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DAFTAR PUSTAKA

Abd Rahman, N.I., Md Dawal, S.Z., Yusoff, N., dan Mohd Kamil, N.S., 2018. Anthropometric measurements among four Asian countries in designing sitting and standing workstations. *Sadhana - Academy Proceedings in Engineering Sciences* **43**: 1–9.

Akbar, A., Shahzadi, S., Khurram, M., Tul, H., dan Khar, B., 2016. SOFA score and outcome: experience at a public sector hospital ICU **66**: .

Ali, M.A., Raza, M.T., Majeed, S., Tahir, U., Ahmad, W., Tahir, M. Bin, dkk., 2024. Correlation of Serum Albumin Levels With the Severity of Sepsis Among Intensive Care Unit Patients. *Cureus* **16**: 1–9.

Altman, D.G. dan Royston, P., 2006. The cost of dichotomising continuous variables. *British Medical Journal* **332**: 1080.

An, G., Creech, C.B., Wu, N., Nation, R.L., Gu, K., Nalbant, D., dkk., 2023. Evaluation of Empirical Dosing Regimens for Meropenem in Intensive Care Unit Patients Using Population Pharmacokinetic Modeling and Target Attainment Analysis **67**: 1–14.

Atkinson, A.J. dan Umans, J.G., 2009. Pharmacokinetic studies in hemodialysis patients. *Clinical Pharmacology and Therapeutics* **86**: 548–552.

Barreto, E.F., Webb, A.J., Pais, G.M., Rule, A.D., Jannetto, P.J., dan Scheetz, M.H., 2021. Setting the Beta-Lactam Therapeutic Range for Critically Ill Patients: Is There a Floor or Even a Ceiling? *Critical Care Explorations* **3**: E0446.

Bartal, C., Rolston, K.V.I., dan Nesher, L., 2022. Carbapenem-resistant Acinetobacter baumannii: Colonization, Infection and Current Treatment Options. *Infectious Diseases and Therapy* **11**: 683–694.

Berezowska, M., Hayden, I.S., Brandon, A.M., Zats, A., Patel, M., Barnett, S., dkk., 2025. Recommended approaches for integration of population pharmacokinetic modelling with precision dosing in clinical practice. *British Journal of Clinical Pharmacology* **91**: 1064–1079.

Boonpeng, A., Jaruratanasirikul, S., Jullangkoon, M., Samaeng, M., Wattanavijitkul, T., Bhurayanontachai, R., dkk., 2022. Population Pharmacokinetics/Pharmacodynamics and Clinical Outcomes of Meropenem in Critically Ill Patients. *Antimicrobial Agents and Chemotherapy* **66**: 1–13.

Carpenter, J. dan Bithell, J., 2000. Bootstrap confidence intervals: When, which, what? A practical guide for medical statisticians. *Statistics in Medicine* **19**: 1141–1164.

Carrié, C., Petit, L., d'Houdain, N., Sauvage, N., Cottenceau, V., Lafitte, M., dkk., 2018. Association between augmented renal clearance, antibiotic exposure and clinical outcome in critically ill septic patients receiving high doses of β-lactams administered by continuous infusion: a prospective observational study. *International Journal of Antimicrobial Agents* **51**: 443–449.

Chai, M.G., Tu, Q., Cotta, M.O., Bauer, M.J., Balch, R., Okafor, C., dkk., 2024. Achievement of therapeutic antibiotic exposures using Bayesian dosing software in critically unwell children and adults with sepsis. *Intensive Care Medicine* **50**: 539–547.

UNIVERSITAS
GADJAH MADA
**Ketercapaian Target PK/PD Meropenem Berbasis Model-informed Precision Dosing dan Hubungannya dengan
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Charlton, M. dan Thompson, J.P., 2019. Pharmacokinetics in sepsis. *BJA Education*.

Chimata, M., Nagase, M., Suzuki, Y., Shimomura, M., dan Kakuta, S., 1993. Pharmacokinetics of meropenem in patients with various degrees of renal function, including patients with end-stage renal disease. *Antimicrobial Agents and Chemotherapy* **37**: 229–233.

Cobussen, M., Verhave, J.C., Buijs, J., dan Stassen, P.M., 2023. The incidence and outcome of AKI in patients with sepsis in the emergency department applying different definitions of AKI and sepsis. *International Urology and Nephrology* **55**: 183–190.

Cusack, T.P., Ashley, E.A., Ling, C.L., Roberts, T., Turner, P., Wangrangsimakul, T., dkk., 2019. Time to switch from CLSI to EUCAST? A Southeast Asian perspective. *Clinical Microbiology and Infection* **25**: 782–785.

Dandekar, P.K., Maglio, D., Sutherland, C.A., Nightingale, C.H., dan Nicolau, D.P., 2003. Pharmacokinetics of Meropenem 0.5 and 2 g Every 8 Hours as a 3-Hour Infusion. *Pharmacotherapy: The Journal of Human Pharmacology and Drug Therapy* **23**: 988–991.

Dilworth, T.J., Schulz, L.T., Micek, S.T., Kollef, M.H., dan Rose, W.E., 2022. β-Lactam Therapeutic Drug Monitoring in Critically Ill Patients: Weighing the Challenges and Opportunities to Assess Clinical Value. *Critical Care Explorations* **4**: E0726.

Ehmann, L., Zoller, M., Minichmayr, I.K., Scharf, C., Huisinga, W., Zander, J., dkk., 2019. Development of a dosing algorithm for meropenem in critically ill patients based on a population pharmacokinetic/pharmacodynamic analysis. *International Journal of Antimicrobial Agents* **54**: 309–317.

Ehmann, L., Zoller, M., Minichmayr, I.K., Scharf, C., Maier, B., Schmitt, M. V., dkk., 2017. Role of renal function in risk assessment of target non-attainment after standard dosing of meropenem in critically ill patients: A prospective observational study. *Critical Care* **21**: .

Eskandari, M., Alizadeh Bahmani, A.H., Mardani-Fard, H.A., Karimzadeh, I., Omidifar, N., dan Peymani, P., 2022. Evaluation of factors that influenced the length of hospital stay using data mining techniques. *BMC Medical Informatics and Decision Making* **22**: 1–11.

Evans, L., Rhodes, A., Alhazzani, W., Antonelli, M., Coopersmith, C.M., French, C., dkk., 2021. Surviving sepsis campaign: international guidelines for management of sepsis and septic shock 2021. *Intensive Care Medicine* **47**: 1181–1247.

Ewoldt, T.M.J., Abdulla, A., Rietdijk, W.J.R., Muller, A.E., de Winter, B.C.M., Hunfeld, N.G.M., dkk., 2022. Model-informed precision dosing of beta-lactam antibiotics and ciprofloxacin in critically ill patients: a multicentre randomised clinical trial. *Intensive Care Medicine* **48**: 1760–1771.

Fleck, A., Hawker, F., Wallace, P.I., Raines, G., Trotter, J., Ledingham, I.M., dkk., 1985. Increased Vascular Permeability: a Major Cause of Hypoalbuminaemia in Disease and Injury. *The Lancet* **325**: 781–784.

Fleischmann-Struzek, C., Mellhammar, L., Rose, N., Cassini, A., Rudd, K.E., Schlattmann, P., dkk., 2020. Incidence and mortality of hospital- and ICU-

UNIVERSITAS GADJAH MADA
Ketercapaian Target PK/PD Meropenem Berbasis Model-informed Precision Dosing dan Hubungannya dengan Kegagalan Terapi pada Pasien Sepsis di Intensive Care Unit
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treated sepsis: results from an updated and expanded systematic review and meta-analysis. *Intensive Care Medicine* **46**: 1552–1562.

Frymoyer, A., Schwenk, H.T., Zorn, Y., Bio, L., Moss, J.D., Chasmawala, B., dkk., 2020. Model-Informed Precision Dosing of Vancomycin in Hospitalized Children: Implementation and Adoption at an Academic Children's Hospital. *Frontiers in Pharmacology* **11**: 1–13.

Gabrielsson, J. dan Weiner, D., 2017. *Pharmacokinetic and Pharmacodynamic Data Analysis : Concepts and Applications 5th Edition*, Swedish Pharmaceutical Press.

Gayatri, A., t.t. 'Population Pharmacokinetics: Pendekatan Alternatif pada Studi Penggunaan Obat di Indonesia Population Pharmacokinetics : An Alternative Approach for Drug Use Study in Indonesia,' Generics : Journal of Research in Pharmacy.

Gijsen, M., Elkayal, O., Annaert, P., Van Daele, R., Meersseman, P., Debaveye, Y., dkk., 2022. Meropenem Target Attainment and Population Pharmacokinetics in Critically Ill Septic Patients with Preserved or Increased Renal Function. *Infection and Drug Resistance* **15**: 53–62.

Goel, P., Rajni, E., dan Rijhwani, P., 2022. Elizabethkingia meningoseptica: An emerging pathogen causing septicemia in an Immunocompromised patient. *Journal of Research in Clinical Medicine* **10**: 2–3.

Guilhaumou, R., Benaboud, S., Bennis, Y., Dahyot-Fizelier, C., Dailly, E., Gandia, P., dkk., 2019. Optimization of the treatment with beta-lactam antibiotics in critically ill patients - Guidelines from the French Society of Pharmacology and Therapeutics (Société Française de Pharmacologie et Thérapeutique - SFPT) and the French Society of Anaesthesia and Intensive Care Medicine (Société Française d'Anesthésie et Réanimation - SFAR). *Critical Care*.

Gulhar, R., Ashraf, M.A., dan Jialal, I., 2023. 'Physiology, Acute Phase Reactants' *StatPearls [Internet]*. URL: https://www.ncbi.nlm.nih.gov/books/NBK519570/ (diakses tanggal 24/6/2026).

Hagel, S., Bach, F., Brenner, T., Bracht, H., Brinkmann, A., Annecke, T., dkk., 2022. Effect of therapeutic drug monitoring-based dose optimization of piperacillin/tazobactam on sepsis-related organ dysfunction in patients with sepsis: a randomized controlled trial. *Intensive Care Medicine* **48**: 311–321.

Hanif, R.S., Hamdi, T., Kadri, A., dan Megawati, E.R., 2024. Initial Sofa Score and Mortality of Sepsis Patients in the Intensive Care Unit of Haji Adam Malik Hospital Medan: Does It Correlate? *Indonesian Journal of Anesthesiology and Reanimation* **6**: 73–79.

Hassani, M. El dan Marsot, A., 2023. External Evaluation of Population Pharmacokinetic Models for Precision Dosing : Current State and Knowledge Gaps. *Clinical Pharmacokinetics*.

Hotchkiss, R.S., Monneret, G., dan Payen, D., 2013. Immunosuppression in sepsis: A novel understanding of the disorder and a new therapeutic approach. *The Lancet Infectious Diseases*.

UNIVERSITAS
GADJAH MADA
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Imani, S., Buscher, H., Marriott, D., Gentili, S., dan Sandaradura, I., 2017. Too much of a good thing: A retrospective study of β-lactam concentration-toxicity relationships. *Journal of Antimicrobial Chemotherapy* **72**: 2891–2897.

Iwata, H., Kaneko, M., Aoki, T., Endo, K., dan Nagai, Y., 2023. Essential components of a definition for early antibiotic treatment failure : A scoping review 1–14.

Jaruratanasirikul, S., Thengyai, S., Wongpoowarak, W., Wattanavijitkul, T., dan Tangkitwanitjaroen, K., 2015. Population Pharmacokinetics and Monte Carlo Dosing Simulations of Meropenem during the Early Phase of Severe Sepsis and Septic Shock in Critically Ill Patients in Intensive Care Units **59**: 2995–3001.

Kementrian Kesehatan Republik Indonesia, 2024. *Pola Patogen dan Antibiogram di Indonesia tahun 2023 (Laporan Surveilans Antimikroba)*.

Kumar, Anand, Roberts, D., Wood, K.E., Light, B., Parrillo, J.E., Sharma, S., dkk., 2006. Duration of hypotension before initiation of effective antimicrobial therapy is the critical determinant of survival in human septic shock* **34**: 1589–1596.

Kyriacou, D.N. dan Lewis, R.J., 2016. Confounding by Indication in Clinical Research. *JAMA* **316**: 1818.

Kyriazos, T. dan Poga, M., 2023. Dealing with Multicollinearity in Factor Analysis: The Problem, Detections, and Solutions. *Open Journal of Statistics* **13**: 404–424.

Le, J., Le, H.N., Nguyen, G., Kim, R., Avedissian, S.N., Vo, C., dkk., 2026. Model-Informed Precision Dosing: Conceptual Framework for Therapeutic Drug Monitoring Integrating Machine Learning and Artificial Intelligence Within Population Health Informatics. *Journal of Personalized Medicine*.

Leekha, S., Terrell, C.L., dan Edson, R.S., 2011. General principles of antimicrobial therapy. *Mayo Clinic Proceedings* **86**: 156–167.

Legg, A., Carmichael, S., Chai, M.G., Roberts, J.A., dan Cotta, M.O., 2023. Beta-Lactam Dose Optimisation in the Intensive Care Unit: Targets, Therapeutic Drug Monitoring and Toxicity. *Antibiotics* **12**: 1–14.

Levitt, D.G. dan Levitt, M.D., 2016. Human serum albumin homeostasis: A new look at the roles of synthesis, catabolism, renal and gastrointestinal excretion, and the clinical value of serum albumin measurements. *International Journal of General Medicine* **9**: 229–255.

Liebchen, U., Salletmeier, H., Kallee, S., Scharf, C., Huebner, L., Weber, A., dkk., 2021. Optimal loading dose of meropenem before continuous infusion in critically ill patients : a simulation study European Committee on Antimicrobial Susceptibility Testing. *Scientific Reports* 1–6.

Liebchen, U., Weinelt, F., Scharf, C., Schroeder, I., Paal, M., Zoller, M., dkk., 2022. 'Combination of Pharmacokinetic and Pathogen Susceptibility Information To Optimize Meropenem Treatment of Gram-Negative Infections in Critically Ill Patients.'

Limato, R., Lazarus, G., Dernison, P., Mudia, M., Alamanda, M., Nelwan, E.J., dkk., 2022. Optimizing antibiotic use in Indonesia: A systematic review and evidence synthesis to inform opportunities for intervention.

UNIVERSITAS GADJAH MADA
Ketercapaian Target PK/PD Meropenem Berbasis Model-informed Precision Dosing dan Hubungannya dengan Kegagalan Terapi pada Pasien Sepsis di Intensive Care Unit
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Lokhandwala, A., Patel, P., Isaak, A.K., Faizan Yousaf, R., Maslamani, A.N.J., Khalil, S.K., dkk., 2023. Comparison of the Effectiveness of Prolonged Infusion and Intermittent Infusion of Meropenem in Patients With Sepsis: A Meta-Analysis. *Cureus* **15**: .

Luo, J., Liao, J., Cai, R., Liu, J., Huang, Z., Cheng, Y., dkk., 2019. 'Prolonged versus Intermittent Infusion of Antibiotics in Acute and Severe Infections: A Meta-analysis,' Arch Iran Med.

Luo, J., Liu, J., Lin, H., Yang, Y., Chen, C., Chen, J., dkk., 2025. Optimization of meropenem dosing regimens in critically ill patients with augmented renal clearance. *Frontiers in Medicine* **12**: .

Luque, S., Hope, W., Sorli, L., Muñoz-Bermudez, R., Campillo, N., Barceló-Vidal, J., dkk., 2021. Dosage individualization of linezolid: precision dosing of linezolid to optimize efficacy and minimize toxicity. *Antimicrobial Agents and Chemotherapy* **65**: 1–10.

Magiorakos, A.P., Srinivasan, A., Carey, R.B., Carmeli, Y., Falagas, M.E., Giske, C.G., dkk., 2012. Multidrug-resistant, extensively drug-resistant and pandrug-resistant bacteria: An international expert proposal for interim standard definitions for acquired resistance. *Clinical Microbiology and Infection* **18**: 268–281.

Moon, Y.S.K., Chung, K.C., dan Gill, M.A., 1997. Pharmacokinetics of meropenem in animals, healthy volunteers, and patients. *Clinical Infectious Diseases* **24**: 249–255.

Mould, D.R. dan Upton, R.N., 2013. Basic concepts in population modeling, simulation, and model-based drug development - Part 2: Introduction to pharmacokinetic modeling methods. *CPT: Pharmacometrics and Systems Pharmacology* **2**: .

Mouton, J.W. dan van den Anker, J.N., 1995. Meropenem Clinical Pharmacokinetics. *Clinical Pharmacokinetics* **28**: 275–286.

Nainggolan, L., Eled, R.P., Rinaldi, I., Rumende, C.M., Jasirwan, C.O.M., Wibowo, S.A.K., dkk., 2024. Identifying Predictors of Mortality in Sepsis Patients with Malignancy: A Retrospective Cohort Study. *Acta Medica Indonesiana* **56**: 39–45.

Neill, R., Gillespie, D., dan Ahmed, H., 2022a. Variation in Antibiotic Treatment Failure Outcome Definitions in Randomised Trials and Observational Studies of Antibiotic Prescribing Strategies: A Systematic Review and Narrative Synthesis. *Antibiotics* **11**: 1–18.

Neill, R., Gillespie, D., dan Ahmed, H., 2022b. Variation in Antibiotic Treatment Failure Outcome Definitions in Randomised Trials and Observational Studies of Antibiotic Prescribing Strategies: A Systematic Review and Narrative Synthesis. *Antibiotics* **11**: 1–18.

O'Jeanson, A., Larcher, R., Le Souder, C., Djebli, N., dan Khier, S., 2021. Population Pharmacokinetics and Pharmacodynamics of Meropenem in Critically Ill Patients: How to Achieve Best Dosage Regimen According to the Clinical Situation. *European Journal of Drug Metabolism and Pharmacokinetics* **46**: 695–705.

UNIVERSITAS
GADJAH MADA
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Onichimowski, D., Będźkowska, A., Ziółkowski, H., Jaroszewski, J., Borys, M., Czuczwar, M., dkk., 2020. Population pharmacokinetics of standard-dose meropenem in critically ill patients on continuous renal replacement therapy: a prospective observational trial. *Pharmacological Reports* **72**: 719–729.

Ostermann, M., Legrand, M., Meersch, M., Srisawat, N., Zarbock, A., dan Kellum, J.A., 2024. Biomarkers in acute kidney injury. *Annals of Intensive Care* **14**: .

Peduzzi, P., Concato, J., Kemper, E., Holford, T.R., dan Feinstein, A.R., 1996. A simulation study of the number of events per variable in logistic regression analysis. *Journal of Clinical Epidemiology* **49**: 1373–1379.

Pérez-Blanco, J.S. dan Lanao, J.M., 2022. Model-Informed Precision Dosing (MIPD). *Pharmaceutics*.

Prieto-Merino, D., Smeeth, L., Van Staa, T.P., dan Roberts, I., 2013. Dangers of non-specific composite outcome measures in clinical trials. *BMJ (Online)* **347**: 1–6.

Purba, A.K.R., Mariana, N., Aliska, G., Wijaya, S.H., Wulandari, R.R., Hadi, U., dkk., 2020. The burden and costs of sepsis and reimbursement of its treatment in a developing country: An observational study on focal infections in Indonesia. *International Journal of Infectious Diseases* **96**: 211–218.

Rac, H., Gould, A.P., Bookstaver, P.B., Justo, J.A., dan Kohn, J., 2020. Evaluation of early clinical failure criteria for gram-negative bloodstream infections. *Clinical Microbiology and Infection* **26**: 73–77.

Roberts, J.A., Abdul-Aziz, M.H., Lipman, J., Mouton, J.W., Vinks, A.A., Felton, T.W., dkk., 2014. Individualised antibiotic dosing for patients who are critically ill: Challenges and potential solutions. *The Lancet Infectious Diseases*.

Roberts, J.A., Kirkpatrick, C.M.J., Roberts, M.S., Robertson, T.A., Dalley, A.J., dan Lipman, J., 2009. Meropenem dosing in critically ill patients with sepsis and without renal dysfunction : intermittent bolus versus continuous administration ? Monte Carlo dosing simulations and subcutaneous tissue distribution 1–9.

Roberts, J.A. dan Lipman, J., 2009. Pharmacokinetic issues for antibiotics in the critically ill patient. *Critical Care Medicine*.

Robey, R.C., Logue, C., Caird, C.A., Hansel, J., Hellyer, T.P., Simpson, J., dkk., 2024. Immunomodulatory drugs in sepsis: a systematic review and meta-analysis. *Anaesthesia* **79**: 869–879.

Roger, C. dan Louart, B., 2021. Beta-Lactams Toxicity in the Intensive Care Unit: An Underestimated Collateral Damage? *Microorganisms* **9**: 1505.

Rudd, K.E., Johnson, S.C., Agesa, K.M., Shackelford, K.A., Tsoi, D., Kievlan, D.R., dkk., 2020. Global, regional, and national sepsis incidence and mortality, 1990–2017: analysis for the Global Burden of Disease Study. *The Lancet* **395**: 200–211.

Rudd, K.E., Kissoon, N., Limmathurotsakul, Di., Bory, S., Mutahunga, B., Seymour, C.W., dkk., 2018. The global burden of sepsis: Barriers and potential solutions. *Critical Care* **22**: 123305059.

Saharman, Y.R., Karuniawati, A., Severin, J.A., dan Verbrugh, H.A., 2021. Infections and antimicrobial resistance in intensive care units in lower-middle

UNIVERSITAS
GADJAH MADA
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income countries: a scoping review. *Antimicrobial Resistance and Infection Control* **10**: 1–19.

Sheiner, L.B. dan Beal, S.L., 1981. Some suggestions for measuring predictive performance. *Journal of Pharmacokinetics and Biopharmaceutics* **9**: 503–512.

Singer, M., Deutschman, C.S., Seymour, C.W., Shankar-Hari, M., Annane, D., Bauer, M., dkk., 2016. The third international consensus definitions for sepsis and septic shock (Sepsis-3). *JAMA* **315**: E801–E810.

Sterne, J.A.C., White, I.R., Carlin, J.B., Spratt, M., Royston, P., Kenward, M.G., dkk., 2009. Multiple imputation for missing data in epidemiological and clinical research: Potential and pitfalls. *BMJ (Online)* **339**: 157–160.

Suhas, S., Manjunatha, N., Kumar, C.N., Benegal, V., Rao, G.N., Varghese, M., dkk., 2023. Firth's penalized logistic regression: A superior approach for analysis of data from India's National Mental Health Survey, 2016. *Indian Journal of Psychiatry* **65**: 1208–1213.

Taeb, A.M., Hooper, M.H., dan Marik, P.E., 2017. Sepsis: Current definition, pathophysiology, diagnosis, and management. *Nutrition in Clinical Practice*.

Thabane, L., Mbuagbaw, L., Zhang, S., Samaan, Z., Marcucci, M., Ye, C., dkk., 2013. A tutorial on sensitivity analyses in clinical trials: The what, why, when and how. *BMC Medical Research Methodology*.

Udy, A.A., Roberts, J.A., Shorr, A.F., Boots, R.J., dan Lipman, J., 2013. Augmented renal clearance in septic and traumatized patients with normal plasma creatinine concentrations: Identifying at-risk patients. *Critical Care* **17**: R35.

Udy, A.A., Varghese, J.M., Altukroni, M., Briscoe, S., McWhinney, B.C., Ungerer, J.P., dkk., 2012. Subtherapeutic initial β-lactam concentrations in select critically Ill patients: Association between augmented renal clearance and low trough drug concentrations. *Chest* **142**: 30–39.

Ulldemolins, M., Roberts, J.A., Rello, J., Paterson, D.L., dan Lipman, J., 2011. The Effects of Hypoalbuminaemia on Optimizing Antibacterial Dosing in Critically Ill Patients **50**: 99–110.

Vale, C., Sime, F.B., Cotta, M.O., Eriksson, L., Roberts, J.A., Horvath, R., dkk., 2026. Therapeutic drug monitoring and the role of pharmacokinetics/pharmacodynamics in optimizing beta-lactam antibiotic dosing for deep-seated infections: a systematic review. *The Journal of antimicrobial chemotherapy* **81**: 1–13.

Vincent, J.L., Sakr, Y., Singer, M., Martin-Loeches, I., MacHado, F.R., Marshall, J.C., dkk., 2020. Prevalence and Outcomes of Infection among Patients in Intensive Care Units in 2017. *JAMA - Journal of the American Medical Association* **323**: 1478–1487.

Wang, J., Li, N., Mu, Y., Wang, K., dan Feng, G., 2024. Association between serum albumin creatinine ratio and all-cause mortality in intensive care unit patients with heart failure. *Frontiers in Cardiovascular Medicine* **11**: 1–8.

Wang, Y., Lu, Q., Zhang, L., Wei, G., Shen, X., dan Peng, Y., 2026. Association of serum albumin and obesity: Mediation effect of extracellular fluid, percent body fat and C-reactive protein. *Medicine* **105**: e47802.

UNIVERSITAS
GADJAH MADA
**Ketercapaian Target PK/PD Meropenem Berbasis Model-informed Precision Dosing dan Hubungannya dengan
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Weaving, G., Batstone, G.F., dan Jones, R.G., 2016. Age and sex variation in serum albumin concentration: an observational study. *Annals of Clinical Biochemistry* **53**: 106–111.

WHO, 2014. *Antimicrobial resistance: global report on surveillance*. World Health Organization, Geneva.

Williams, P., Cotta, M.O., Abdul-Aziz, M.H., Wilks, K., Farkas, A., dan Roberts, J.A., 2023. In silico evaluation of a beta-lactam dosing guideline among adults with serious infections. *Pharmacotherapy* **43**: 1121–1130.

Wu, C.C., Tai, C.H., Liao, W.Y., Wang, C.C., Kuo, C.H., Lin, S.W., dkk., 2019. Augmented renal clearance is associated with inadequate antibiotic pharmacokinetic/ pharmacodynamic target in Asian ICU population: a prospective observational study. *Infection and Drug Resistance* **12**: 2531–2541.