

Global Surveillance of Catheter Associated Urinary Tract Infections

Sarah Beth Gleeson

August 2021

Global CAUTI Rate Data shown on Interactive Map (References start on next page.)

| Nation | CAUTI rates (# of infections per 1000 device/patient days) |
|---------------|--|
| Germany | 0.68 (Gastmeier, 2003) |
| China | 1.29 (Hu, 2008-2010) |
| United States | 1.3 (CDC/NHSN), 2013 |
| Costa Rica | 1.5 (Ugalde, 2007-2015) |
| India | 2.1 (Mehta, 2004-2013) |
| Cyprus | 2.7 (Iordanu, 2015) |
| Taiwan | 3.0 (Chiang, 2015) |
| Kuwait | 3.3 (Al-Mousa, 2013-2015) |
| Spain | 3.6 (Álvarez-Lerma, 2007-2016) |
| Japan | 3.91 (Tsuchida, 2004) |
| Lebanon | 4.1 (Kanj, Beirut, 2007-2010) |
| Philippines | 4.2 (Navoa-Ng, 2005 - 2009) |
| Colombia | 4.3 (Moreno, 2006) |
| Saudi Arabia | 4.7 (Al-Abdely, 2013-2015) |
| Poland | 4.8 (Kübler, Wroclaw, 2007-2010) |
| Peru | 5.1 (Cuellar, 2003-2007) |
| INICC | 5.5 (Rosenthal, 2007-2012) |
| Ecuador | 5.7 (Yepez, Quito, 2013-2015) |
| El Salvador | 5.8 (Dueñas, 2007-2009) |
| UAE | 6.8 (Taha, Abu Dhabi, 2015-2016) |
| Cuba | 8.1 (Guanche-Garcell, 2006-2009) |
| Turkey | 8.3 (Leblebicioglu, 2003 - 2012) |
| Iran | 8.99 (Jahani-Sherafat, 2011-2012) |
| Brazil | 9.6 (Salomao, 2003-2006) |
| Mexico | 13.4 (Ramirez Barba, 2006) |
| Mongolia | 15.7 (Ider, 2013-2015) |
| Argentina | 18.5 (Rosenthal, 2004) |

REFERENCES

- About | NHSN | CDC.* 25 Jan. 2021, <https://www.cdc.gov/nhsn/about-nhsn/index.html>.
- Ackerman, A. Lenore, and Toby C. Chai. "The Bladder Is Not Sterile: An Update on the Urinary Microbiome." *Current Bladder Dysfunction Reports*, vol. 14, no. 4, Dec. 2019, pp. 331–41. Springer Link, <https://doi.org/10.1007/s11884-019-00543-6>.
- Al-Abdely, Hail M., et al. "Prospective Multicentre Study in Intensive Care Units in Five Cities from the Kingdom of Saudi Arabia: Impact of the International Nosocomial Infection Control Consortium (INICC) Multidimensional Approach on Rates of Central Line-Associated Bloodstream Infection." *Journal of Infection Prevention*, vol. 18, no. 1, Jan. 2017, pp. 25–34. PubMed, <https://doi.org/10.1177/1757177416669424>.
- Al-Mousa, Haifaa Hassan, et al. "Device-Associated Infection Rates, Bacterial Resistance, Length of Stay, and Mortality in Kuwait: International Nosocomial Infection Consortium Findings." *American Journal of Infection Control*, vol. 44, no. 4, Apr. 2016, pp. 444–49. DOI.org (Crossref), <https://doi.org/10.1016/j.ajic.2015.10.031>.
- Álvarez-Lerma, F., et al. "Invasive Device-Associated Infections Caused by Pseudomonas Aeruginosa in Critically Ill Patients: Evolution over 10 Years." *Journal of Hospital Infection*, vol. 100, no. 3, Nov. 2018, pp. e204–08. DOI.org (Crossref), <https://doi.org/10.1016/j.jhin.2018.04.027>.
- Aquafree. *What is a biofilm?* 31 July 2019, <https://www.aqua-free.com/en/magazine/what-is-a-biofilm>.
- Catheter-Associated Urinary Tract Infections (CAUTI) | HAI | CDC. 1 Oct. 2019, https://www.cdc.gov/hai/ca_uti/uti.html.
- Chiang, Cho-Han, et al. "Healthcare-Associated Infections in Intensive Care Units in Taiwan, South Korea, and Japan: Recent Trends Based on National Surveillance Reports." *Antimicrobial Resistance & Infection Control*, vol. 7, no. 1, Nov. 2018, p. 129. BioMed Central, <https://doi.org/10.1186/s13756-018-0422-1>.

Cuellar, Luis E., et al. "Device-Associated Infection Rates and Mortality in Intensive Care Units of Peruvian Hospitals: Findings of the International Nosocomial Infection Control Consortium." *Revista Panamericana de Salud Pública*, vol. 24, Organización Panamericana de la Salud, July 2008, pp. 16–24. SciELO, <https://doi.org/10.1590/S1020-49892008000700002>.

Dall, Chris. "New Klebsiella Strains 'worst-Case Scenario,' Experts Say." *CIDRAP*, 8 Sept. 2017, <https://www.cidrap.umn.edu/news-perspective/2017/09/new-klebsiella-strains-worst-case-scenario-experts-say>.

Datta, Priya, et al. "Health-Care-Associated Infections: Risk Factors and Epidemiology from an Intensive Care Unit in Northern India." *Indian Journal of Anaesthesia*, vol. 58, no. 1, Jan. 2014, p. 30. www.ijaweb.org, <https://doi.org/10.4103/0019-5049.126785>.

Davenport, K., and F. X. Keeley. "Evidence for the Use of Silver-Alloy-Coated Urethral Catheters." *Journal of Hospital Infection*, vol. 60, no. 4, Elsevier, Aug. 2005, pp. 298–303. www.journalofhospitalinfection.com, <https://doi.org/10.1016/j.jhin.2005.01.026>.

Delcaru, Cristina, et al. "Microbial Biofilms in Urinary Tract Infections and Prostatitis: Etiology, Pathogenicity, and Combating Strategies." *Pathogens*, vol. 5, no. 4, Nov. 2016, p. 65. PubMed Central, <https://doi.org/10.3390/pathogens5040065>.

Donlan, Rodney M. "Biofilms: Microbial Life on Surfaces." *Emerging Infectious Diseases*, vol. 8, no. 9, Sept. 2002, pp. 881–90. PubMed Central, <https://doi.org/10.3201/eid0809.020063>.

Dueñas, Lourdes, et al. "Device-Associated Infection Rates in Pediatrics and Neonatal Intensive Care Units in El Salvador: Findings of the INICC." *The Journal of Infection in Developing Countries*, vol. 5, no. 06, 06 Mar. 2011, pp. 445–51. jidc.org, <https://doi.org/10.3855/jidc.1319>.

Ershova, Ksenia, et al. "Implementing an Infection Control and Prevention Program Decreases the Incidence of Healthcare-Associated Infections and Antibiotic Resistance in a Russian Neuro-ICU." *Antimicrobial Resistance & Infection Control*, vol. 7, no. 1, July 2018, p. 94. BioMed Central, <https://doi.org/10.1186/s13756-018-0383-4>.

Ferriol-González, Celia, and Pilar Domingo-Calap. "Phages for Biofilm Removal." *Antibiotics*, vol. 9, no. 5, May 2020, p. 268. DOI.org (Crossref), <https://doi.org/10.3390/antibiotics9050268>.

Flemming, Hans-Curt, and Jost Wingender. "The Biofilm Matrix." *Nature Reviews Microbiology*, vol. 8, no. 9, 9, Nature Publishing Group, Sept. 2010, pp. 623–33. www.nature.com, <https://doi.org/10.1038/nrmicro2415>.

Gastmeier, P., et al. "Benchmarking of Urinary Tract Infection Rates: Experiences from the Intensive Care Unit Component of the German National Nosocomial Infections Surveillance System." *Journal of Hospital Infection*, vol. 78, no. 1, May 2011, pp. 41–44. DOI.org (Crossref), <https://doi.org/10.1016/j.jhin.2011.01.021>.

Gpsc_ccisc_fact_sheet_en.Pdf. https://www.who.int/gpsc/country_work/gpsc_ccisc_fact_sheet_en.pdf. Accessed 15 July 2021.

Guanche-Garcell, H., et al. "Device-Associated Infection Rates in Adult Intensive Care Units of Cuban University Hospitals: International Nosocomial Infection Control Consortium (INICC) Findings." *International Journal of Infectious Diseases*, vol. 15, no. 5, May 2011, pp. e357–62. DOI.org (Crossref), <https://doi.org/10.1016/j.ijid.2011.02.001>.

Haque, Mainul, et al. "Health Care-Associated Infections – an Overview." *Infection and Drug Resistance*, vol. 11, Nov. 2018, pp. 2321–33. *PubMed Central*, <https://doi.org/10.2147/IDR.S177247>.

Hu, Bijie, et al. "Device-Associated Infection Rates, Device Use, Length of Stay, and Mortality in Intensive Care Units of 4 Chinese Hospitals: International Nosocomial Control Consortium Findings." *American Journal of Infection Control*, vol. 41, no. 4, Apr. 2013, pp. 301–06. *ScienceDirect*, <https://doi.org/10.1016/j.ajic.2012.03.037>.

Ider, Bat-Erdene, et al. "Multicenter Study of Device-Associated Infection Rates in Hospitals of Mongolia: Findings of the International Nosocomial Infection Control Consortium (INICC)." *American Journal of Infection Control*, vol. 44, no. 3, Mar. 2016, pp. 327–31. *ScienceDirect*, <https://doi.org/10.1016/j.ajic.2015.10.010>.

Iordanou, Stelios, et al. "Surveillance of Device Associated Infections and Mortality in a Major Intensive Care Unit in the Republic of Cyprus." *BMC Infectious Diseases*, vol. 17, Sept. 2017, p. 607. *PubMed Central*, <https://doi.org/10.1186/s12879-017-2704-2>.

Jahani-Sherafat, Somayeh, et al. "Device-Associated Infection Rates and Bacterial Resistance in Six Academic Teaching Hospitals of Iran: Findings from the International Nosocomial Infection Control Consortium (INICC)." *Journal of Infection and Public Health*, vol. 8, no. 6, Nov. 2015, pp. 553–61. *DOI.org (Crossref)*, <https://doi.org/10.1016/j.jiph.2015.04.028>.

Jamal, Muhsin, et al. "Bacterial Biofilm and Associated Infections." *Journal of the Chinese Medical Association*, vol. 81, no. 1, Jan. 2018, pp. 7–11. *ScienceDirect*, <https://doi.org/10.1016/j.jcma.2017.07.012>.

Kanj, S. S., et al. "Impact of a Multidimensional Infection Control Approach on Catheter-Associated Urinary Tract Infection Rates in an Adult Intensive Care Unit in Lebanon: International Nosocomial Infection Control Consortium (INICC) Findings." *International Journal of Infectious Diseases*, vol. 17, no. 9, Elsevier, Sept. 2013, pp. e686–90. www-sciencedirect-com.proxy.library.upenn.edu, <https://doi.org/10.1016/j.ijid.2013.01.020>.

Kitagawa, Koichi, et al. "International Comparison of Causative Bacteria and Antimicrobial Susceptibilities of Urinary Tract Infections between Kobe, Japan, and Surabaya, Indonesia." *Japanese Journal of Infectious Diseases*, vol. 71, no. 1, Jan. 2018, pp. 8–13. *PubMed*, <https://doi.org/10.7883/yoken.JJID.2017.233>.

Kübler, Andrzej, et al. "Device-Associated Infection Rates and Extra Length of Stay in an Intensive Care Unit of a University Hospital in Wroclaw, Poland: International Nosocomial Infection Control Consortium's (INICC) Findings." *Journal of Critical Care*, vol. 27, no. 1, Feb. 2012, p. 105.e5-105.e10. *ScienceDirect*, <https://doi.org/10.1016/j.jcrc.2011.05.018>.

Kundrat, Laurie. "Environmental Isolate Case Files: Acinetobacter Baumannii." *Microbiologics Blog*, 28 Dec. 2015, <https://blog.microbiologics.com/environmental-isolate-case-files-acinetobacter-baumannii/>.

Leblebicioglu, H., et al. "Device-Associated Hospital-Acquired Infection Rates in Turkish Intensive Care Units. Findings of the International Nosocomial Infection Control Consortium (INICC)." *Journal of Hospital Infection*, vol. 65, no. 3, Mar. 2007, pp. 251–57. *ScienceDirect*, <https://doi.org/10.1016/j.jhin.2006.10.012>.

Mehta, A., et al. "Device-Associated Nosocomial Infection Rates in Intensive Care Units of Seven Indian Cities. Findings of the International Nosocomial Infection Control Consortium (INICC)." *Journal of Hospital Infection*, vol. 67, no. 2, Oct. 2007, pp. 168–74. *ScienceDirect*, <https://doi.org/10.1016/j.jhin.2007.07.008>.

Moreno, Carlos Álvarez, et al. "Device-Associated Infection Rate and Mortality in Intensive Care Units of 9 Colombian Hospitals: Findings of the International Nosocomial Infection Control Consortium." *Infection Control and Hospital Epidemiology*, vol. 27, no. 4, [Cambridge University Press, The Society for Healthcare Epidemiology of America], 2006, pp. 349–56. *JSTOR*, <https://doi.org/10.1086/503341>.

Navoa-Ng, Josephine Anne, et al. "Device-Associated Infections Rates in Adult, Pediatric, and Neonatal Intensive Care Units of Hospitals in the Philippines: International Nosocomial Infection Control Consortium (INICC) Findings." *American Journal of Infection Control*, vol. 39, no. 7, Sept. 2011, pp. 548–54. *ScienceDirect*, <https://doi.org/10.1016/j.ajic.2010.10.018>.

Nickel, J. Curtis, and J. William Costerton. "Bacterial Biofilms and Catheters: A Key to Understanding Bacterial Strategies in Catheter-Associated Urinary Tract Infection." *The Canadian Journal of Infectious Diseases*, vol. 3, no. 5, 1992, pp. 261–67.

Ramirez Barba, Ector Jaime, et al. "Device-Associated Nosocomial Infection Rates in Intensive Care Units in Four Mexican Public Hospitals." *American Journal of Infection Control*, vol. 34, no. 4, May 2006, pp. 244–47. *ScienceDirect*, <https://doi.org/10.1016/j.ajic.2005.05.024>.

Rosenthal, Victor, et al. "Device-Associated Nosocomial Infection Rates in Intensive Care Units of Argentina." *Infection Control and Hospital Epidemiology*, vol. 25, no. 3, [Cambridge University Press, The Society for Healthcare Epidemiology of America], 2004, pp. 251–55. JSTOR, <https://doi.org/10.1086/502386>.

Rosenthal, Victor D., et al. "The International Nosocomial Infection Control Consortium (INICC): Goals and Objectives, Description of Surveillance Methods, and Operational Activities." *American Journal of Infection Control*, vol. 36, no. 9, Nov. 2008, pp. e1–12. ScienceDirect, <https://doi.org/10.1016/j.ajic.2008.06.003>.

Rosenthal, Víctor Daniel, et al. "International Nosocomial Infection Control Consortium (INICC) Report, Data Summary of 43 Countries for 2007-2012. Device-Associated Module." *American Journal of Infection Control*, vol. 42, no. 9, Sept. 2014, pp. 942–56. ScienceDirect, <https://doi.org/10.1016/j.ajic.2014.05.029>.

Salgado Yepez, Estuardo, et al. "Device-Associated Infection Rates, Mortality, Length of Stay and Bacterial Resistance in Intensive Care Units in Ecuador: International Nosocomial Infection Control Consortium's Findings." *World Journal of Biological Chemistry*, vol. 8, no. 1, Feb. 2017, pp. 95–101. PubMed Central, <https://doi.org/10.4331/wjbc.v8.i1.95>.

Salomao, Reinaldo, et al. "Device-Associated Infection Rates in Intensive Care Units of Brazilian Hospitals: Findings of the International Nosocomial Infection Control Consortium." *Revista Panamericana De Salud Publica = Pan American Journal of Public Health*, vol. 24, no. 3, Sept. 2008, pp. 195–202. PubMed, <https://doi.org/10.1590/s1020-49892008000900006>.

Soto, Sara M. "Importance of Biofilms in Urinary Tract Infections: New Therapeutic Approaches." *Advances in Biology*, vol. 2014, Hindawi, July 2014, p. e543974. www.hindawi.com, <https://doi.org/10.1155/2014/543974>.

Stewart, Philip S., and J. William Costerton. "Antibiotic Resistance of Bacteria in Biofilms." *The Lancet*, vol. 358, no. 9276, July 2001, pp. 135–38. *ScienceDirect*, [https://doi.org/10.1016/S0140-6736\(01\)05321-1](https://doi.org/10.1016/S0140-6736(01)05321-1).

Taha, Haytham, et al. "Improving Catheter Associated Urinary Tract Infection Rates in the Medical Units." *BMJ Quality Improvement Reports*, vol. 6, no. 1, Jan. 2017. *Europe PMC*, <https://doi.org/10.1136/bmjquality.u209593.w7966>.

Tao, Lili, et al. "Device-Associated Infection Rates in 398 Intensive Care Units in Shanghai, China: International Nosocomial Infection Control Consortium (INICC) Findings." *International Journal of Infectious Diseases: IJID: Official Publication of the International Society for Infectious Diseases*, vol. 15, no. 11, Nov. 2011, pp. e774-780. *PubMed*, <https://doi.org/10.1016/j.ijid.2011.06.009>.

Trautner, Barbara W., and Rabih O. Darouiche. "Role of Biofilm in Catheter-Associated Urinary Tract Infection." *American Journal of Infection Control*, vol. 32, no. 3, May 2004, pp. 177–83. *PubMed Central*, <https://doi.org/10.1016/j.ajic.2003.08.005>.

Tsuchida, Toshie, et al. "Relationship between Catheter Care and Catheter-Associated Urinary Tract Infection at Japanese General Hospitals: A Prospective Observational Study." *International Journal of Nursing Studies*, vol. 45, no. 3, Mar. 2008, pp. 352–61. *ScienceDirect*, <https://doi.org/10.1016/j.ijnurstu.2006.10.006>.

Ugalde, O. Chavarria, et al. "Device-Associated Infection Rates, Bacterial Resistance, Length of Stay, and Mortality in Intensive Care Units of Costa Rica: Findings of the International Nosocomial Infection Control Consortium (INICC)." *Can J Infect Control*, vol. 31, no. 1, 2016, pp. 28–34.

Watson, P. S., and C. Robinson. *THE ARCHITECTURE AND MICROBIAL COMPOSITION OF NATURAL PLAQUE BIOFILMS*. p. 24.