.7)	22.4 (5.7)
SOFA score, mean (SD)[c]	12.1 (2.8)	12.2 (2.6)
SAPS II score, mean (SD)[b]	44.6 (12.4)	43.9 (12.2)
Charlson comorbidity index score, median (IQR)	2 (1–3)	2 (1–3)
Septic shock, no. (%)	96 (76.2)	92 (72.4)
Required mechanical ventilation, no. (%)	100 (79.3)	92 (72.4)
Laboratory values, median (IQR)		
White blood cell count, cells/μL	17.0 (11.7–22.2)	13.6 (10–23.5)
Plasma procalcitonin, ng/mL	4.3 (0.9–13.4)	4.2 (1.0–14.5)
Plasma lactate, mg/dL	2.2 (1.5–3.5)	2.2 (1.4–3.6)
Plasma creatinine, mg/dL	1.3 (0.84–2)	1.4 (0.9–2.3)
Creatinine clearance, mL/min	55.6 (34.5–90.3)	53 (32.7–95)
Plasma albumin, g/dL	2.5 (2.2–2.9)	2.4 (2–3)
Source of infection, no. (%)[d]		
Pneumonia	74 (62.7)	81 (65.8)
Intra-abdominal infection	25 (21.2)	24 (19.5)
Urinary tract	15 (12.7)	17 (13.8)
Bone or soft tissue	11 (9.3)	15 (6.2)
Surgical site infection	5 (4.2)	4 (3.3)
Other	20 (16.9)	17 (13.8)
Unknown	8 (6.3)	4 (3.1)
Acquisition, no. (%)		
Health care-associated	71 (56.3)	72 (56.7)
Community-associated	55 (43.7)	55 (43.3)
Time between onset of sepsis and randomization, mean (SD), h	15.0 ± 6.4	15.1 ± 6.9

TARGET study

Control

TDM

Fig. 3 Attainment of piperacillin target concentration in percent up to day 5 after randomization in patients with piperacillin TDM-guided therapy (TDM, right columns) and patients in the control group (control, left column). Within range (green), above range (blue) or below range (red) per the target range on a given day

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Hagel, S et al. Intensive Care Med. 2022

Table 2 Study outcomes

Outcome	TDM ($n=125$)	No-TDM ($n=124$)	p value[a]
SOFA score, mean (95% CI)	7.9 (7.1–8.7)	8.2 (7.5–9)	0.39
28-Day mortality, no. (%)	27 (21.6)	32 (25.8)	0.44
ΔSOFA, mean score day 1–10 (or 24 points if death within 10 days) minus score at baseline	2.1 (-0.2–4.3)	2.6 (0.3–4.9)	0.59
ΔSOFA, score at day 10 (or 24 points if death within 10 days) minus score at baseline	1.6 (-1–4.2)	2.9 (0.2–5.6)	0.26
SOFA subscore, median (IQR)			
Cardiovascular	2 (1–3)	2 (1.2–3.2)	0.81
Respiratory	2.5 (2–3)	2.5 (2–2.9)	0.45
Coagulation	0.1 (0–1)	0 (0–0.8)	0.54
Renal	0.5 (0–1.5)	0.8 (80–2)	0.4
Hepatic	3.2 (2.6–4)	3.3 (2.8–4)	0.68
Central nervous system	0.1 (0–1.2)	0.3 (0–1.3)	0.31
Length of stay (days), median (IQR)			
In ICU	9 (4–15)	11 (7–17	0.24
In hospital	24 (15–28)	25 (15–28)	0.52
Intervention-free days, median (IQR)			
Ventilator[b]	20 (5–27)	18.5 (1–25)	0.06
Renal replacement therapy[b]	28 (21–28)	28 (10–28)	0.33
Antibiotic[c]	8 (6–12)	8 (5–11)	0.19
Vasopressor[c]	11 (2–13)	9 (2–12)	0.14
Clinical cure, EOT[d]	21/59 (35.6)	12/69 (17.4)	
Microbiological cure, EOT[e]	27/48 (56.3)	23/50 (46)	
Total daily dose (grams) of piperacillin/tazobactam, mean (SD)	10.3 ± 5.6	9.8 ± 2.5	0.12

ORIGINAL

Model-informed precision dosing of beta-lactam antibiotics and ciprofloxacin in critically ill patients: a multicentre randomised clinical trial

Tim M. J. Ewoldt[1,2,3*], Alan Abdulla[2,3], Wim J. R. Rietdijk[2], Anouk E. Muller[3,4,5], Brenda C. M. de Winter[2,3], Nicole G. M. Hunfeld[1,2], Ilse M. Purmer[6], Peter van Vliet[7], Evert-Jan Wils[1,8], Jasper Haringman[9], Annelies Draisma[10], Tom A. Rijpstra[11], Attila Karakus[12], Diederik Gommers[1], Henrik Endeman[1] and Birgit C. P. Koch[2,3]

Abstract

Purpose: Individualising drug dosing using model-informed precision dosing (MIPD) of beta-lactam antibiotics and ciprofloxacin has been proposed as an alternative to standard dosing to optimise antibiotic efficacy in critically ill

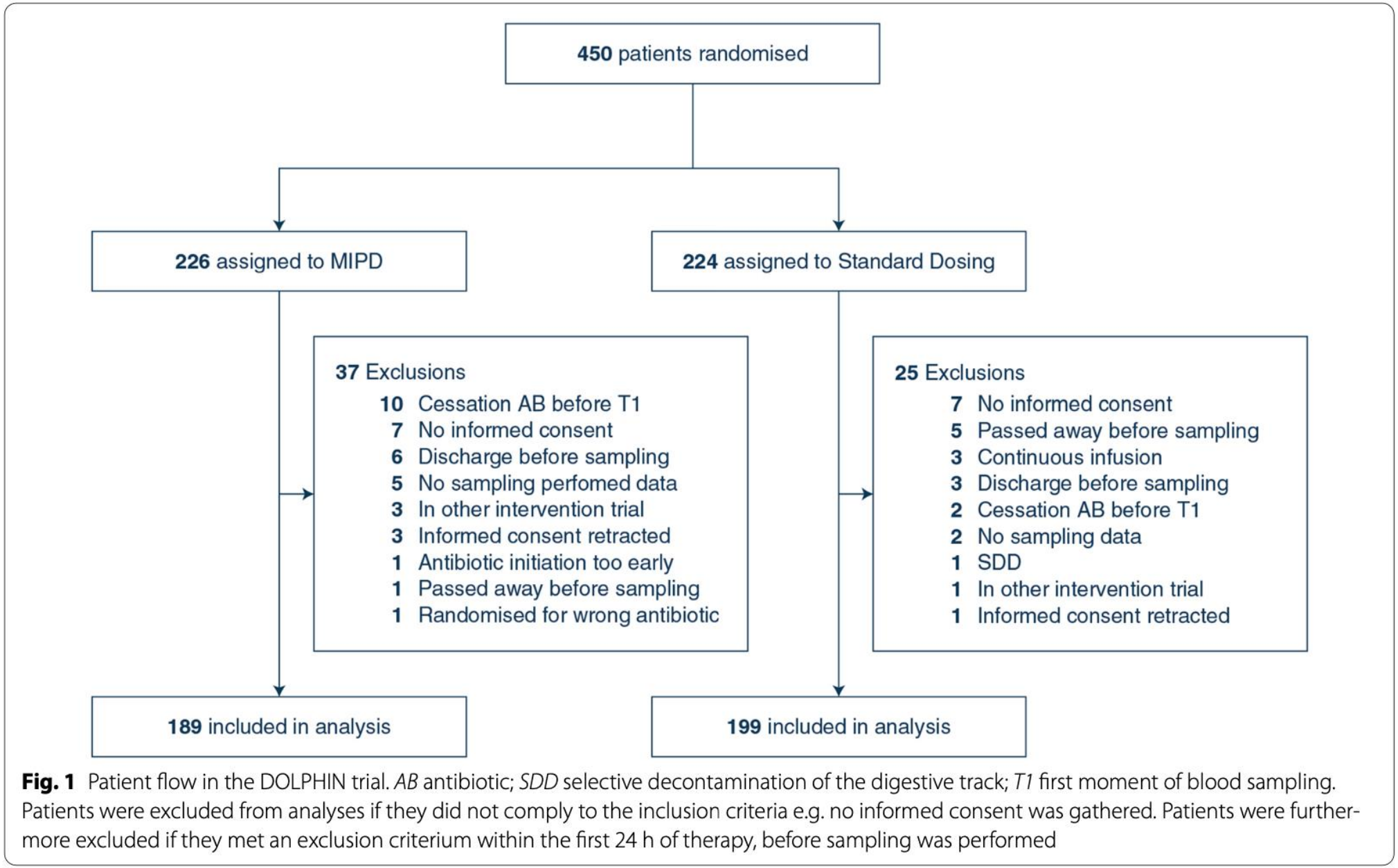

Fig. 1 Patient flow in the DOLPHIN trial. *AB* antibiotic; *SDD* selective decontamination of the digestive track; *T1* first moment of blood sampling. Patients were excluded from analyses if they did not comply to the inclusion criteria e.g. no informed consent was gathered. Patients were furthermore excluded if they met an exclusion criterium within the first 24 h of therapy, before sampling was performed

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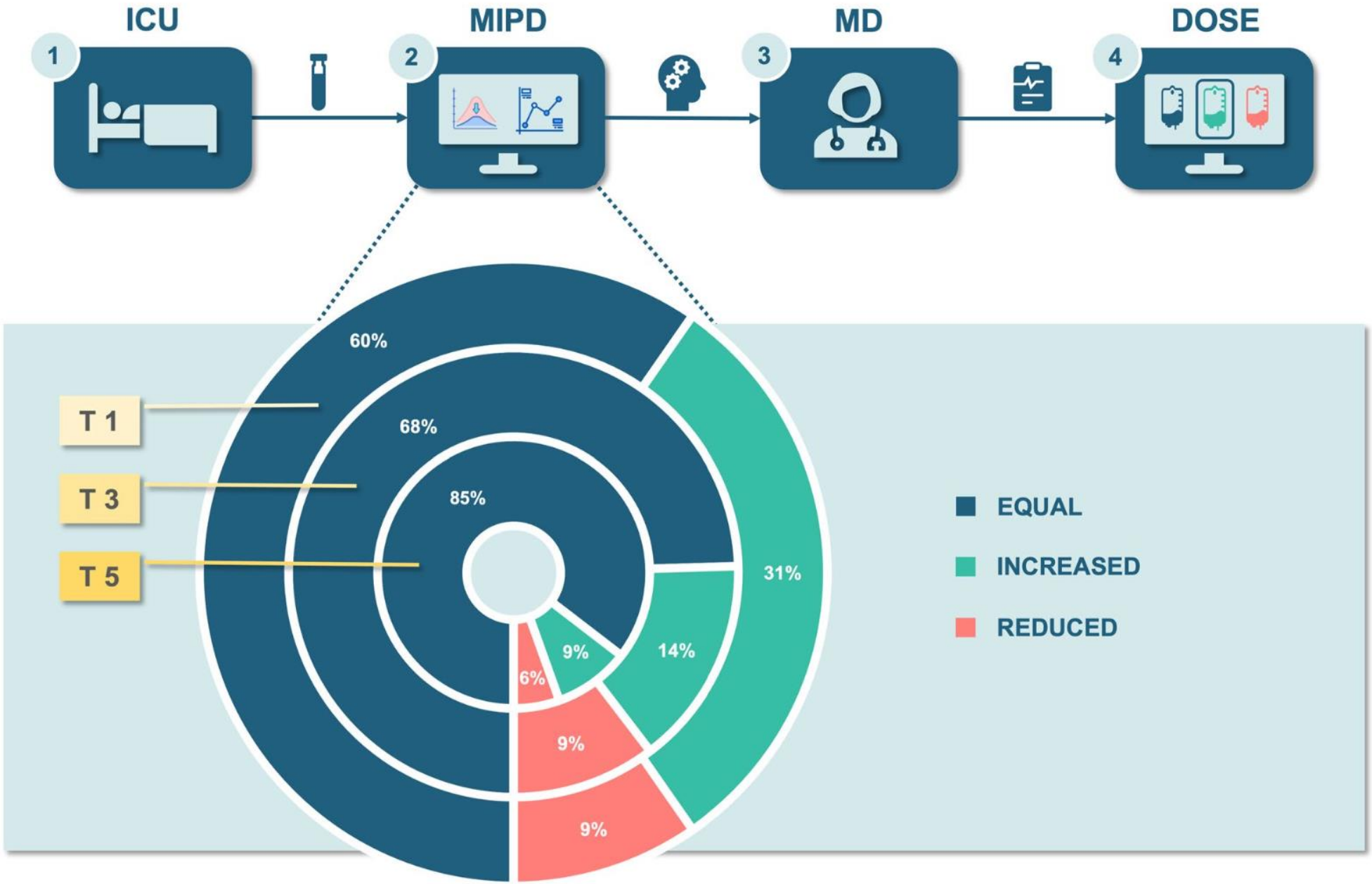

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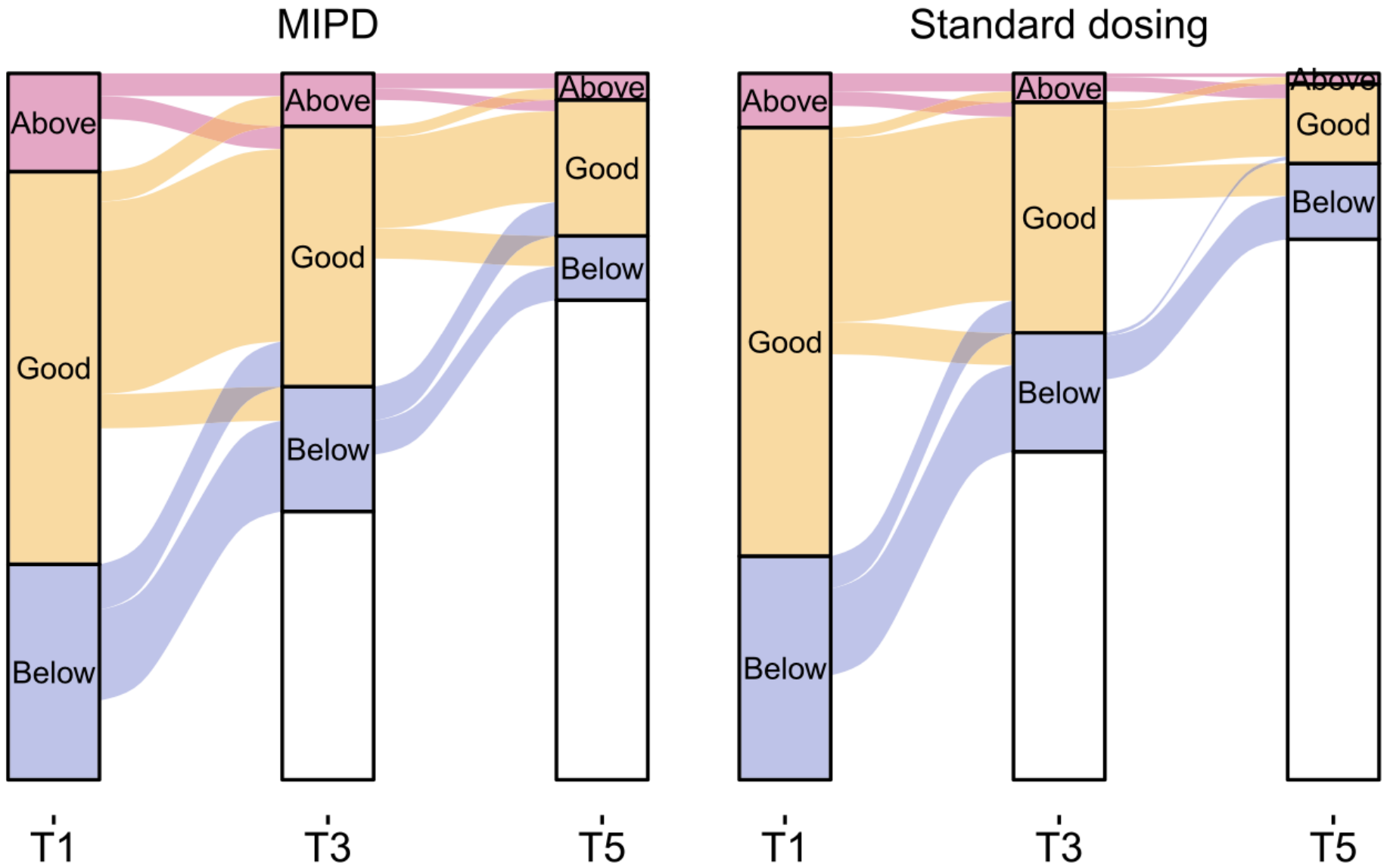

Fig. 3 Alluvial plot of target attainment over time. T1, first moment of antibiotic sampling, 1 day after initiation of antibiotic; T3, second moment of sampling, 48 h after T1; T5, third moment of sampling, 48 h after T3

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Table 2 Study outcomes

Outcome	MIPD	Standard therapy	Crude effect (95% CI)	Adjusted Effect (95% CI)	P-value	P-value adjusted
ICU LOS, median (IQR)	10 (5–20)	8 (3–19)	1.12 (0.92–1.36)[b]	1.16 (0.96–1.41)[b]	0.27	0.13
ICU LOS after T0, median (IQR)	7 (3–13)	6 (3–14)	1.09 (0.9–1.31)[b]	1.11 (0.92–1.34)[b]	0.4	0.27
ICU-free days alive, median (IQR)[a]	16 (0–23)	18 (0–25)			0.21[h]	
ICU mortality, No. (%)	41 (21.7)	36 (18.1)	1.25 (0.76–2.07)[c]	1.21 (0.74–2.02)[c]	0.37	0.44
28-day mortality, no. (%)	50 (26.5)	49 (24.6)	1.1 (0.7–1.74)[c]	1.04 (0.65–1.66)[c]	0.68	0.87
Hospital mortality, no. (%)	53 (28)	51 (25.6)	1.13 (0.72–1.77)[c]	1.07 (0.68–1.7)[c]	0.59	0.76
6 month mortality, no. (%)	69 (36.5)	64 (32.2)	1.21 (0.8–1.85)[c]	1.14 (0.74–1.76)[c]	0.37	0.57
SOFA score at T5, median (IQR)	3 (0–6)	1.5 (0–7)			0.11[h]	
Delta-SOFA score at T5, median (IQR)	4 (1–7)	4 (1–7)	− 0.03 (− 0.92 to 0.87)[d]	− 0.1 (− 0.99 to 0.79)[d]	0.95	0.82
CRP at T5, median (IQR)	79 (41–162)	84 (42–180)			0.68[h]	
Delta-CRP score at T5, median (IQR)	61 (9–160)	75 (17–190)	− 12.2 (− 49.1 to 24.6)[d]	− 14.2 (− 51.1 to 22.8)[d]	0.52	0.45
WBC at T5, median (IQR)	13.5 (9.5–18.7)	12.9 (9.8–17.1)			0.51[h]	
Delta-WBC score at T5, median (IQR)	0.02 (− 6.7 to 4.7)	0.7 (− 4.9 to 4.9)	− 0.7 (− 3.2 to 1.8)[d]	− 0.8 (− 3.3 to 1.7)[d]	0.59	0.55
Target attainment at T1, no. (%)	105 (55.6)	120 (60.9)	0.8 (0.53–1.2)[c]	0.78 (0.52–1.18)[c]	0.29	0.24
Above target at T1, no. (%)	26 (13.8)	15 (7.6)	1.93 (1–3.86)[c]	1.84 (0.94–3.7)[c]	0.05	0.08
Target attainment at T3, No. (%)[e]	69 (59.5)	64 (60.4)	0.96 (0.56–1.64)[c]	0.95 (0.55–1.63)[c]	0.89	0.84
Above target at T3, No. (%)[e]	14 (12.1)	8 (7.5)	1.68 (0.69–4.37)[c]	1.62 (0.65–4.25)[c]	0.26	0.31
Target attainment at T5, no. (%)[f]	36 (60)	24 (50)	1.5 (0.7–3.25)[c]	1.52 (0.7–3.33)[c]	0.3	0.29
Above target at T5, no. (%)[f]	7 (11.7)	3 (6.3)	1.98 (0.52–9.6)[c]	1.87 (0.48–9.13)[c]	0.34	0.39
Target attainment at T7, No. (%)[g]	15 (71.4)	15 (57.7)	1.83 (0.55–6.54)[c]	1.71 (0.5–6.27)[c]	0.33	0.4
Above target at T7, no. (%)[g]	2 (9.5)	0 (0)	∞ (0–∞)[c]	∞ (0–∞)[c]	1	1
Quality of Life VAS at 6 months, median (IQR)	70 (50–80)	65 (55–75)	− 0.8 (− 6.26 to 4.66)[d]	− 0.75 (− 6.26 to 4.76)[d]	0.775	0.79
QALY at 6 months, median (IQR)	0.78 (0.57–0.89)	0.72 (0.51–0.85)	− 0.03 (− 0.12 to 0.06)[d]	− 0.03 (− 0.12 to 0.06)[d]	0.55	0.49

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Clinical Infectious Diseases

REVIEW ARTICLE

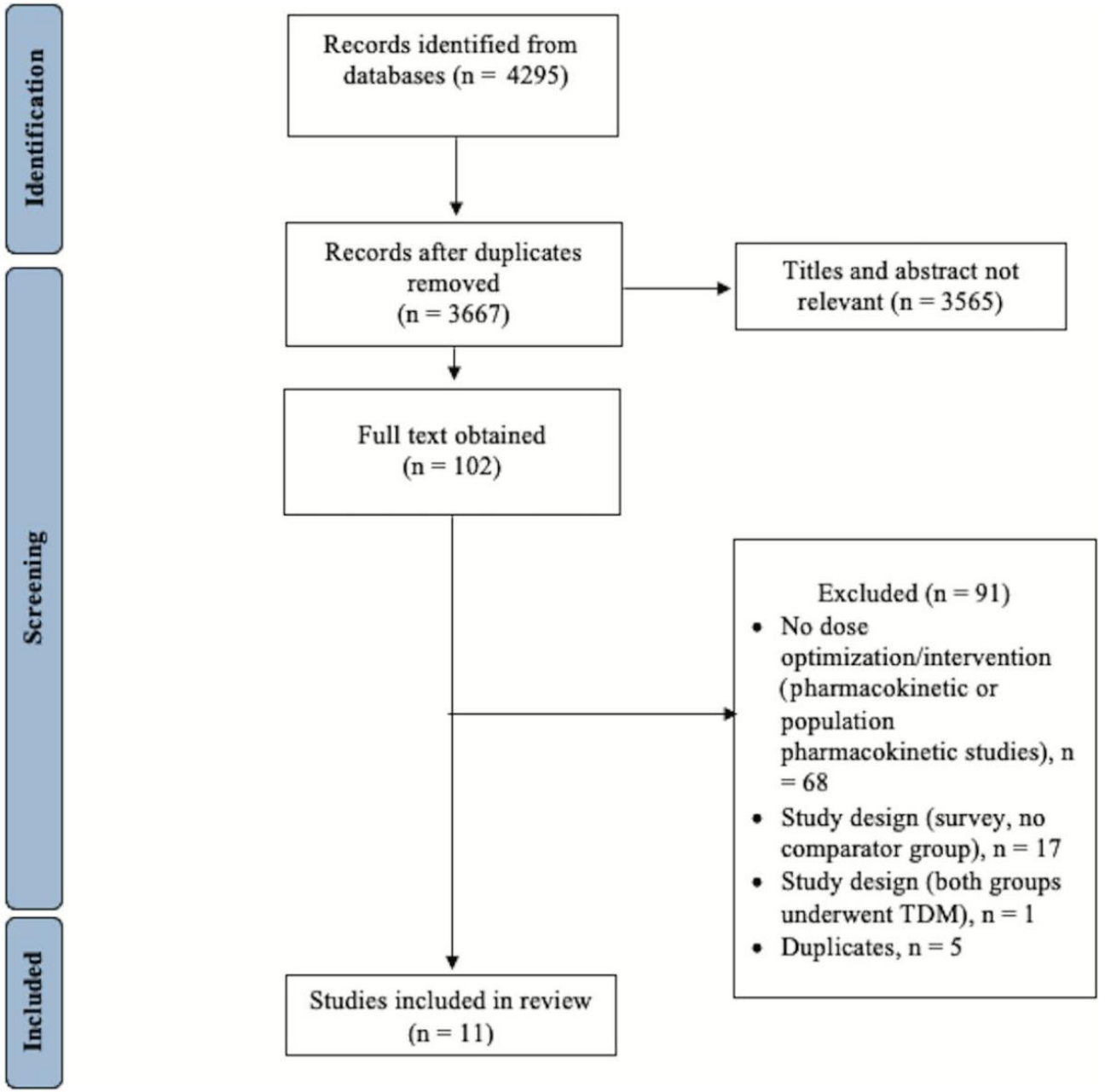
Beta-Lactam Antibiotic Therapeutic Drug Monitoring in Critically Ill Patients: A Systematic Review and Meta-Analysis

Rekha Pai Mangalore,[1,2] Aadith Ashok,[1] Sue J. Lee,[1,2] Lorena Romero,[3] Trisha N. Peel,[1,2] Andrew A. Udy,[4,5] and Anton Y. Peleg[1,2,6]

[1]Department of Infectious Diseases, Alfred Hospital, Alfred Health, Melbourne, Victoria, Australia; [2]Central Clinical School, Monash University, Melbourne, Victoria, Australia; [3]Ian Potter Library, Alfred Hospital, Melbourne, Victoria, Australia; [4]Department of Intensive Care and Hyperbaric Medicine, Alfred Hospital, Alfred Health, Melbourne, Victoria, Australia; [5]School of Public Health and Preventative Medicine Australia, Monash University, Melbourne, Victoria, Australia; and [6]Monash Biomedicine Discovery Institute, Department of Microbiology, Monash University, Melbourne, Victoria, Australia

Therapeutic drug monitoring (TDM) of beta-lactam antibiotics is recommended to address the variability in exposure observed in critical illness. However, the impact of TDM-guided dosing on clinical outcomes remains unknown. We conducted a systematic review and meta-analysis on TDM-guided dosing and clinical outcomes (all-cause mortality, clinical cure, microbiological cure, treatment failure, hospital and intensive care unit length of stay, target attainment, antibiotic-related adverse events, and emergence of resistance) in critically ill patients with suspected or proven sepsis. Eleven studies (n = 1463 participants) were included. TDM-guided dosing was associated with improved clinical cure (relative risk, 1.17; 95% confidence interval [CI], 1.04 to 1.31), microbiological cure (RR, 1.14; 95% CI, 1.03 to 1.27), treatment failure (RR, 0.79; 95% CI, .66 to .94), and target attainment (RR, 1.85; 95% CI, 1.08 to 3.16). No associations with mortality and length of stay were found. TDM-guided dosing improved clinical and microbiological cure and treatment response. Larger, prospective, randomized trials are required to better assess the utility of beta-lactam TDM in critically ill patients.

Keywords. antibacterial agents; pharmacokinetics; pharmacodynamics; drug concentration; critical illness.



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Systematic review TDM

Study or subgroup	TDM-guided dosing Events	Total	Standard dosing Events	Total	Weight	RR M-H, Random, 95% CI	Year
De Waele 2014	3	21	5	20	2.6%	0.57 (.16 to 2.08)	2014
Fournier 2015	5	27	7	82	3.8%	2.17 (.75 to 6.27)	2015
McDonald 2016	2	48	4	45	1.6%	0.47 (.09 to 2.44)	2016
Machado 2017	30	77	23	63	23.3%	1.07 (.69 to 1.64)	2017
Fournier 2018	0	19	2	19	0.5%	0.20 (.01 to 3.91)	2018
Meyer 2019	20	146	24	101	14.9%	0.58 (.34 to .99)	2019
Nikolas 2021	12	114	6	46	5.1%	0.81 (.32 to 2.02)	2021
Aldaz 2021	20	77	20	77	15.1%	1.00 (.59 to 1.70)	2021
Kunz Coyne 2021	14	95	23	105	11.8%	0.67 (.37 to 1.23)	2021
Hagel 2022	27	125	32	124	21.4%	0.84 (.83 to 1.31)	2022
Total (95% CI)		**749**		**682**	**100.0%**	**0.85 (.69 to 1.04)**	
Total events	133		146				

Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 8.87$, df = 9 ($P = .45$); $I^2 = 0\%$;
Test for overall effect: Z = 1.58 ($P = .11$)

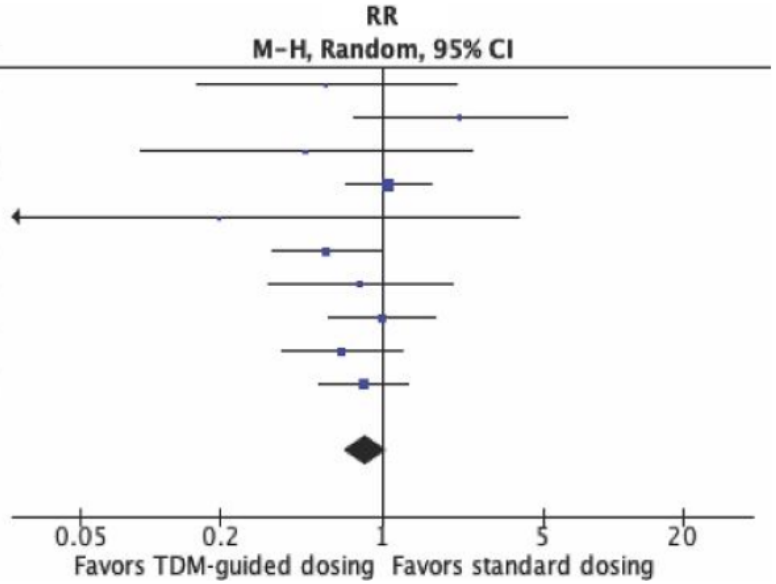

Figure 2. Forest plot showing the risk of mortality with TDM-guided beta-lactam dosing compared with standard dosing. The blue squares represent the effect estimates from individual studies; the size of the square is proportional to the weight of the study. The horizontal lines represent the 95% CI of the study estimate. The black diamond represents the pooled effect size. Abbreviation: CI, confidence interval; df, degrees of freedom; M-H, Mantel-Haenszel Test; RR, risk ratio; TDM, therapeutic drug monitoring.

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Target attainment

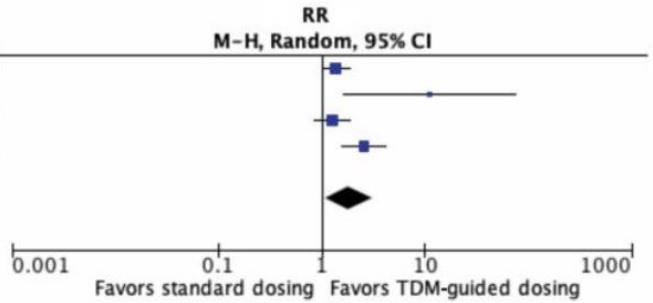
Clinical cure

Microbiological cure

A

Study or subgroup	TDM-guided dosing Events	Total	Standard dosing Events	Total	Weight	RR M-H, Random, 95% CI	Year
De Waele 2014	18	19	13	19	33.4%	1.38 (1.00 to 1.91)	2014
Sime 2015	11	15	1	15	6.5%	11.00 (1.62 to 74.88)	2015
2016	27	48	20	45	31.1%	1.27 (.84 to 1.91)	2016
2	47	125	18	124	29.1%	2.59 (1.60 to 4.20)	2022
CI)		207		203	100.0%	1.85 (1.08 to 3.16)	
s	103		52				

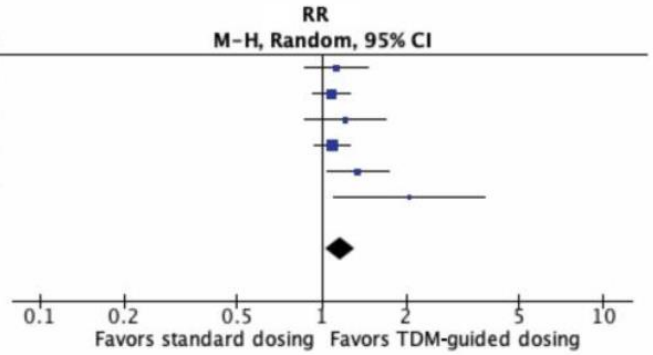
Heterogeneity: $\tau^2 = 0.20$; $\chi^2 = 12.75$, df = 3 ($P = .005$); $I^2 = 76\%$
Test for overall effect: Z = 2.24 ($P = .03$)



B

Study or subgroup	TDM-guided dosing Events	Total	Standard dosing Events	Total	Weight	RR M-H, Random, 95% CI	Year
De Waele 2014	19	21	16	20	14.6%	1.13 (.87 to 1.47)	2014
2016	44	48	38	45	27.8%	1.09 (.93to 1.26)	2016
017	43	77	29	63	9.9%	1.21 (.87 to 1.69)	2017
2021	78	95	79	105	29.1%	1.09 (0.94 to 1.26)	2021
	55	77	41	77	15.2%	1.34 (1.04 to 1.73)	2021
	21	59	12	69	3.3%	2.05 (1.10 to 3.80)	2022
Total (95% CI)		**377**		**379**	**100.0%**	**1.17 (1.04 to 1.31)**	
Total events	260		215				

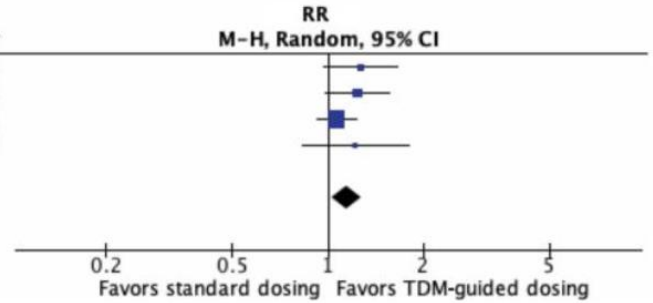
Heterogeneity: $\tau^2 = 0.01$; $\chi^2 = 7.53$, df = 5 ($P = .18$); $I^2 = 34\%$
Test for overall effect: Z = 2.59 ($P = .010$)



C

Study or subgroup	TDM-guided dosing Events	Total	Standard dosing Events	Total	Weight	RR M-H, Random, 95% CI	Year
014	20	21	15	20	15.5%	1.27 (.97 to 1.66)	2014
016	41	48	31	45	21.7%	1.24 (.99 to 1.56)	2016
	66	77	62	77	55.5%	1.06 (.92 to 1.23)	2021
	27	48	23	50	7.4%	1.22 (0.83 to 1.81)	2022
CI)		194		192	100.0%	1.14 (1.03 to 1.27)	
Total events	154		131				

Heterogeneity: $\tau^2 = 0.00$; $\chi^2 = 2.20$, df = 3 ($P = .53$); $I^2 = 0\%$
Test for overall effect: Z = 2.45 ($P = .01$)



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Preventing HAI

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Research

JAMA | Original Investigation | CARING FOR THE CRITICALLY ILL PATIENT

Effect of Selective Decontamination of the Digestive Tract on Hospital Mortality in Critically Ill Patients Receiving Mechanical Ventilation
A Randomized Clinical Trial

The SuDDICU Investigators for the Australian and New Zealand Intensive Care Society Clinical Trials Group

IMPORTANCE Whether selective decontamination of the digestive tract (SDD) reduces mortality in critically ill patients remains uncertain.

OBJECTIVE To determine whether SDD reduces in-hospital mortality in critically ill adults.

DESIGN, SETTING, AND PARTICIPANTS A cluster, crossover, randomized clinical trial that recruited 5982 mechanically ventilated adults from 19 intensive care units (ICUs) in Australia between April 2018 and May 2021 (final follow-up, August 2021). A contemporaneous ecological assessment recruited 8599 patients from participating ICUs between May 2017 and August 2021.

Visual Abstract

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Supplemental content

POPULATION

3780 Men **2202** Women

Adults receiving mechanical ventilation in an intensive care unit

Mean age: **58** years

LOCATIONS

19
Intensive care units in Australia

INTERVENTION

5982 Patients randomized

2791

SDD

6-Hourly oral paste and gastric suspension of colistin, tobramycin, and nystatin, plus 4-day IV antibiotic course

3191

Standard care

Standard care without SDD

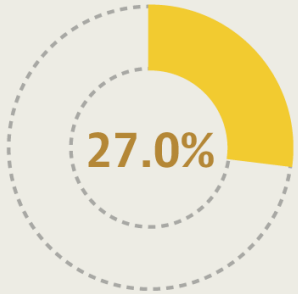
PRIMARY OUTCOME

90-Day in-hospital mortality

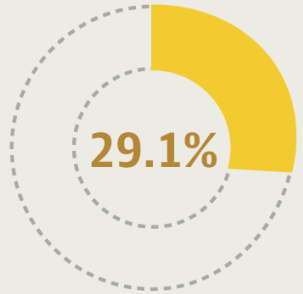
FINDINGS

In-hospital deaths

SDD
753 of 2791 patients



Standard care
928 of 3191 patients



SDD did not significantly reduce in-hospital mortality:

Mean difference, −1.7% (95% CI, −4.8% to 1.3%)

Odds ratio, 0.91 (95% CI, 0.82-1.02); *P* = .12

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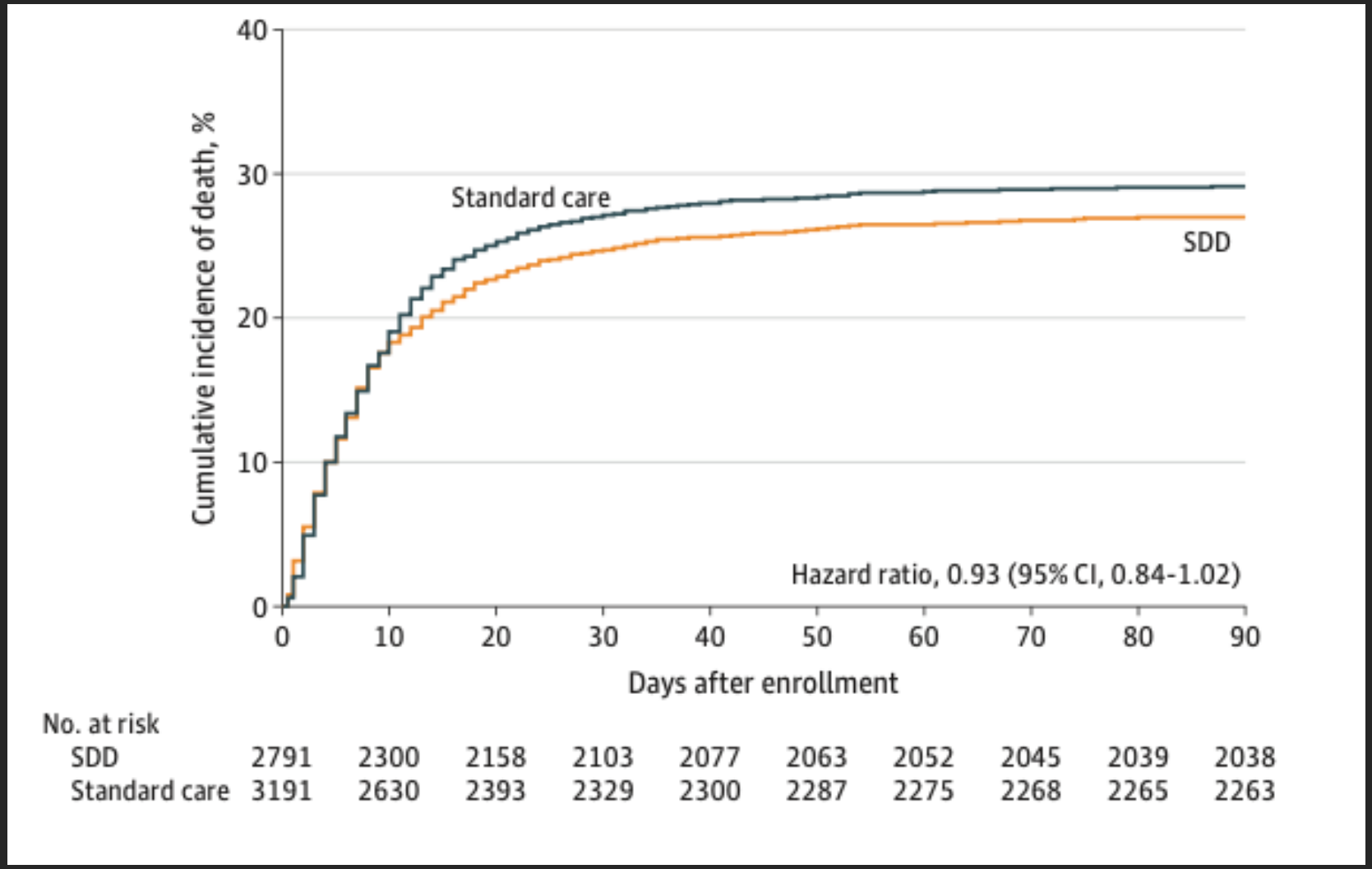
Probability of in-hospital death within 90 days



No. at risk										
SDD	2791	2300	2158	2103	2077	2063	2052	2045	2039	2038
Standard care	3191	2630	2393	2329	2300	2287	2275	2268	2265	2263

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JAMA | Original Investigation

Association Between Selective Decontamination of the Digestive Tract and In-Hospital Mortality in Intensive Care Unit Patients Receiving Mechanical Ventilation
A Systematic Review and Meta-analysis

Naomi E. Hammond, RN, PhD; John Myburgh, MD, PhD; Ian Seppelt, MD; Tessa Garside, MBBS, PhD; Ruan Vlok, MBBS; Sajeev Mahendran, MD; Derick Adigbli, MD, PhD; Simon Finfer, MD; Ya Gao, MM; Fiona Goodman, BN; Gordon Guyatt, MD, PhD; Joseph Alvin Santos, PhD; Balasubramanian Venkatesh, MD; Liang Yao, MM; Gian Luca Di Tanna, PhD; Anthony Delaney, MBBS, PhD

IMPORTANCE The effectiveness of selective decontamination of the digestive tract (SDD) in critically ill adults receiving mechanical ventilation is uncertain.

OBJECTIVE To determine whether SDD is associated with reduced risk of death in adults receiving mechanical ventilation in intensive care units (ICUs) compared with standard care.

DATA SOURCES The primary search was conducted using MEDLINE, EMBASE, and CENTRAL databases until September 2022.

STUDY SELECTION Randomized clinical trials including adults receiving mechanical ventilation in the ICU comparing SDD vs standard care or placebo.

DATA EXTRACTION AND SYNTHESIS Data extraction and risk of bias assessments were performed in duplicate. The primary analysis was conducted using a bayesian framework

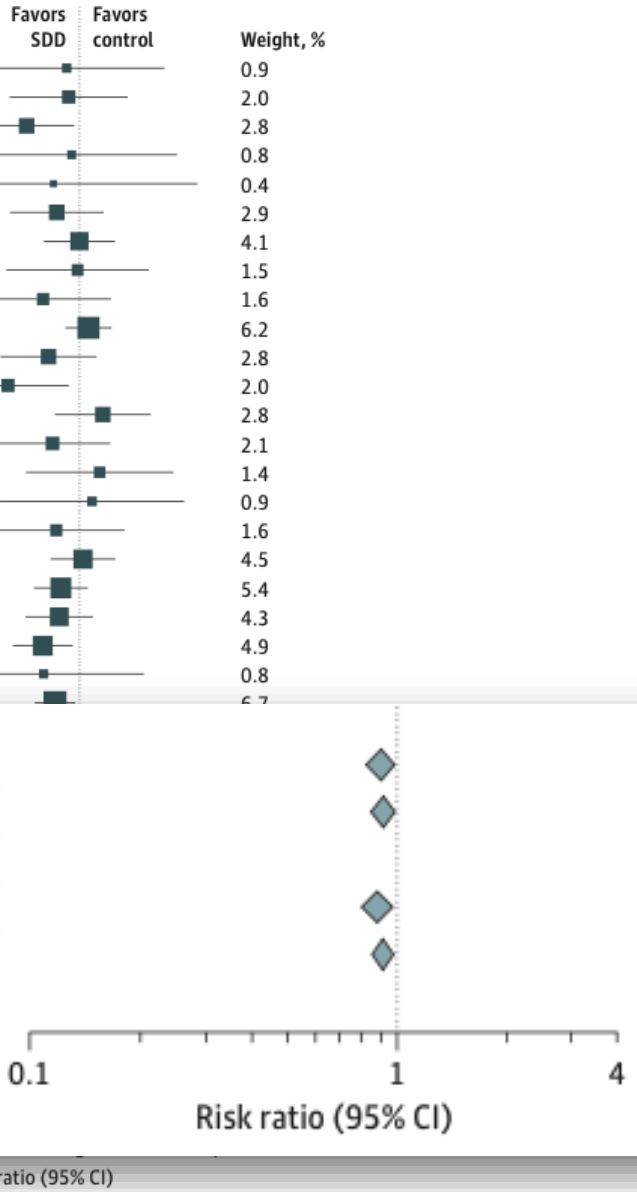
Related article page 1911

Supplemental content

Hammond, NE et al. JAMA. 2022 328(19) 1922.

Figure 2. Forest Plot for Hospital Mortality for the Comparison Between Selective Decontamination of the Digestive Tract (SDD) Compared With Standard Care

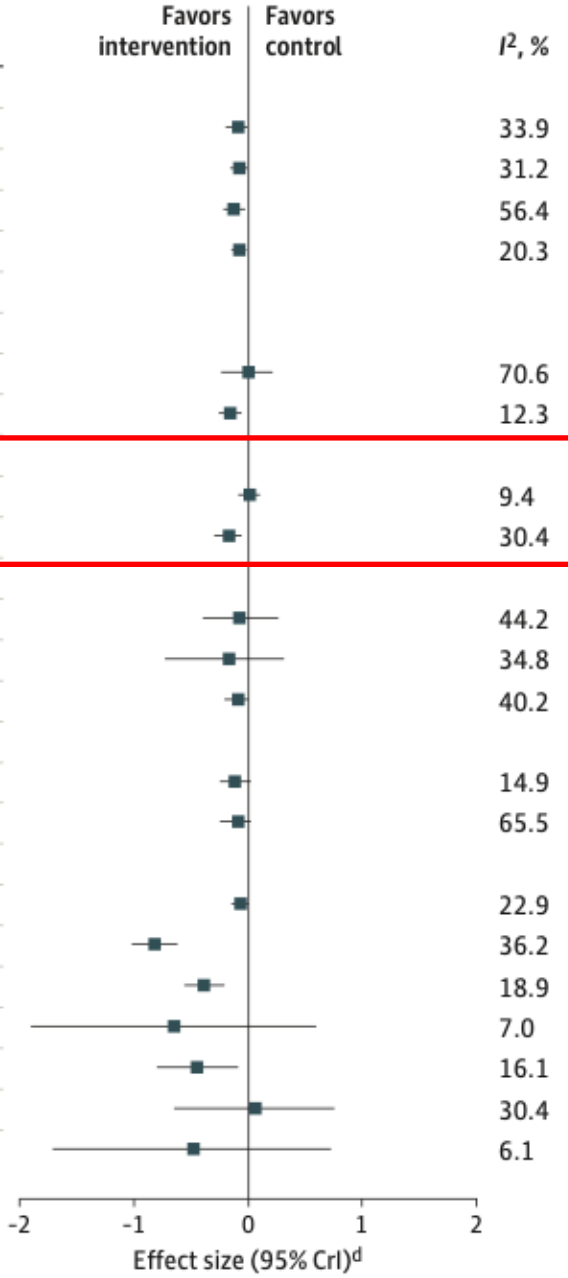
Study	SDD Dead	SDD Alive	Control Dead	Control Alive	Risk ratio (95% CI)[a]	Weight, %
Unertl et al,[55] 1987	5	14	6	14	0.88 (0.32-2.40)	0.9
Kerver et al,[54] 1988	14	35	15	32	0.90 (0.49-1.65)	2.0
Ulrich et al,[53] 1989	15	33	28	24	0.58 (0.36-0.95)	2.8
Rodríguez-Roldán et al,[52] 1990	4	9	5	10	0.92 (0.31-2.73)	0.8
Aerdts et al,[51] 1991	2	15	6	33	0.76 (0.17-3.41)	0.4
Blair et al,[50] 1991	24	137	32	138	0.79 (0.49-1.28)	2.9
Gaussorgues et al,[49] 1991	29	30	29	30	1.00 (0.69-1.44)	4.1
Pugin et al,[48] 1991	10	28	11	30	0.98 (0.47-2.04)	1.5
Cockerill et al,[47] 1992	11	64	16	59	0.69 (0.34-1.38)	1.6
Gastinne et al,[46] 1992	88	132	82	143	1.10 (0.87-1.39)	6.2
Jacobs et al,[45] 1992	14	22	23	20	0.73 (0.44-1.19)	2.8
Rocha et al,[44] 1992	10	37	24	30	0.48 (0.26-0.89)	2.0
Korinek et al,[43] 1993	27	69	21	74	1.27 (0.78-2.09)	2.8
Wiener et al,[41] 1995	11	19	15	16	0.76 (0.42-1.37)	2.1
Quinio et al,[40] 1996	13	63	10	62	1.23 (0.58-2.63)	1.4
Abele-Horn,[39] 1997	11	47	5	25	1.14 (0.44-2.97)	0.9
Palomar et al,[38] 1997	10	31	13	29	0.79 (0.39-1.59)	1.6
Verwaest et al,[37] 1997	89	355	40	167	1.04 (0.74-1.45)	4.5
Sánchez García et al,[36] 1998	51	80	66	74	0.83 (0.63-1.09)	5.4
Bergmans et al,[35] 2001	30	57	59	80	0.81 (0.57-1.15)	4.3
Krueger et al,[34] 2002	52	213	75	187	0.69 (0.50-0.93)	4.9
Pneumatikos et al,[33] 2002	5	26	7	23	0.69 (0.25-1.94)	0.8
de Jonge et al,[32] 2003	113	353	146	322	0.78 (0.63-0.96)	6.7
Bayesian						
Vague priors					0.91 (0.82-0.99)	
Semi-informative priors					0.92 (0.85-0.99)	
Frequentist						
Sidik-Jonkman					0.88 (0.80-0.97)	
DerSimonian-Laird					0.92 (0.86-0.98)	



Risk ratio (95% CI)

Hammond, NE et al. JAMA. 2022 328(19) 1922.

Outcomes	Trials	Participants	Effect size (95% CrI)
Primary outcome: hospital mortality			
Vague priors	30	24034	-0.09 (-0.20 to -0.01)
Semi-informative priors	30	24034	-0.08 (-0.16 to -0.01)
Hartung-Knapp-Sidik-Jonkman	30	24034	-0.13 (-0.22 to -0.03)[a]
DerSimonian-Laird	30	24034	-0.08 (-0.15 to -0.02)[a]
Subgroup analysis for the primary outcome			
Study type			
Cluster crossover	3	18335	0.00 (-0.24 to 0.21)
Individual patient randomized	27	5699	-0.16 (-0.26 to -0.06)
Study intervention[b]			
SDD with no IV agent	14	11037	0.01 (-0.09 to 0.10)
SDD with IV agent	17	12997	-0.17 (-0.30 to -0.06)
Study population[c]			
Surgical ICU	5	1544	-0.08 (-0.40 to 0.26)
Trauma ICU	4	717	-0.17 (-0.73 to 0.31)
Mixed population ICU	21	21773	-0.09 (-0.21 to 0.00)
Publication year			
1987 to 1999	19	3115	-0.12 (-0.25 to 0.02)
2000 to 2022	11	20919	-0.09 (-0.25 to 0.02)
Secondary outcomes			
Mortality at longest time point	30	24034	-0.07 (-0.15 to 0.00)
Incidence of ventilator-associated pneumonia	22	3619	-0.82 (-1.02 to -0.62)
Incidence of ICU-acquired bacteremia	21	22076	-0.39 (-0.56 to -0.21)
Clostridioides difficile infection	3	12323	-0.65 (-1.90 to 0.59)
Positive culture of any antimicrobial-resistant organism	5	12841	-0.45 (-0.80 to -0.09)
Positive methicillin-resistant *Staphylococcus aureus* culture	5	13240	0.06 (-0.65 to 0.75)
Positive vancomycin-resistant enterococcus culture	3	13287	-0.48 (-1.71 to 0.72)



Hammond, NE et al. JAMA. 2022 328(19) 1922.

Organisational aspects of ASP

Lanckohr *et al. Ann. Intensive Care* (2021) 11:131
https://doi.org/10.1186/s13613-021-00917-2

Annals of Intensive Care

RESEARCH Open Access

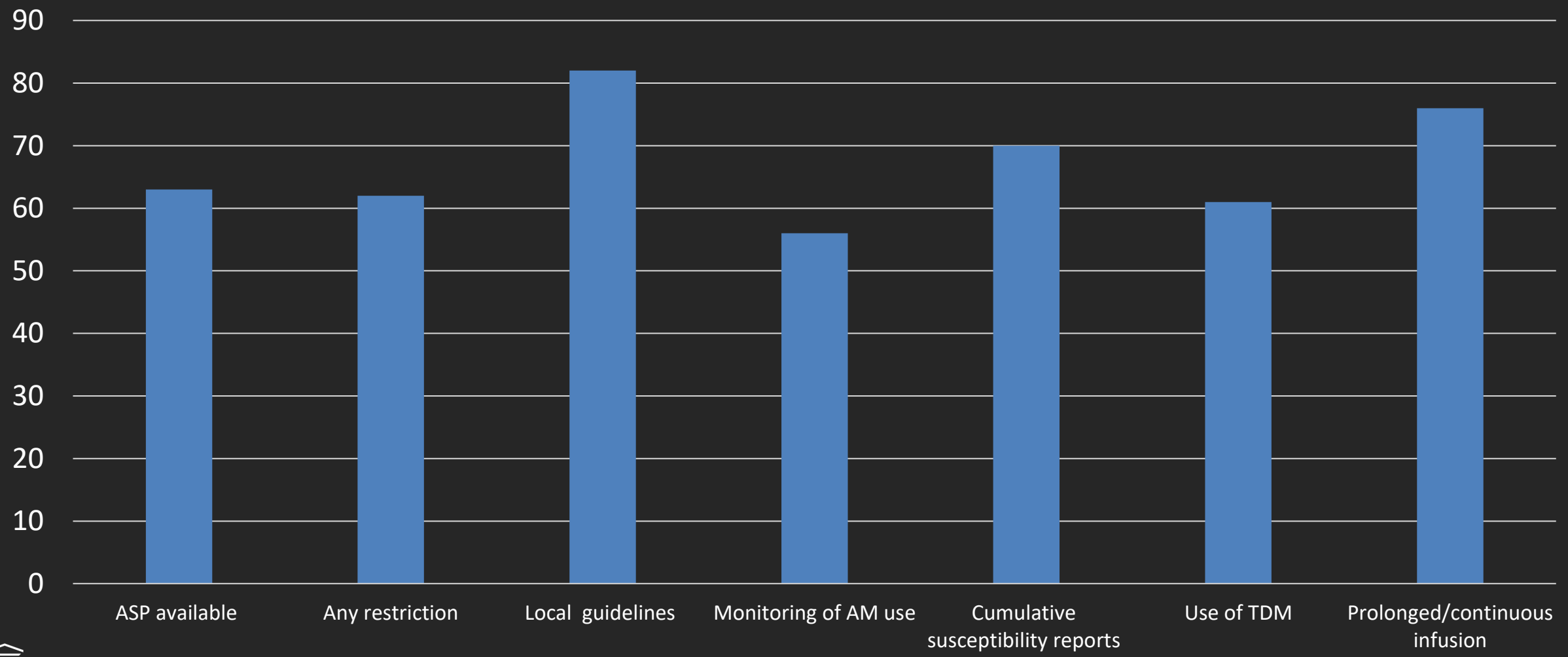
Antimicrobial stewardship, therapeutic drug monitoring and infection management in the ICU: results from the international A- TEAMICU survey

Christian Lanckohr[1], Christian Boeing[1], Jan J. De Waele[2], Dylan W. de Lange[3], Jeroen Schouten[4], Menno Prins[5], Maarten Nijsten[6], Pedro Povoa[7], Andrew Conway Morris[8] and Hendrik Bracht[9*]

Abstract

Background: Severe infections and multidrug-resistant pathogens are common in critically ill patients. Antimicrobial stewardship (AMS) and therapeutic drug monitoring (TDM) are contemporary tools to optimize the use of antimi-

ASP components in ICUs



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Lanckohr, C et al. Ann Intensive Care. 2021 11(1) 131.

J Antimicrob Chemother 2020; **75** Suppl 2: ii20–ii32
doi:10.1093/jac/dkaa426

Journal of Antimicrobial Chemotherapy

White Paper: Bridging the gap between human and animal surveillance data, antibiotic policy and stewardship in the hospital sector—practical guidance from the JPIAMR ARCH and COMBACTE-MAGNET EPI-Net networks

Maria Diletta Pezzani[1]†, Elena Carrara[1]†, Marcella Sibani [1]* , Elisabeth Presterl[2,3,4], Petra Gastmeier[5,6], Hanna Renk[7], Souha S. Kanj[8], Thirumalaisamy P. Velavan[9,10,11], Le Huu Song[10,12], Leonard Leibovici[13], Didem Torumkuney[14], Tomislav Kostyanev[15], Marc Mendelson[16]‡ and Evelina Tacconelli[1,17,18]‡ on behalf of the ARCH working group§

[1]Infectious Diseases Section, Department of Diagnostics and Public Health, University of Verona, Verona, Italy; [2]European Committee on Infection Control, Basel, Switzerland; [3]ESCMID Study group for nosocomial infections, Basel, Switzerland; [4]Department of Infection Control and Hospital Epidemiology, Medical University of Vienna, Vienna, Austria; [5]German Centre for Infection Research Association (DZIF), Braunschweig, Germany; [6]Institute for Hygiene and Environmental Medicine, Charité - Universitätsmedizin Berlin, Germany, corporate member of Freie Universität Berlin, Humboldt-Universität zu Berlin, and Berlin Institute of Health, Berlin, Germany; [7]University Children's Hospital Tübingen, Department of Paediatric Cardiology, Pulmology and Intensive Care Medicine, Tübingen,

Table 4. Leadership commitment, accountability and antimicrobial stewardship team

Participants in the antimicrobial stewardship team
1.1. Essential All hospitals should establish a multidisciplinary antimicrobial stewardship team. The core members should always include an antibiotic prescriber and a pharmacist trained in infection management, antimicrobial usage and antimicrobial resistance or another professional with a similar role.
1.2. Desirable The antimicrobial stewardship team should have core members comprising an infectious disease specialist and/or a clinical microbiologist, and an infection control professional trained in antimicrobial usage and resistance.
1.3. Desirable Include additional figures in the core group according to the setting, resources and type of intervention (i.e. other specialists from target wards, infection control nurses, clinical psychologists and IT experts).
Institutional support for organization and management of antimicrobial stewardship programmes: legal framework
1.4. Essential Regulate and promote antimicrobial stewardship activities at every level of the healthcare organization with well-defined roles and responsibilities and a clear governance structure.
Institutional support for the organization and management of antimicrobial stewardship programmes: staffing personnel
1.5. Essential Include dedicated time and specific salary support for antimicrobial stewardship activities as part of antimicrobial stewardship programmes.
1.6. Essential Allocate full-time equivalents according to national requirements for the different settings and level of intervention, where available.

Opportunities in ASP

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Australian Critical Care

journal homepage: www.elsevier.com/locate/aucc

Research paper

Nursing experiences in antimicrobial optimisation in the intensive care unit: A convergent analysis of a national survey

Junel Padigos, MHSc (Hons), RN [a, b, *], Simon Reid, PhD [b], Emma Kirby, PhD [c], Chris Anstey, MSc FANZCA FCICM [d, f], Jennifer Broom, PhD FRACP [e, f]

[a] *Intensive Care Unit, Sunshine Coast University Hospital, Birtinya, QLD, 4575, Australia;* [b] *School of Public Health, The University of Queensland, Herston, QLD, 4006, Australia;* [c] *Centre for Social Research in Health, University of New South Wales, Sydney NSW, 2052, Australia;* [d] *School of Medicine and Dentistry, Griffith University, Birtinya, QLD, 4575, Australia;* [e] *Infectious Diseases Research Network, Sunshine Coast University Hospital, Birtinya, QLD, 4575, Australia;* [f] *Faculty of Medicine, The University of Queensland, Herston, QLD, 4006, Australia*

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Keywords:

ABSTRACT

Background: Recent evidence highlights the need for an interdisciplinary approach to antimicrobial stewardship (AMS). Nursing involvement in optimising antimicrobials in the intensive care unit (ICU) remains understudied.

Objective: The objective of this study was to explore nurses' perceptions and experiences of antimicrobial optimisation or stewardship in ICUs in Australia.

Methods: An anonymous web-based survey was deployed nationally in early 2021 through two ICU nursing networks. Associations between survey responses were analysed descriptively and by using

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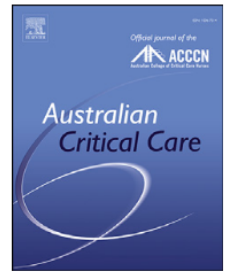

Research paper

data were integrated.

Results: A total of 226 ICU nurses completed the survey. The majority (197/226; 87%) responded that lack of education limits engagement in AMS. Only 13% (30/226) reported the presence of AMS education and training for nurses in their ICUs. Only about half (108/226; 48%) of the nurses were confident to question prescribers when they considered that the antimicrobial prescribed was unnecessary, with nurses in senior roles more likely to do so than nurses providing bedside care ($p < 0.05$). Gaps in education (including unfamiliarity with AMS roles), noninclusive antimicrobial discussions, moral distress, and potential workload burden were seen as potential barriers/challenges to engagement.

Conclusion: The multifactorial barriers identified that inhibit nurses from performing AMS tasks could be addressed by strengthening interprofessional education at all levels and by applying practical AMS in-

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Methods: An anonymous web-based survey was deployed nationally in early 2021 through two ICU nursing networks. Associations between survey responses were analysed descriptively and by using

Padigos, J et al. Aust Crit Care. 2022 S1036.

Clinical Microbiology and Infection 28 (2022) 362–370

Contents lists available at ScienceDirect

Clinical Microbiology and Infection

journal homepage: www.clinicalmicrobiologyandinfection.com

Narrative review

Indications for medical antibiotic prophylaxis and potential targets for antimicrobial stewardship intervention: a narrative review

Petros Ioannou [1], Stamatis Karakonstantis [1], Jeroen Schouten [2], Tomislav Kostyanev [3], Esmita Charani [4], Vera Vlahovic-Palcevski [5], Diamantis P. Kofteridis [1,*], supported by the ESCMID Study Group for Antimicrobial Stewardship (ESGAP)

[1)] *Department of Internal Medicine & Infectious Diseases, University Hospital of Heraklion, Heraklion, Crete, Greece*
[2)] *Department of Intensive Care Medicine, Radboud University Medical Center, Nijmegen, the Netherlands*
[3)] *Laboratory of Medical Microbiology, Vaccine & Infectious Disease Institute, University of Antwerp, Antwerp, Belgium*
[4)] *Health Protection Research Unit in Healthcare Associated Infections and Antimicrobial Resistance, Imperial College London, UK*
[5)] *Department of Clinical Pharmacology, University Hospital Rijeka / Medical Faculty and Faculty of Health Studies, University of Rijeka, Rijeka, Croatia*

ARTICLE INFO

Article history:

ABSTRACT

Background: Most of the antimicrobial stewardship (AMS) literature has focused on antimicrobial con-

Potential targets for AMS interventions

- Reducing unnecessary prophylaxis beyond recommended indications
- Reducing the use of prophylaxis with a broader spectrum than necessary
- reducing the use of prophylaxis for longer than the recommended duration

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Ioannou, P et al. Clin Microbiol Infect. 2022 28(3) 362.

J Antimicrob Chemother
https://doi.org/10.1093/jac/dkac162

Journal of Antimicrobial Chemotherapy

Why we prescribe antibiotics for too long in the hospital setting: a systematic scoping review

Robin M. E. Janssen [1,2,3]*, Anke J. M. Oerlemans[2], Johannes G. Van Der Hoeven[1], Jaap Ten Oever [3,4], Jeroen A. Schouten[1,2,3] and Marlies E. J. L. Hulscher[2,3]

[1]Department of Intensive Care Medicine, Radboud Institute for Health Sciences, Radboud University Medical Center, Nijmegen, The Netherlands; [2]Scientific Center for Quality of Healthcare (IQ healthcare), Radboud Institute for Health Sciences, Radboud University Medical Center, Nijmegen, The Netherlands; [3]Radboud Center for Infectious Diseases (RCI), Radboud University Medical Center, Nijmegen, The Netherlands; [4]Department of Internal Medicine, Radboud Institute for Health Sciences, Radboud University Medical Center, Nijmegen, The Netherlands

*Corresponding author. E-mail: Robin.Janssen@radboudumc.nl

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Background: In daily hospital practice, antibiotic therapy is commonly prescribed for longer than recommended in guidelines. Understanding the key drivers of prescribing behaviour is crucial to generate meaningful interventions to bridge this evidence-to-practice gap.

Objectives: To identify behavioural determinants that might prevent or enable improvements in duration of

Table 2. Determinants describing group differences in antibiotic therapy duration

Category	Determinants
1. Pathogen factors	Resistant (+) versus non-resistant pathogens[42]
2. Disease factors	Type of infection (either + or −)[35]
	Type of infection in palliative patient/end-of-life patient (either + or −)[28]
	Severity of infection (either + or −)[35]
	Clinical infectious disease not meeting certified diagnostic criteria (+) (e.g. VAP criteria)[31]
	Type of surgery [emergency (+) versus elective surgery][30]
3. Patient factors	Age of patient (+)[31]
	End-of-life vignette (either + or −)[28]
	Age of patient (−)[30]
4. Professional factors	Being a consultant (−) versus other occupations[38]
	Prescriber personality traits [extraversion, more likely to choose to continue antibiotics (+); agreeableness, less likely to continue antibiotics (−)][38]
	Profession of healthcare provider [nurse (+) versus aesthetic technician][34]
	Academic career [orthopaedic surgeon (+) versus (associate) professor][26]
	Number of arthroplasties per month [1–10 (+) versus >10][26]
5. Hospital department factors	Type of medical specialty [surgical (+) versus general medical][25]
	Type of surgical (sub)specialty/surgical procedure [orthopaedic, neurological, urological and gastroenterology (+)][27]
	Patient care department [orthopaedic surgery (+) versus obstetrics & gynaecology][34]

(+), longer duration of antibiotic treatment; (−), shorter duration of antibiotic treatment. Text in Roman type denotes antibiotic therapy studies; text in italic type denotes antibiotic prophylaxis studies.

Janssen, RME et al. J Antimicrob Chemother. 2022 dkac162.

antibiotics

MDPI

Article

Instant Gratification and Overtreating to Be Safe: Perceptions of U.S. Intensive Care Unit Pharmacists and Residents on Antimicrobial Stewardship

Katharina Rynkiewich [1,*], Kruthika Uttla [2] and Leila Hojat [3,4]

1 Department of Anthropology, Florida Atlantic University, Boca Raton, FL 33431, USA
2 Department of Anthropology, Case Western Reserve University, Cleveland, OH 44106, USA
3 Department of Medicine, Division of Infectious Diseases, Case Western Reserve University, Cleveland, OH 44106, USA
4 Division of Infectious Diseases and HIV Medicine, University Hospitals Cleveland Medical Center, Cleveland, OH 44106, USA
* Correspondence: krynkiewich@fau.edu

Abstract: Antimicrobial stewardship programs have been associated with numerous impacts on

antibiotics

MDPI

Article

Instant Gratification and Overtreating to Be Safe: Perceptions of

standings of the value of antimicrobial stewardship among medical practitioners vary. Additionally, non-physician practitioners are regularly left out of antimicrobial stewardship interventions targeting antimicrobial decision-making. Here, we contribute the perspective from resident physicians and specialists in pharmacy regarding their involvement in antimicrobial prescribing. Notably, our semi-structured interviews with 10 residents and pharmacy specialists described their limited autonomy in the clinical setting. However, the participants regularly worked alongside primary antimicrobial decision-makers and described feeling pressure to overtreat to be safe. The clear rationales and motivations associated with antimicrobial prescribing have a noticeable impact on physicians in training and non-physician practitioners, and as such, we argue that antimicrobial stewardship interventions targeting primary antimicrobial decision-makers are missing an opportunity to address the breadth

OH 44106, USA

* Correspondence: krynkiewich@fau.edu

Abstract: Antimicrobial stewardship programs have been associated with numerous impacts on

PLOS ONE

RESEARCH ARTICLE

Use of stewardship smartphone applications by physicians and prescribing of antimicrobials in hospitals: A systematic review

R. I. Helou[1☯], D. E. Foudraine[1☯], G. Catho[2‡], A. Peyravi Latif[3‡], N. J. Verkaik[1☯], A. Verbon[1☯*]

1 Department of Medical Microbiology and Infectious Diseases, Erasmus Medical Center, Rotterdam, The Netherlands, **2** Division of Infectious Diseases, Geneva University Hospitals and Faculty of Medicine, Geneva, Switzerland, **3** Department of Medical Sciences, Uppsala University, Uppsala, Sweden

☯ These authors contributed equally to this work.
‡ These authors also contributed equally to this work.
* a.verbon@erasmusmc.nl

OPEN ACCESS

Citation: Helou RI, Foudraine DE, Catho G, Peyravi Latif A, Verkaik NJ, Verbon A (2020) Use of

Abstract

Background

Antimicrobial stewardship (AMS) programs promote appropriate use of antimicrobials and reduce antimicrobial resistance. Technological developments have resulted in smartphone

PLOS ONE

Results

Thirteen studies met the eligibility criteria. None was a randomized controlled trial. Methodological study quality was considered low to moderate in all but three qualitative studies. The primary outcomes were process indicators, adherence to guidelines and user experience. Guidelines were more frequently accessed by app (53.0% - 89.6%) than by desktop in three studies. Adherence to guidelines increased (6.5% - 74.0%) significantly for several indications after app implementation in four studies. Most users considered app use easy (77.4%—>90.0%) and useful (71.0%—>90%) in three studies and preferred it over guideline access by web viewer or booklet in two studies. However, some physicians regarded app use adjacent to colleagues or patients unprofessional in three qualitative studies. Susceptibility to several antimicrobials changed significantly post-intervention (from 5%

Abstract

Background

Antimicrobial stewardship (AMS) programs promote appropriate use of antimicrobials and reduce antimicrobial resistance. Technological developments have resulted in smartphone

OPEN ACCESS

Citation: Helou RI, Foudraine DE, Catho G, Peyravi

De Corte *et al. Critical Care* (2022) 26:79
https://doi.org/10.1186/s13054-022-03916-2

Critical Care

REVIEW Open Access

Artificial Intelligence in Infection Management in the ICU

Thomas De Corte[1,2*], Sofie Van Hoecke[3] and Jan De Waele[1,2]

Abstract

This article is one of ten reviews selected from the Annual Update in Intensive Care and Emergency Medicine 2022. Other selected articles can be found online at https://www.biomedcentral.com/collections/annualupdate2022. Further information about the Annual Update in Intensive Care and Emergency Medicine is available from https://link.springer.com/bookseries/8901.

Introduction

Research and development of data-driven artificial intelligence (AI), so-called machine learning, in the intensive care unit (ICU) is at an all-time high. Data scientists and physicians are exploring the potential of machine learning in a vast range of domains, including infection management. important progress has been made in the infection management field as well [2–4]. In this chapter, we provide an overview of the current stance of AI/machine learning research in different areas of antimicrobial infection management, the barriers that hinder clinical adaptation, and pitfalls for bedside use.

Clinical Infectious Diseases

SUPPLEMENT ARTICLE

Surgeons, Infectious Diseases, and Twitter Hit a Home Run for Antibiotic Stewardship

Debra A. Goff,[1] John Alverdy,[2] Anthony T. Gerlach,[1] Julio Mayol,[3] and Benedict Nwomeh[4]

[1]Department of Ph... State University Wexner Medical Center, Ohio State University College of Pharmacy, Columbus, Ohio, USA; [2]Department of Surgery, University of Chicago, Chicago, Illinois, USA; ... San Carlos, Instituto de Investigación Sanitaria San Carlos, Universidad Complutense de Madrid, Madrid, Spain; and [4]Department of Pediatric Surgery, Nationwide Children's Hospital, Columbus, Ohio, USA

Go to page 1

Many infectious diseases (ID) clinicians join Twitter to follow other ID colleagues or "like" people. While there is great value in engaging with people who have similar interests, there is equal value in engaging with "unlike" or non-ID people. Here, we describe how Twitter connected an ID pharmacist with a pediatric surgeon, a vice chair of surgery, a surgeon chief medical officer from Spain, and a surgical intensive care unit pharmacist. This Twitter collaboration resulted in several scholarly activities related to antibiotic resistance and antibiotic stewardship and served as a conduit for global collaboration.

Keywords. social media; Twitter; antibiotic stewardship; antibiotic resistance; surgeons.

The coronavirus disease 2019 (COVID-19) global pandemic required antibiotic stewardship programs (ASPs) to pause from providing daily antibiotic prospective audit and feedback of antibiotics to developing COVID-19 guidelines, managing drug shortages, completing emergency use authorization forms, and the authors of this viewpoint confirmed that 63% of 173 responding ID clinicians and surgeons initially followed people within their specialty. While there is great value in engaging with people and organizations with similar interests, there is equal value in engaging with "unlike" or non-ID people and organizations. ID clinicians and


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