EPIDEMIOLOGY AND PREVENTION OF HEALTHCARE-ASSOCIATED INFECTIONS IN LOW—AND MIDDLE-INCOME COUNTRIES

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August 22, 2024

Disclosure

I declare that I do not receive any fees, compensation, or financial benefits from any company related to this lecture.

Agenda

- International reports of HAI Rates in LMICs
- PLABSI Rates in ICUs in LMICs
- SSI Rates in LMICs
- Antimicrobial Resistance of Microorganisms from ICUs of LMICs
- Are HAIs an Independent Risk Factor for Mortality in LMICs?
- Risk Factors for CLABSI in LMICs
- Risk Factors for VAP in LMICs
- Risk Factors for CAUTI in LMICs
- INICC Surveillance Online System (ISOS)
- Multi-Dimensional Approach and BUNDLE to Prevent CLABSI
- Multi-Dimensional Approach and BUNDLE to Prevent VAP
- Multi-Dimensional Approach and BUNDLE to Prevent CAUTI

HAI RATES, LENGTH OF STAY, MORTALITY, MICROORGANISM PROFILE AND BACTERIAL RESISTANCE PER COUNTRY

2003 - Argentina

Nosocomial infections in medical-surgical intensive care units in Argentina: Attributable mortality and length of stay

2006 – Colombia

Device-Associated Infection Rate and Mortality in Intensive Care Units of 9 Columbian Hospitals: Findings of the International Nosocomial Infection Control Consortium

2006 – Mexico

Device-associated nosocomial infection rates in intensive care units in four Mexican public hospitals

2007 – India

Device-associated nosocomial infection rates in intensive care units of seven Indian cities. Findings of the International Nosocomial Infection Control Consortium (INICC)

2007 – Turkey

Device-associated hospital-acquired infection rates in Turkish intensive care units. Findings of the International Nosocomial Infection Control Consortium (INICC)

2008 – Brazil

Device-associated infection rates in intensive care units of Brazilian hospitals: findings of the International Nosocomial Infection Control Consortium

2008 - Peru

Device-associated infection rates and mortality in intensive care units of Peruvian hospitals: findings of the International Nosocomial Infection Control Consortium

2009 – Morocco

Health-care associated infections rates, length of stay, and bacterial resistance in an intensive care unit of Morocco: Findings of the International Nosocomial Infection Control Consortium (INICC)

2011 – Cuba

Device-associated infection rates in adult intensive care units of Cuban university hospitals: International Nosocomial Infection Control Consortium (INICC) findings

2011– Philippines

Device-associated infections rates in adult, pediatric, and neonatal intensive care units of hospitals in the Philippines: International Nosocomial Infection Control Consortium (INICC) findings

2011– Poland

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

2011– Salvador

Device-associated infection rates in intensive care units in El Salvador: International Nosocomial Infection Control Consortium (INICC) Findings

2012 - China

Device-associated infection rates in 398 intensive care units in Shanghai, China: International Nosocomial Infection Control Consortium (INICC) findings

2012 – Egypt

Device-associated infection rates in adult and pediatric intensive care units of hospitals in Egypt. International Nosocomial Infection Control Consortium (INICC) findings

2012 – Lebanon

International Nosocomial Infection Control Consortium Findings of Device-Associated Infections Rate in an Intensive Care Unit of a Lebanese University Hospital

2014 – Turkey

International Nosocomial Infection Control Consortium (INICC) national report on device-associated infection rates in 19 cities of Turkey, data summary for 2003–2012

2015– India

Device-Associated Infection Rates in 40 Hospitals From 20 Cities of India, Data Summary for 2004–2013: International Nosocomial Infection Control Consortium's Findings

2015 – Saudi Arabia

Device-associated infection rates in Intensive Care Units of five cities of the Kingdom of Saudi Arabia: International Nosocomial Infection Control Consortium (INICC) findings

2016- Kuwait

Device-associated infection rates, bacterial resistance, length of stay, and mortality in Kuwait: International Nosocomial Infection Consortium findings

2016 – Costa Rica

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)

2016 – Malaysia

Device-associated infection and mortality rates, bacterial resistance, and length of stay in hospitals of Malaysia: International Nosocomial Infection Control Consortium (INICC)'s findings

2016– Mongolia

Multicenter study of device-associated infection rates in hospitals of Mongolia: Findings of the International Nosocomial Infection Control Consortium (INICC)

2017- Ecuador

Device-associated infection rates, mortality, length of stay and bacterial resistance in intensive care units in Ecuador: International Nosocomial Infection Control Consortium's findings

2017- Venezue

Multicenter prospective study on device-associated infection rates and bacterial resistance in intensive care units of Venezuela: International Nosocomial Infection Control Consortium (INICC) findings

2018- Vietnam

Multicenter Study of Device-Associated Infection Rates, Bacterial Resistance, Length of Stay, and Mortality in Intensive Care Units of 2 Cities of Vietnam: International Nosocomial Infection Control Consortium Findings

International Reports of HAI Rates in LMICs

Annals of Internal Medicine | ARTICLE

Device-Associated Nosocomial Infections in 55 Intensive Care Units of 8 Developing Countries

Victor D. Rosenthal, MD; Dennis G. Maki, MD; Reinaldo Salomao, MD; Carlos Álvarez-Moreno, MD; Yatin Mehta, MD; Francisco Higuera, MD; Luis E. Cuellar, MD; Özay Akan Arikan, MD; Rédouane Abouqal, MD; and Hakan Leblebicioglu, MD, for the International Nosocomial Infection Control Consortium*

Background: Health care–associated infections from invasive medical devices in the intensive care unit (ICU) are a major threat to patient safety. Most published studies of ICU-acquired infections have come from industrialized western countries. In a Centers for Disease Control and Prevention (CDC) National Nosocomial Infections Surveillance (NNIS) System report, the U.S. pooled mean rates of central venous catheter (CVC)–related bloodstream infections, ventilator-associated pneumonia, and catheter-associated urinary tract infections were 4.0 per 1000 CVC days, 5.4 per 1000 mechanical ventilator days, and 3.9 per Foley catheter days, respectively.

Objective: To ascertain the incidence of device-associated infections in the ICUs of developing countries.

Design: Multicenter, prospective cohort surveillance of device-associated infection by using the CDC NNIS System definitions.

Setting: 55 ICUs of 46 hospitals in Argentina, Brazil, Colombia, India, Mexico, Morocco, Peru, and Turkey that are members of the International Nosocomial Infection Control Consortium (INICC).

Measurements: Rates of device-associated infection per 100 patients and per 1000 device days.

Results: During 2002–2005, 21 069 patients who were hospitalized in ICUs for an aggregate 137 740 days acquired 3095 device-associated infections for an overall rate of 14.7% or 22.5 infections per 1000 ICU days. Ventilator-associated pneumonia posed the greatest risk (41% of all device-associated infections or 24.1 cases [range, 10.0 to 52.7 cases] per 1000 ventilator days), followed by CVC-related bloodstream infections (30% of all device-associated infections or 12.5 cases [range, 7.8 to 18.5 cases] per 1000 catheter days) and catheter-associated urinary tract infections (29% of all device-associated infections or 8.9 cases [range, 1.7 to 12.8 cases] per 1000 catheter days). Notably, 84% of *Staphylococcus aureus* infections were caused by methicillin-resistant strains, 51% of *Enterobacteriaceae* isolates were resistant to ceftriaxone, and 59% of *Pseudomonas aeruginosa* isolates were resistant to fluoroquinolones. The crude mortality rate for patients with device-associated infections ranged from 35.2% (for CVC-associated bloodstream infection) to 44.9% (for ventilator-associated pneumonia).

Limitations: These initial data are not adequate to represent any entire country, and likely variations in the efficiency of surveillance and institutional resources may have affected the rates that were detected.

Conclusions: Device-associated infections in the ICUs of these developing countries pose greater threats to patient safety than in U.S. ICUs. Active infection control programs that perform surveillance of infection and implement guidelines for prevention can improve patient safety and must become a priority in every country.

Ann Intern Med. 2006;145:582-591. www.annals.org

For author affiliations, see end of text.

*For a list of members of the International Nosocomial Infection Control Consortium, see the Appendix.

American Journal of Infection Control xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

International Nosocomial Infection Control Consortium (INICC) report of health care associated infections, data summary of 45 countries for 2015 to 2020, adult and pediatric units, device-associated module

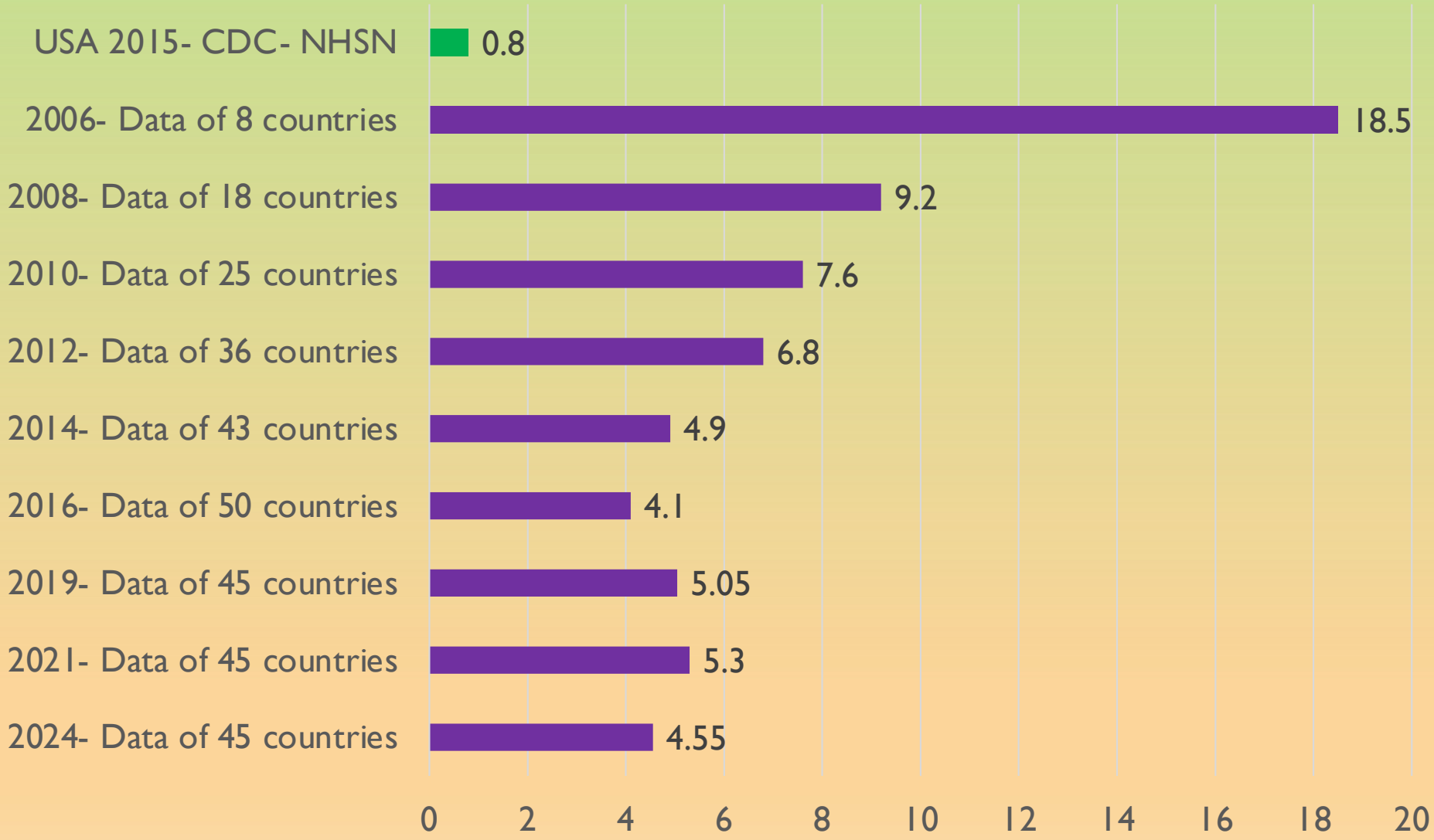
Victor D. Rosenthal MD, PhD [a,b,*], Ruijie Yin PhD [c], Patricio Nercelles MD [d], Sara E. Rivera-Molina MD [e], Somani Jyoti MD [f], Reshma Dongol RN [g], Daisy Aguilar-De-Moros RN [h], Nellie Tumu RN [i], Johana Alarcon-Rua RN [j], Juan P. Stagnaro MD [k], Safaa Alkhawaja MD [l], Luisa F. Jimenez-Alvarez MD [m], Yuliana A. Cano-Medina MD [n], Sandra L. Valderrama-Beltran MD [o], Claudia M. Henao-Rodas MD [p], Maria A. Zuniga-Chavarria MD [q], Amani El-Kholy MD [r], Hala Mounir Agha MD [s], Suneeta Sahu MD [t], Siksha O. Anusandhan MD [u], Mahuya Bhattacharyya MD [v], Mohit Kharbanda MD [w], Aruna Poojary MD [x], Pravin K. Nair MD [y], Sheila N. Myatra MD [z], Rajesh Chawla MD [aa], Kavita Sandhu MD [ab], Yatin Mehta MD [ac], Prasad Rajhans MD [ad], Farid Zand MD [ae], Mohammad Abdellatif-Daboor MD [af], Chian-Wern Tai MD [ag], Chin S. Gan MD [ah], Mohd-Basri Mat Nor MD [ai], Guadalupe Aguirre-Avalos MD [aj], Blanca E. Hernandez-Chena MD [ak], Alejandro Sassoe-Gonzalez MD [al], Isabel Villegas-Mota MD [am], Mary C. Aleman- Bocanegra MD [an], Ider Bat-Erdene MD [ao], Nilton Y. Carreazo MD [ap], Alex Castaneda-Sabogal MD [aq], Jarosław Janc MD [ar], Vladislav Belskiy MD [as], Sona Hlinkova MD [at], Dincer Yildizdas MD [au], Merve Havan MD [av], Alper Koker MD [aw], Hulya Sungurtekin MD [ax], Ener C. Dinleyici MD [ay], Ertugrul Guclu MD [az], Lili Tao MD [ba], Ziad A. Memish MD [bb], Zhilin Jin PhD [c]

Nine INICC international reports (From 2006 to 2024)

Year of Publication	2006	2008	2010	2012	2014	2016	2019	2021	2024
Number of Countries	8	18	25	36	43	50	45	45	45
Number of patients	21,069	43,114	155,358	313,008	605,310	861,284	532,483	428,847	204,770
Peer Review Journal	Annals of Internal Medicine	AJIC	AJIC	AJIC	AJIC	AJIC	AJIC	AJIC	AJIC

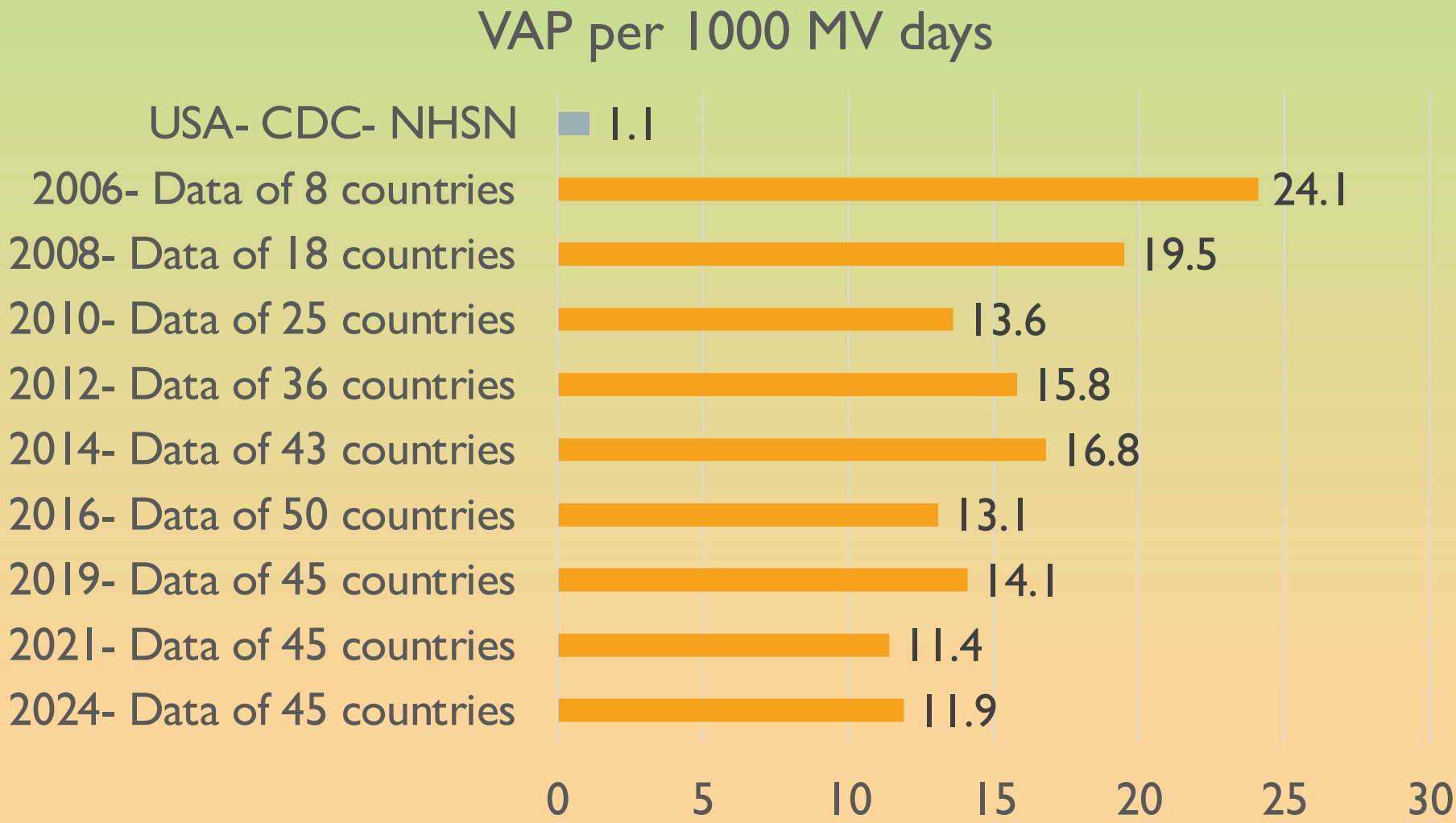
AJIC= American Jornal of Infection Control

CLABSI per 1000 CL days- pooled international INICC reports- ICUs



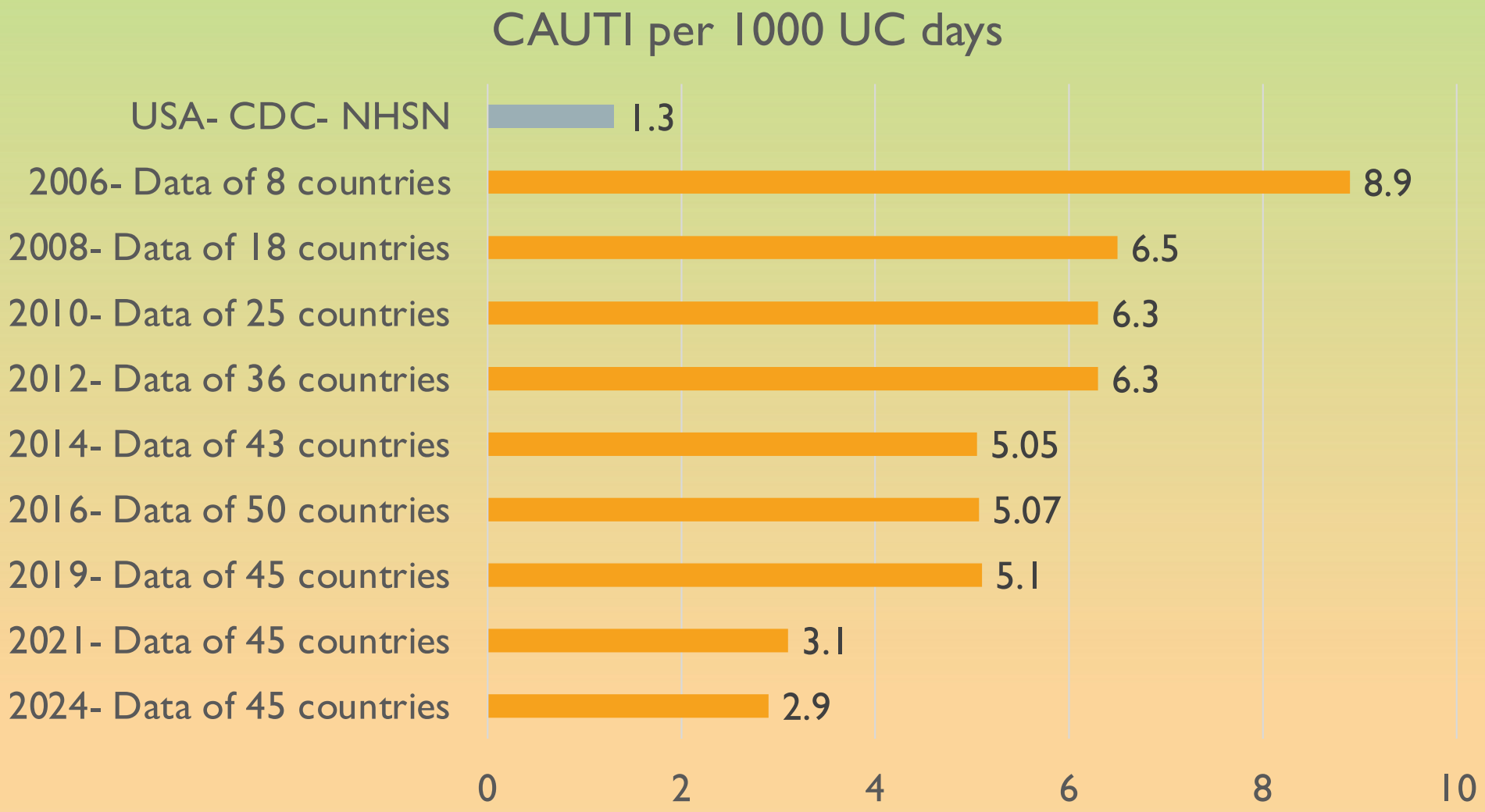
Dudeck MA, Edwards JR, Allen-Bridson K, et al.
National Healthcare Safety Network report, data summary for 2013, Device-associated Module. Am J Infect Control. 2015 Mar 1;43(3):206-21. doi: 10.1016/j.ajic.2014.11.014. Epub 2015 Jan 6. PMID: 25575913; PMCID: PMC4653815.

VAP per 1000 MV days- pooled international INICC reports- ICUs



Dudeck MA, Weiner LM, Allen-Bridson K, Malpiedi PJ, et al.
National Healthcare Safety Network (NHSN) report, data summary for 2012, Device-associated module. Am J Infect Control. 2013 Dec;41(12):1148-66. doi: 10.1016/j.ajic.2013.09.002. PMID: 24274911; PMCID: PMC4629786.

CAUTI per 1000 UC days- pooled international INICC reports- ICUs



Dudeck MA, Edwards JR, Allen-Bridson K, et al.
National Healthcare Safety Network report, data summary for 2013, Device-associated Module. Am J Infect Control. 2015 Mar 1;43(3):206-21. doi: 10.1016/j.ajic.2014.11.014. Epub 2015 Jan 6. PMID: 25575913; PMCID: PMC4653815.

Length of stay with and without HAI

	No. of Patients, n	Pooled crude Average LOS, days
Patients without DA-HAI	163,882	6.57
Patients with CLABSI	5,189	23.17
Patients with VAP	10,281	22.54
Patients with CAUTI	3,728	24.41

Mortality with and without HAI

	No. of Patients, n	No. of Deaths, n	Pooled crude Mortality, %
Patients without DA-HAI	163,882	23,034	14.06 %
Patients with CLABSI	5,189	2,066	39.81 %
Patients with VAP	10,281	3,793	36.89 %
Patients with CAUTI	3,728	1,161	31.14 %

PLABSI Rates in ICUs in LMICs

PLABSI rates in 42 Countries of 5 Continents. ICHE. 2019

Infection Control & Hospital Epidemiology (2020), 1–11
doi:10.1017/ice.2020.20

Original Article

Six-year multicenter study on short-term peripheral venous catheters-related bloodstream infection rates in 727 intensive care units of 268 hospitals in 141 cities of 42 countries of Africa, the Americas, Eastern Mediterranean, Europe, South East Asia, and Western Pacific Regions: International Nosocomial Infection Control Consortium (INICC) findings

Víctor Daniel Rosenthal[1], Ider Bat-Erdene[2], Debkishore Gupta[3], Souad Belkebir[4], Prasad Rajhans[5], Farid Zand[6], Sheila Nainan Myatra[7], Majeda Afeef[8], Vito L. Tanzi[9], S. Muralidharan[10], Hail M. Al-Abdely[11], Amani El-Kholy[12], Safa A. Aziz AlKhawaja[13], Ali Pekcan Demiroz[14], Yatin Mehta[15], Vineya Rai[16], Nguyen Viet Hung[17], Amani F. Sayed[18], Estuardo Salgado-Yepez[19], Naheed Elahi[20], María del Rayo Morfin-Otero[21], Montri Luxsuwong[22], Braulio Matias De-Carvalho[23], Audrey Rose D. Tapang[24], Velmira Angelova Velinova[25], Ana Marcela Quesada-Mora[26], Tanja Anguseva[27], Aamer Ikram[28], Daisy Aguilar-de-Moros[29], Wieslawa Duszynska[30], Nepomuceno Mejia[31], Florin George Horhat[32], Vladislav Belskiy[33], Vesna Mioljevic[34], Gabriela Di-Silvestre[35], Katarina Furova[36], May Osman Gamar-Elanbya[37], Umesh Gupta[38], Khalid Abidi[39], Lul Raka[40], Xiuqin Guo[41], Kushlani Jayatilleke[42], Najla Ben-Jaballah[43], Harrison Ronald Sandoval-Castillo[44], Andrew Trotter[45], Sandra L. Valderrama-Beltrán[46], Hakan Leblebicioglu[47], Humberto Guanche-Garcell[48] and Miriam de Lourdes-Dueñas[49,a]

PLABSI rates in 8 Countries of Asia. JVA. 2019

Original research article

JVA The Journal of Vascular Access

The Journal of Vascular Access
1–8

DOI: 10.1177/1129729820917259
journals.sagepub.com/home/jva
SAGE

Six-year study on peripheral venous catheter–associated BSI rates in 262 ICUs in eight countries of South-East Asia: International Nosocomial Infection Control Consortium findings

Víctor Daniel Rosenthal[1], Ider Bat-Erdene[2], Debkishore Gupta[3,4], Prasad Rajhans[5], Sheila Nainan Myatra[6], S Muralidharan[7], Yatin Mehta[8], Vineya Rai[9], Nguyen Viet Hung[10], Montri Luxsuwong[11], Audrey Rose D Tapang[12], Xiuqin Guo[13], Andrew Trotter[14], Mohit Kharbanda[15], Camilla Rodrigues[16], Arpita Dwivedy[17], Sweta Shah[18], Aruna Poojary[19], Subhash Kumar Todi[20], Supriya Chabukswar[21], Mahuya Bhattacharyya[22], Bala Ramachandran[23], Nagarajan Ramakrishnan[24], Sujit Kar Purkayasta[25], Asmita Sagar Sakle[26], Siva Kumar[27], Anup R Warrier[28], Maithili Satish Kavathekar[29], Samir Sahu[30], Aisha Mubarak[31], Nikhil Modi[32], Namita Jaggi[33], Nadimpalli Gita[34], Shakti Bedanta Mishra[35], Suneeta Sahu[36], Burhan Jawadwala[37], Dolatsinh Zala[38], Tenzin Zompa[39], Purva Mathur[40], Suhas Nirkhiwale[41], Sonali Vadi[42], Sanjeev Singh[43], Manoj Agarwal[44], Nagamani Sen[45], Anil Karlekar[46], DP Punia[47], Suresh Kumar[48], Ramachadran Gopinath[49], Pravin Kumar Nair[50], Chin Seng Gan[51], Murali Chakravarthy[52], Kavita Sandhu[53], Chandrika Kambam[54], Salil Kumar Mohanty[55], Ami Varaiya[56], Nirav Pandya[57], Vaibhavi R Subhedar[58], MR Vanajakshi[59], Deepak Singla[60], M Tuvshinbayar[61], Mayur Patel[62], Guxiang Ye[63], Lucy Chai See Lum[64], Rhendra Hardy Mohamad Zaini[65], Byambadorj Batkhuu[66], Kimberley M Dayapera[67], Le Thu Nguyet[68], Regina Berba[69], Maria Carmen SG Buenaflor[70], Josephine Anne Ng[71], Nirada Siriyakorn[72] and Le Thi Anh Thu[73,*]

PLABSI rates in 19 cities of India. AJIC. 2019

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American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Six-year multicenter study on short-term peripheral venous catheters-related bloodstream infection rates in 204 intensive care units of 57 hospitals in 19 cities of India: International Nosocomial Infection Control Consortium (INICC) findings

Víctor Daniel Rosenthal[a,*], Debkishore Gupta[b], Prasad Rajhans[c], Sheila Nainan Myatra[d], S. Muralidharan[e], Yatin Mehta[f], Mohit Kharbanda[g], Camilla Rodrigues[h], Arpita Dwivedy[i], Sweta Shah[j], Aruna Poojary[k], Subhash Kumar Todi[l], Supriya Chabukswar[m], Mahuya Bhattacharyya[n], Bala Ramachandran[o], Nagarajan Ramakrishnan[p], Sujit Kar Purkayasta[q], Asmita Sagar Sakle[r], Siva Kumar[s], Anup R. Warrier[t], Maithili Satish Kavathekar[u], Samir Sahu[v], Aisha Mubarak[w], Nikhil Modi[x], Namita Jaggi[y], Nadimpalli Gita[z], Shakti Bedanta Mishra[aa], Suneeta Sahu[bb], Burhan Jawadwala[cc], Dolatsinh Zala[dd], Tenzin Zompa[ee], Purva Mathur[ff], Suhas Nirkhiwale[gg], Sonali Vadi[hh], Sanjeev Singh[ii], Manoj Agarwal[jj], Nagamani Sen[kk], Anil Karlekar[ll], D.P. Punia[mm], Suresh Kumar[nn], Ramachadran Gopinath[oo], Pravin Kumar Nair[pp], Murali Chakravarthy[qq], Kavita Sandhu[rr], Chandrika Kambam[ss], Salil Kumar Mohanty[tt], Ami Varaiya[uu], Nirav Pandya[vv], Vaibhavi R. Subhedar[ww], M.R. Vanajakshi[xx], Deepak Singla[yy], Mayur Patel[zz]

PLABSI rates in 14 Countries of Middle East. JIPH. 2019

Journal of Infection and Public Health xxx (2020) xxx–xxx

Contents lists available at ScienceDirect

Journal of Infection and Public Health

journal homepage: http://www.elsevier.com/locate/jiph

Six-year multicenter study on short-term peripheral venous catheters-related bloodstream infection rates in 246 intensive units of 83 hospitals in 52 cities of 14 countries of Middle East: Bahrain, Egypt, Iran, Jordan, Kingdom of Saudi Arabia, Kuwait, Lebanon, Morocco, Pakistan, Palestine, Sudan, Tunisia, Turkey, and United Arab Emirates—International Nosocomial Infection Control Consortium (INICC) findings☆

Víctor D. Rosenthal[a,*,1], Souad Belkebir[b], Farid Zand[c], Majeda Afeef[d], Vito L. Tanzi[e], Hail M. Al-Abdely[f], Amani El-Kholy[g], Safa A. Aziz AlKhawaja[h], Ali P. Demiroz[i], Amani F. Sayed[J], Naheed Elahi[k], May O. Gamar-Elanbya[l], Khalid Abidi[m], Najla Ben-Jaballah[n], Mona F. Salama[o], Najla J. Helali[p], Mona M. Abdel-Halim[q], Nadia L. Demaisip[r], Hala Ahmed[s], Hanan H. Diab[t], Apsia M. Molano[u], Fahad A. Sawan[v], Ashraf Kelany[w], Rami Altowerqi[x], Hala Rushdi[y], Modhi A. Alkamaly[z], Eatedal Bohlega[A], Hajer A. Aldossary[B], Kareem M. Abdelhady[C], Aamer Ikram[D], Marjory Madco[E], Yvonne Caminade[F], Muneefah Alazmi[G], Tahsine Mahfouz[H], Reham H. Abdelaziz-Yousef[I], Ahmed Ibrahim[J], Basma Elawady[K], Tasmiya Asad[L], Leide Shyrine[M], Hakan Leblebicioglu[N]

PLABSI rates in 9 Countries of Latin America. ICHE. 2021

Infection Control & Hospital Epidemiology (2021), 1–7
doi:10.1017/ice.2020.1373

Original Article

An eight-year multicenter study on short-term peripheral intravenous catheter–related bloodstream infection rates in 100 intensive care units of 9 countries in Latin America: Argentina, Brazil, Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Panama, and Venezuela. Findings of the International Nosocomial Infection Control Consortium (INICC)

Victor Daniel Rosenthal MD[1], Gustavo Jorge Chaparro MD[2], Eduardo Alexandrino Servolo-Medeiros MD[3], Dayana Souza-Fram RN[3], Daniela Vieira da Silva Escudero RN[3], Sandra Milena Gualtero-Trujillo MD[4], Rayo Morfin-Otero MD[5], Esteban Gonzalez-Diaz MD[5], Eduardo Rodriguez-Noriega MD[5], Miguel Angel Altuzar-Figueroa MD[6], Guadalupe Aguirre-Avalos MD[7], Julio César Mijangos-Méndez MD[7], Federico Corona-Jiménez MD[7], Blanca Estela Hernandez-Chena MD[8], Mohamed Rajab Abu-Jarad MD[8], Evelia Maria Diaz-Hernandez MD[8], María Guadalupe Miranda-Novales MD[9], José Guillermo Vázquez-Rosales MD[9], Daisy Aguilar-De-Morós RN[10], Elizabeth Castaño-Guerra RN[10], Gabriel Munoz-Gutierrez MD[11], Nepomuceno Mejia MD[12], Jenia Johana Acebo-Arcentales MD[13] and Gabriela Di-Silvestre MD[14]

Infection Control & Hospital Epidemiology (2020), **41**, 553–563
doi:10.1017/ice.2020.20

Original Article

Six-year multicenter study on short-term peripheral venous catheters-related bloodstream infection rates in 727 intensive care units of 268 hospitals in 141 cities of 42 countries of Africa, the Americas, Eastern Mediterranean, Europe, South East Asia, and Western Pacific Regions: International Nosocomial Infection Control Consortium (INICC) findings

Víctor Daniel Rosenthal MD, CIC, MSc[1], Ider Bat-Erdene MD[2], Debkishore Gupta MD[3], Souad Belkebir MD[4], Prasad Rajhans MD[5], Farid Zand MD[6], Sheila Nainan Myatra MD[7], Majeda Afeef MD[8], Vito L. Tanzi MD[9], S. Muralidharan MD[10], Hail M. Al-Abdely MD[11], Amani El-Kholy MD[12], Safa A. Aziz AlKhawaja MD[13], Ali Pekcan Demiroz MD[14], Yatin Mehta MD[15], Vineya Rai MD[16], Nguyen Viet Hung MD[17], Amani F. Sayed MD[18], Estuardo Salgado-Yepez MD[19], Naheed Elahi MD[20], María del Rayo Morfin-Otero MD[21], Montri Luxsuwong MD[22], Braulio Matias De-Carvalho MD[23], Audrey Rose D. Tapang MD[24], Velmira Angelova Velinova MD[25], Ana Marcela Quesada-Mora MD[26], Tanja Anguseva MD[27], Aamer Ikram MD[28], Daisy Aguilar-de-Moros MD[29], Wieslawa Duszynska MD[30], Nepomuceno Mejia MD[31], Florin George Horhat MD[32], Vladislav Belskiy MD[33], Vesna Mioljevic MD[34], Gabriela Di-Silvestre MD[35], Katarina Furova MD[36], May Osman Gamar-Elanbya MD[37], Umesh Gupta MD[38], Khalid Abidi MD[39], Lul Raka MD[40], Xiuqin Guo MD[41], Kushlani Jayatilleke MD[42], Najla Ben-Jaballah MD[43], Harrison Ronald Sandoval-Castillo MD[44], Andrew Trotter MD[45], Sandra L. Valderrama-Beltrán MD[46], Hakan Leblebicioglu MD[47], Humberto Guanche-Garcell MD[48] and Miriam de Lourdes-Dueñas MD[49,a]

PERIOD, SETTING AND SAMPLE

- September 1st, 2013, to 31st May 2019
- 727 ICUs
- 268 hospitals
- 141 cities
- 42 countries of Africa, the Americas, the Eastern Mediterranean, Europe, Southeast Asia, and Western Pacific regions.
- 149,609 ICU patients
- 731,135 bed-days
- 743,508 short-term peripheral venous catheter (PVC)-days.
- 1,789 PLABSIs

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PLAB rates in 42 Countries of Asia, Latin America, Africa, and Europe.
ICHE. 2019

Type of ICU	ICU, n	Patients, n	PVCLABSIs, n	PVC days, n	Pooled PLABSI rate
Burn	5	191	14	2,168	**6.46**
Cardiothoracic	21	1,185	1	4,043	**0.25**
Coronary	57	14,060	42	62,288	**0.67**
Medical	126	19,127	163	97,880	**1.67**
Medical/Surgical	277	88,542	1,305	435,185	**3.00**
Neuro Surgical	34	3,921	9	18,093	**0.50**
Neurologic	16	837	19	4,086	**4.65**
Oncology	5	1,037	78	7,027	**11.10**
Pediatric	66	10,144	100	62,688	**1.60**
Pediatric Oncology	6	357	1	1,307	**0.77**
Respiratory	15	204	0	1,113	**0.00**
Surgical	60	7,018	41	35,995	**1.14**
Trauma	17	2,500	10	9,571	**1.04**
Other	22	486	6	2,064	**2.91**
Pooled (Adult and Pediatric ICUs)	727	149,609	1,789	743,508	**2.41**

Crude LENGTH OF STAY of patients with short-term PLABSI

	Pooled mean LOS, days,
without HAI	4.83 days
with PLABSI	9.85 days

Rosenthal VD, et al.
PLAB rates in 42 Countries of Asia, Latin America, Africa, and Europe.
ICHE. 2019

Crude MORTALITY of patients with short-term peripheral venous catheter-related BSI

	Pooled crude mortality, %
without HAI	6.67%
with PLABSI	17.94%

Rosenthal VD, et al.
PLAB rates in 42 Countries of Asia, Latin America, Africa, and Europe.
ICHE. 2019

SSI Rates in LMICs

INFECTION CONTROL AND HOSPITAL EPIDEMIOLOGY JUNE 2013, VOL. 34, NO. 6

ORIGINAL ARTICLE

Surgical Site Infections, International Nosocomial Infection Control Consortium Report, Data Summary of 30 Countries, 2005–2010

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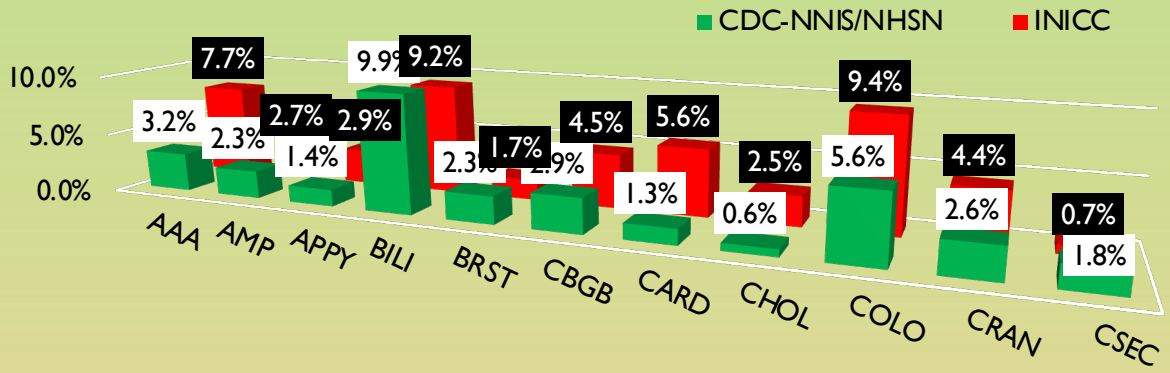
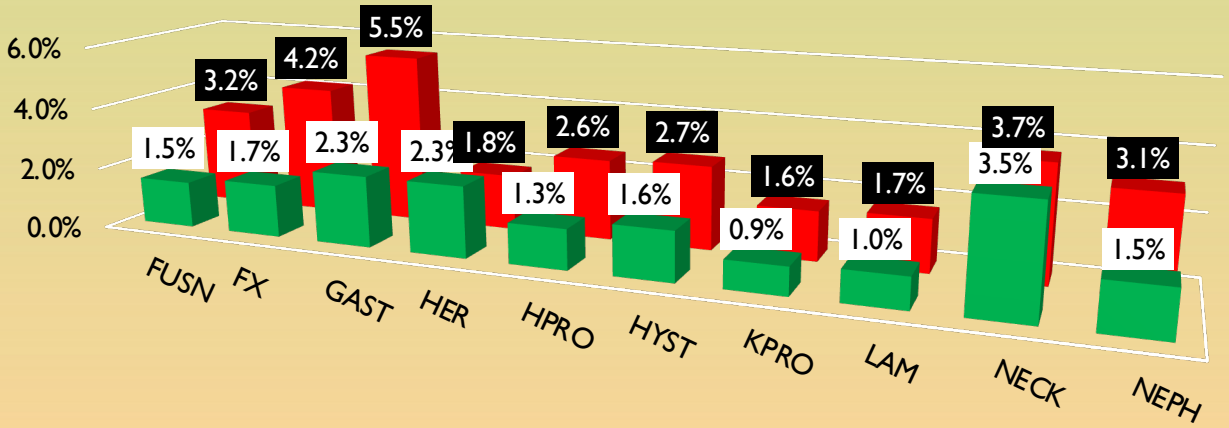
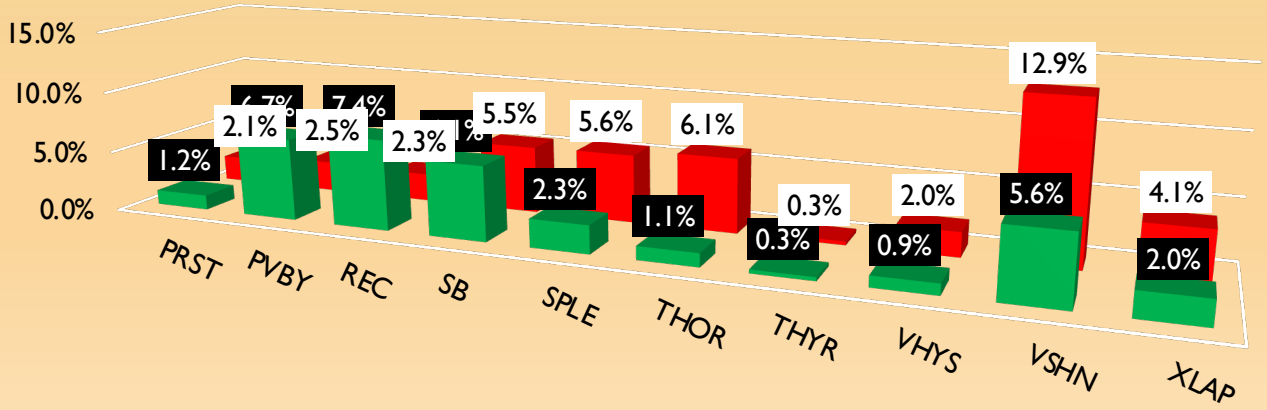
SSI rates: Comparing CDC-NHSN (USA) and International data (INICC)



AAA: Abdominal Aortic Aneurysm Repair
AMP: Limb Amputation
APPY: Appendectomy
BILI: Bile duct, liver or pancreatic surgery
CBGC: CABG-Chest only
CARD: Cardiac surgery
CHOL: Cholecystectomy
COLO: Colon Surgery
CRAN: Craniotomy
CSEC: Cesarean section



FUSN: Spinal fusion
FX: Open Reduction of Fracture
GAST: Gastric surgery
HER: Herniorrhaphy
HPRO: Hip prosthesis
HYST: Abdominal hysterectomy
KPRO: Knee prosthesis
LAM: Laminectomy
NECK: Neck surgery
NEPH: Kidney surgery



PRST: Prostatectomy
PVBY: Peripheral vascular bypass surgery
REC: Rectal surgery
SB: Small bowel surgery
SPLE: Spleen surgery
THOR: Thoracic surgery
THYR: Thyroid and/or parathyroid surgery
VHYS: Vaginal Hysterectomy
VSHN: Ventricular shunt
XLAP: Exploratory abdominal surgery

American Journal of Infection Control xxx (xxxx) xxx–xxx

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

International Nosocomial Infection Control Consortium (INICC) report of health care-associated infections, data summary of 25 countries for 2014 to 2023, Surgical Site Infections Module

Victor Daniel Rosenthal MD, PhD [a,b,*], Ruijie Yin PhD [a], Zhilin Jin PhD [a], Safaa Abdulaziz Alkhawaja MD [c], Maria Adelia Zuñiga-Chavarria MD [d], Estuardo Salgado MD [e], Amani El-Kholy MD [f], Julio C. Zuniga Moya MD [g], Priyanka Patil MD [h], Gita Nadimpalli MD [i], Rao Nadimpalli Pattabhiramarao MD [i], Dolatsinh Zala PhD [j], Isabel Villegas-Mota MD [k], Bat-Erdene Ider MD [l], Nellie Tumu RN [m], Wieslawa Duszynska MD [n], Le Thi Thu Nguyet MD [o], Pravin K. Nair MD [p], Ziad A. Memish MD [q]

Comparison of SSI rates: LMICs (INICC) vs CDC/NHSN

Procedure Code	INICC report	CDC- NHSN report	INICC report 2014-2023 vs CDC/NHSN RR (95% CI) p value
AAA	8.51%	2.12%	4.02 (2.11-7.65) p<0.0001
AMP	8.74%	1.25%	6.99 (2.92-16.73) p<0.0001
APPY	1.76%	1.15%	1.52 (1.06-2.17) p=0.0203
CARD	2.99%	1.10%	2.71 (2.12-3.45) p<0.0001
CBGC	4.16%	1.37%	3.03 (2.35-3.91) p<0.0001
CHOL	0.69%	0.23%	3.00 (1.57-5.75) p=0.0009
COLO	8.40%	3.99%	2.10 (1.60-2.77) p<0.0001
FUSN	6.47%	0.70%	9.27 (6.21-13.84) p<0.0001
FX	3.24%	1.11%	2.91 (2.04-4.15) p<0.0001
GAST	2.84%	1.72%	1.65 (1.13-2.41) p=0.0085
HPRO	3.68%	0.67%	5.46 (3.71-8.03) p<0.0001
HYST	2.12%	1.10%	1.93 (1.22-3.05) p=0.0046
KPRO	2.02%	0.58%	3.49 (1.87-6.49) p<0.0001
KTP	9.02%	3.67%	2.45 (1.30-4.62) p=0.0053
LAM	2.68%	0.72%	3.75 (2.36-5.95) p<0.0001
PVBY	15.69%	2.93%	5.35 (2.30-12.48) p<0.0001
SB	7.89%	3.44%	2.29 (1.25-4.19) p=0.0069
XLAP	4.34%	1.67%	2.60 (1.90-3.56) p<0.0001

AAA = Abdominal Aortic Aneurysm Repair; AMP = Limb Amputation; APPY = Appendix Surgery; CARD = Cardiac Surgery; CBGC = Coronary Artery Bypass Graft with Chest Incision; CHOL = Gallbladder Surgery; COLO = Colon Surgery; FUSN = Spinal Fusion; FX = Open Reduction of Fracture; GAST = Gastric Surgery; HPRO = Hip Prosthesis; KPRO = Knee Prosthesis; KTP = Kidney Transplant; LAM = Laminectomy; PVBY = Peripheral Vascular Bypass Surgery; SB = Small Bowel Surgery; XLAP = Exploratory Abdominal Surgery.

Comparison of SSI rates: LMICs (INICC) vs CDC/NHSN

Procedure Code	INICC report	CDC- NHSN report	INICC report 2014-2023 vs CDC/NHSN RR (95% CI) p value
BILI	15.69%	8.07%	1.94 (0.97-3.88) p=0.0595
BRST	0.66%	0.95%	0.69 (0.28-1.71) p=0.4293
CRAN	2.61%	2.15%	1.21 (0.80-1.83) p=0.3611
CSEC	1.23%	1.46%	0.84 (0.71-1.00) p=0.0552
HTP	2.33%	3.28%	0.70 (0.16-3.11) p=0.6489
HER	0.82%	0.74%	1.11 (0.60-2.03) p=0.7301
LTP	14.06%	11.61%	1.21 (0.63- 2.30) p=0.5599
NECK	1.2%	1.64%	0.73 (0.19-2.73) p=0.6427
NEPH	1.92%	0.88%	2.19 (0.73-6.49) p=0.1567
OVRY	0.98%	0.43%	2.30 (0.80-6.61) p=0.1196
PACE	0.74%	0.44%	1.66 (0.70-3.92) p=0.2401
PRST	2.22%	0.89%	2.48 (0.94-6.57) p=0.0664
REC	2.77%	3.47%	0.79 (0.38-1.66) p=0.5485
SPLE	1.21%	2.33%	0.51 (0.06-4.22) p=0.5374
THOR	0.82%	0.76%	1.07 (0.47-2.41) p=0.8693
THYR	0.25%	0.26%	0.96 (0.10-9.23) p=0.9744
VHYS	0.82%	0.73%	1.12 (0.27-4.54) p=0.8677
VSHN	6.25%	4.04%	1.542 (0.56-4.22) p=0.3929

BILI = Bile Duct, Liver, or Pancreatic Surgery; BRST = Breast Surgery; CRAN = Craniotomy; CSEC = Cesarean Section; HER = Herniorrhaphy; HTP = Heart Transplant; LTP = Liver Transplant; NECK = Neck Surgery; NEPH = Kidney Surgery; OVRY = Ovarian Surgery; PACE = Pacemaker Surgery; PRST = Prostate Surgery; REC = Rectal Surgery; SB = (Not defined in the image); SPLE = Spleen Surgery; THOR = Thoracic Surgery; THYR = Thyroid and/or Parathyroid Surgery; VHYS = Vaginal Hysterectomy; VSHN = Ventricular Shunt.

Antimicrobial Resistance of Microorganisms from ICUs of LMICs

Percentage of pathogens reported from adult and pediatric HAIs in ICUs of acute-care hospitals of LMICs, that tested resistant to selected antimicrobial agents, 2015–2020

			Resistance, %									
Bacteria	**PIPTAZ**	**IPM**	**CST**	**CRO**	**CAZ**	**FEP**	**CIP**	**AMK**	**GEN**	**AMS**	**OX**	**VAN**
Staphylococcus aureus	45.83	NA	NA	57.72	48.75	52.44	44.68	25.33	24.24	63.95	53.83	3.12
Enterococcus faecalis	50.00	NA	NA	98.41	92.59	81.48	74.17	62.79	58.30	54.55	88.89	17.87
coagulase-negative Staphylococci	70.37	NA	NA	69.23	84.00	71.43	57.67	20.56	43.15	78.57	81.33	1.13
Klebsiella pneumoniae/oxytoca	58.16	48.29	9.58	66.95	72.03	72.55	61.78	40.32	50.77	68.13	NA	NA
Escherichia coli	37.76	20.40	2.11	68.59	70.03	66.34	68.11	13.97	36.25	61.56	NA	NA
Enterobacter spp	30.27	19.44	5.26	40.76	43.32	27.78	24.66	13.92	25.08	74.51	NA	NA
Pseudomonas aeruginosa	39.69	50.73	7.86	88.12	44.99	49.15	37.95	31.50	38.52	90.87	NA	NA
Acinetobacter spp	91.91	89.09	3.60	96.02	91.10	92.71	90.94	80.30	83.17	80.23	NA	NA
Citrobacter spp	27.45	15.09	12.50	57.14	42.55	32.65	34.55	14.29	32.79	80.95	NA	NA
Moraxella spp	100.00	28.57	0.00	37.50	50.00	33.33	83.33	50.00	83.33	50.00	NA	NA
Morganella morganii	20.59	50.00	87.50	36.84	33.33	23.08	61.11	10.53	38.89	100	NA	NA
Proteus spp	9.64	14.96	77.55	35.85	31.06	32.47	40.32	15.38	38.71	26.56	NA	NA
Providencia spp	32.00	28.85	77.27	72.73	83.87	61.11	69.77	29.85	66.67	86.67	NA	NA
Serratia spp	22.22	19.09	88.33	35.96	24.75	28.91	21.13	9.36	26.59	94.74	NA	NA
Shigella spp	100.00	100	NA	NA	100.00	100	0.00	NA	NA	NA	NA	NA
Stenotrophomonas maltophilia	72.73	93.55	43.75	100	50.00	80.00	48.15	73.33	74.07	100	NA	NA

PIPTAZ (piperacillin-tazobactam); IPM (imipenem); CST (colistin); CRO (ceftriaxone); CAZ (ceftazidime); FEP (cefepime); CIP (ciprofloxacin); AMK (amikacin); GEN (gentamicin); AMS (sulbactam ampicillin); OX (oxacillin); VAN (vancomycin).

Benchmark LMICs data vs US CDC/NHNS data of percentage of pathogens reported from HAIs in ICUs of acute-care hospitals of LMICs, that tested resistant to selected antimicrobial agents

	LMICs (INICC)	USA (CDC NHSN)
Pathogen/antimicrobial	**% resistance**	**% resistance**
Staphylococcus aureus		
OX	53.83	50.7
Enterococcus faecalis		
VAN	17.87	9.8
Klebsiella pneumoniae/oxytoca		
CRO	66.95	24.1
IPM	48.29	10.9
Escherichia coli		
CRO	68.59	22.2
CIP	68.11	49.3
IPM	20.40	1.9
Enterobacter spp		
CRO	40.76	36.1
IPM	19.44	6.6
Pseudomonas aeruginosa		
CAZ	44.99	24.2
CIP	37.95	30.2
IPM	50.73	25.8
PIPTAZ	39.69	18.4
Acinetobacter spp		
IPM	89.09	46.6

PIPTAZ (piperacillin-tazobactam); IPM (imipenem); CST (colistin); CRO (ceftriaxone); CAZ (ceftazidime); FEP (cefepime); CIP (ciprofloxacin); AMK (amikacin); OX (oxacillin); VAN (vancomycin).

Are HAIs an Independent Risk Factor for Mortality in LMICs?

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

The impact of healthcare-associated infections on mortality in ICU: A prospective study in Asia, Africa, Eastern Europe, Latin America, and the Middle East

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TABLE 1. SETTING AND PATIENT CHARACTERISTICS

Data collected from 07/01/1998 to 02/12/2022, over 24 years, at 786 ICUs, of 287 hospitals, in 147 cities of 37 countries

Total patients, n (%)	**300,827**
Survival status, n (%)	
Alive	256,935 (85.46%)
Death	43,728 (14.54%)
Gender, n (%)	
Male	182,935 (60.84%)
Female	117,780 (39.16%)
Age, mean, SD	Mean = 52.15
Patient-days, n	2,167,397
Average LOS, mean, SD	Mean = 7.21
CL-days, n, mean, SD	1,507,281; Mean = 5.01
MV-days, n, mean, SD	830,311; Mean = 2.76
UC-days, n, mean, SD	1,413,708; Mean = 4.70
CL-utilization ratio, mean, SD	Mean = 0.66; SD = 1.55
MV-utilization ratio, mean, SD	Mean = 0.28; SD = 0.66
UC-utilization ratio, mean, SD	Mean = 0.62; SD = 0.67
CLABSI, n (%)	6,279 (29.38%)
VAP, n (%)	10,941 (51.2%)
CAUTI, n (%)	4,151 (19.42%)

MULTIPLE LOGISTIC REGRESSION ANALYSIS OF RISK FACTORS ASSOCIATED WITH DEATH

Variable	aOR	95% CI	P value
Patient-days	1.01	1.01-1.02	<0.0001
Gender, female	1.09	1.07-1.12	<0.0001
Age	1.01	1.011-1.0124	<0.0001

MULTIPLE LOGISTIC REGRESSION ANALYSIS OF RISK FACTORS ASSOCIATED WITH DEATH

Variable	aOR	95% CI	P value
CLABSI	1.84	1.73-1.95	<0.0001
VAP	1.48	1.41-1.55	<0.0001
CAUTI	1.18	1.10-1.28	<0.0001

ICU = intensive care unit; CL = central line; MV = mechanical ventilator; UC = urinary catheter; PC = peripheral catheter; LOS = length of stay; CLABSI = central line associated bloodstream infection; VAP = ventilator-associated pneumonia; CAUTI = catheter associated urinary tract infection; aOR = adjusted odds ratio; CI = confidence interval.

Risk Factors for CLABSI in LMICs

Infection Control & Hospital Epidemiology (2023), 1–10
doi:10.1017/ice.2023.69

SHEA

Original Article

Multinational prospective study of incidence and risk factors for central-line–associated bloodstream infections in 728 intensive care units of 41 Asian, African, Eastern European, Latin American, and Middle Eastern countries over 24 years

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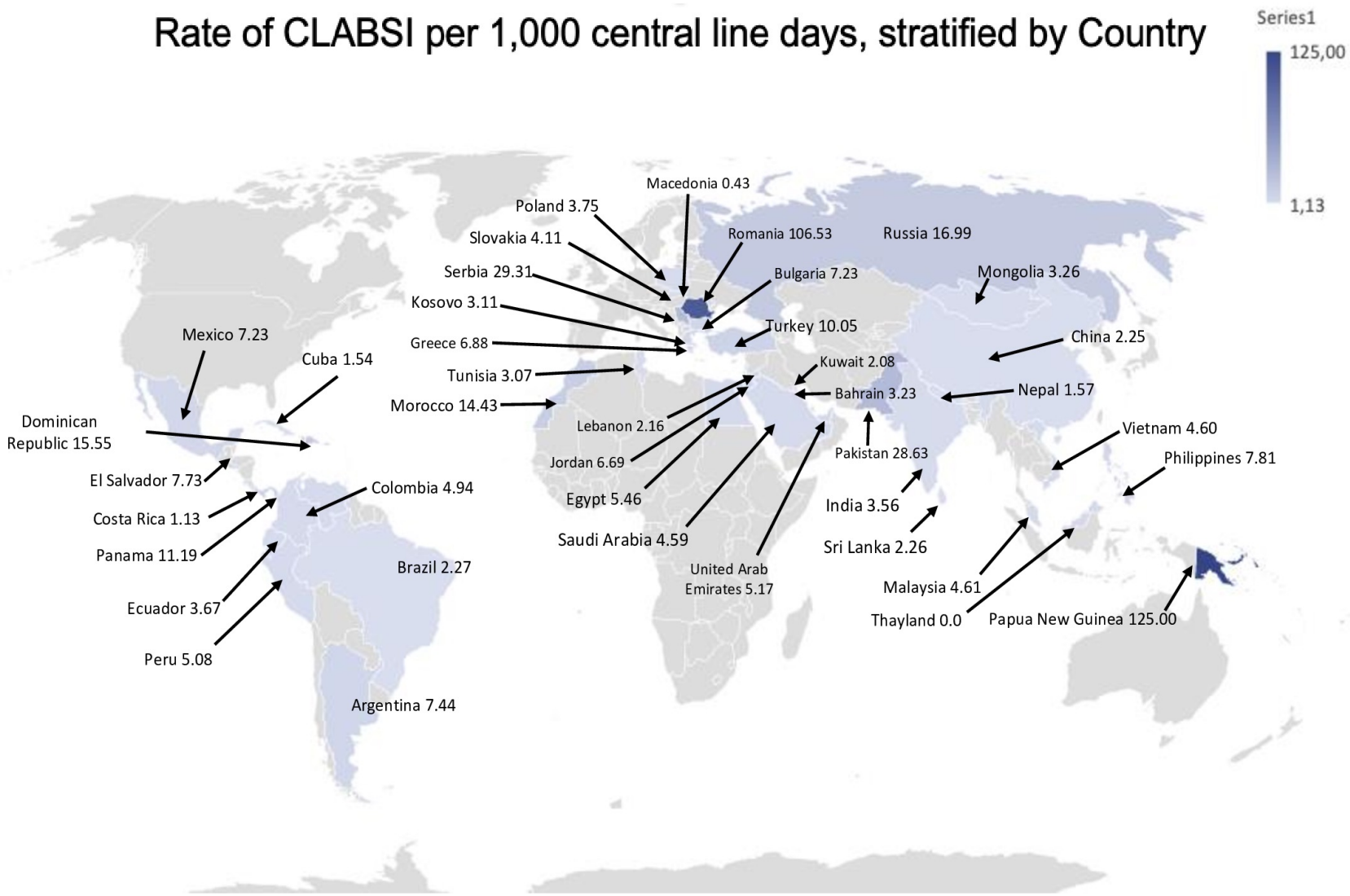
TABLE 2. CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTIONS RATES AND CENTRAL LINE DEVICE UTILIZATION RATIO STRATIFIED PER COUNTRY



CENTRAL LINE-ASSOCIATED BLOODSTREAM INFECTION RATES AND CENTRAL LINE DEVICE UTILIZATION RATIO STRATIFIED PER REGION

Region	Patients, n	Patient-days, n	CL-days, n	CLABS, n	CLABSI rate*	95% CI
Eastern Europe	8,988	NA	94,592	728	7.70	7.67-7.71
Middle East	70,047	934,086	458,563	2,795	6.10	6.08-6.10
Latin America	75,606	587,896	411,339	2,061	5.01	5.00-5.01
Asia	177,155	2,186,255	906,449	3,434	3.79	3.78-3.79

MULTIPLE LOGISTIC REGRESSION ANALYSIS OF RISK FACTORS FOR CENTRAL LINE ASSOCIATED BLOODSTREAM INFECTIONS

	aOR	95% CI	P value
Length of stay	1.03	1.03-1.04	<0.0001
CL-days	1.04	1.03-1.04	<0.0001
Internal Jugular	3.01	2.71-3.33	<0.0001
Femoral	2.29	1.96-2.68	<0.0001
Subclavian	2.13	1.92-2.36	<0.0001
Arterial	1.89	1.69-2.13	<0.0001
Temporary Hemodialysis	1.84	1.41-2.39	<0.0001
PICC	1.48	1.02-2.18	0.04
Tracheostomy	1.52	1.23-1.88	<0.0001
Adult-Oncology ICU	4.35	3.11-6.09	<0.0001
Publicly owned facilities	3.04	2.31-4.01	<0.0001
Teaching hospitals	2.91	2.22-3.83	<0.0001
Upper middle-income country	2.41	2.09-2.77	<0.0001

Risk Factor s for VAP in LMICs

Antimicrobial Stewardship & Healthcare Epidemiology (2023), **3**, e6, 1–10
doi:10.1017/ash.2022.339

SHEA

Original Article

Multinational prospective cohort study of rates and risk factors for ventilator-associated pneumonia over 24 years in 42 countries of Asia, Africa, Eastern Europe, Latin America, and the Middle East: Findings of the International Nosocomial Infection Control Consortium (INICC)

Victor Daniel Rosenthal MD[1,2], Zhilin Jin MS[1], Ziad A. Memish MD[3], Camilla Rodrigues MD[4], Sheila Nainan Myatra MD[5], Mohit Kharbanda MD[6], Sandra Liliana Valderrama-Beltran MD[7], Yatin Mehta MD[8], Mohammad Abdellatif Daboor MD[9], Subhash Kumar Todi[10], Guadalupe Aguirre-Avalos MD[11], Ertugrul Guclu MD[12], Chin Seng Gan MD[13], Luisa Fernanda Jiménez Alvarez MD[14], Rajesh Chawla MD[15], Sona Hlinkova MD[16], Rajalakshmi Arjun MD[17], Hala Mounir Agha MD[18], Maria Adelia Zuniga Chavarria MD[19], Narangarav Davaadagva MD[20], Mat Nor Mohd Basri MD[21], Katherine Gomez RN[22], Daisy Aguilar De Moros RN[23], Chian-Wern Tai MD[24], Alejandro Sassoe Gonzalez MD[25], Lina Alejandra Aguilar Moreno MD[26], Kavita Sandhu MD[27], Jarosław Janc MD[28], Mary Cruz Aleman Bocanegra MD[29], Dincer Yildizdas MD[30], Yuliana Andrea Cano Medina MD[31], Maria Isabel Villegas Mota MD[32], Abeer Aly Omar MD[33], Wieslawa Duszynska MD[34], Souad BelKebir MD[35], Amani Ali El-Kholy MD[36], Safaa Abdulaziz Alkhawaja[37], George Horhat Florin MD[38], Eduardo Alexandrino Medeiros MD[39], Lili Tao MD[40], Nellie Tumu RN[41], May Gamar Elanbya MD[42], Reshma Dongol RN[43], Vesna Mioljević MD[44], Lul Raka MD[45], Lourdes Dueñas MD[46], Nilton Yhuri Carreazo MD[47], Tarek Dendane MD[48], Aamer Ikram MD[49], Souha S. Kanj MD[50], Michael M. Petrov MD[51], Asma Bouziri MD[52], Nguyen Viet Hung MD[53], Vladislav Belskiy MD[54], Naheed Elahi MD[55], María Marcela Bovera MS[56] and Ruijie Yin MS[1]

VENTILATOR ASSOCIATED PNEUMONIA RATES STRATIFIED PER REGION

Country *	Patients, n	Patient-days, n	VAP, n	MV-days, n	VAP rate	95% CI
Latin America	74,578	581,279	3,683	239,472	15.38	15.36 – 15.40
Asia	177,155	2,186,255	5,732	354,545	16.17	16.15 – 16.18
Eastern Europe	8,988	79,493	959	43,903	21.84	21.80 - 21.88
Middle East	70,115	934,520	4,809	367,336	13.09	13.08 – 13.10

VENTILATOR ASSOCIATED PNEUMONIA RATES STRATIFIED PER ICU TYPE

	Patients, n	Patient days, n	VAP, n	MV-days, n	VAP rate	95% CI
ICU type *						
Adult-oncology	1,381	13,438	92	9,679	24.96	24.84 - 25.07
Neurologic	1,703	11,702	52	3,389	15.34	15.21 - 15.47
Medical	5,710	38,669	121	11,806	14.07	14.04 - 14.10
Cardio-thoracic	174,396	1,181,406	5,790	477,062	12.50	12.44 - 12.54
Pediatric-oncology	3,573	17,748	173	6,931	12.23	12.05 - 12.40
Medical-surgical	32,212	234,303	911	64,731	12.14	12.13 - 12.15
Neuro-surgical	8,215	49,858	225	18,004	10.25	10.19 - 10.30
Respiratory	2,724	13,357	27	4,593	9.51	9.44 - 9.56
Surgical	15,851	124,703	388	48,049	8.23	8.19 - 8.25
Pediatric	26,940	154,734	209	28,696	8.08	8.04 - 8.10
Coronary	1,501	9,288	19	1,554	7.28	7.25 - 7.31
Trauma	15,437	102,199	229	27,841	5.88	5.80 - 5.94
Pooled	289,643	1,951,405	8,236	702,335	11.73	11.72 - 11.73

VENTILATOR ASSOCIATED PNEUMONIA RATES STRATIFIED PER TYPE OF RESPIRATORY SUPPORT

	Patients, n	Patient days, n	VAP, n	MV-days, n	VAP rate	95% CI
Respiratory support type						
CPAP connected to a MV	2,361	18,187	252	4,092	61.58	61.34 - 61.82
Tracheostomy connected to a MV	3,068	41,098	329	30,751	10.70	10.66 - 10.73
Endotracheal tube connected to a MV	93,574	834,256	5,857	587,815	9.96	9.95 - 9.97

VENTILATOR ASSOCIATED PNEUMONIA RATES STRATIFIED PER WORLD BANK COUNTRY CLASSIFICATIONS BY INCOME LEVEL AND PER FACILITY OWNERSHIP TYPE

	Patients, n	Patient days, n	VAP, n	MV-days, n	VAP rate	95% CI
Lower-middle income						
Pooled	154,646	907,515	3,453	256,999	13.44	13.42 - 13.45
Publicly owned facilities	14,333	91,176	606	33,562	18.06	18.01 - 18.10
For-profit privately owned facilities	76,555	442,987	1,996	121,341	16.45	16.43 - 16.47
University hospitals	52,805	312,669	707	86,626	8.16	8.14 - 8.18
Not-for-profit privately owned facilities	10,953	60,683	144	15,470	9.31	9.26 - 9.35
Upper-middle income						
Pooled	98,839	699,513	3,277	273,755	11.97	11.96 - 11.98
Publicly owned facilities	22,515	167,783	963	75,883	12.69	12.66 - 12.71
For-profit privately owned facilities	42,536	262,694	854	73,329	11.64	11.62 - 11.67
University hospitals	32,357	258,542	1,396	119,806	11.65	11.63 - 11.67
Not-for-profit privately owned facilities	1,431	10,494	64	4,737	13.51	13.40 - 13.61
High income						
Pooled	36,158	344,377	1,506	171,581	8.78	8.76 - 8.79
Publicly owned facilities	31,589	300,701	1,208	148,744	8.12	8.10 - 8.13
For-profit privately owned facilities	2,701	26,083	133	10,358	12.84	12.77 - 12.91
University hospitals	1,868	17,593	165	12,479	13.22	13.15 - 13.28

MULTIPLE LOGISTIC REGRESSION ANALYSIS OF RISK FACTORS FOR VENTILATOR ASSOCIATED PNEUMONIA

	aOR	95% CI	P value
Age	1.01	1.00-1.01	0.01
Gender, male	1.22	1.16-1.28	<0.0001
Length of stay	1.07	1.07-1.08	<0.0001
MV-utilization ratio	1.27	1.23-1.31	<0.0001
Device Type			
CPAP connected to a MV	13.38	11.57-15.48	<0.0001
Tracheostomy connected to a MV	8.31	7.21-9.58	<0.0001
Endotracheal tube connected to a MV	6.76	6.34-7.21	<0.0001
Tracheostomy not connected to a MV	4.48	3.19-6.28	<0.0001
Surgical Hospitalization	1.23	1.17-1.29	<0.0001
Publicly owned facilities	1.59	1.35-1.86	<0.0001
For-profit privately owned facilities	1.36	1.17-1.59	<0.0001
University hospitals	1.05	0.91-1.24	0.48
Upper middle income country	1.22	1.15-1.29	<0.0001
High income country	0.79	0.73-0.86	<0.0001

MULTIPLE LOGISTIC REGRESSION ANALYSIS OF RISK FACTORS FOR VENTILATOR ASSOCIATED PNEUMONIA

	aOR	95% CI	P value
Adult-Oncology ICU	4,05	3.22-5.09	<0.0001
Neurologic ICU	2,48	1.78-3.45	<0.0001
Respiratory ICU	2,35	1.79-3.07	<0.0001
Medical-Surgical ICU	2,15	1.85-2.49	<0.0001
Medical ICU	1,99	1.68-2.34	<0.0001
Neuro-Surgical ICU	1,26	0.98-1.63	0.07
Pediatric ICU	1,19	0.97-1.43	0.08
Pediatric-Oncology ICU	1,09	0.64-1.83	0.76
Surgical ICU	1,02	0.83-1.24	0.87
Trauma ICU	0,91	0.59-1.39	0.67
Coronary ICU	0,63	0.51-0.77	<0.0001

Risk Factor for CAUTI in LMICs

Incidence and risk factors for catheter-associated urinary tract infection in 623 intensive care units throughout 37 Asian, African, Eastern European, Latin American, and Middle Eastern nations: A multinational prospective research of INICC

Published online by Cambridge University Press: **04 January 2024**

Victor Daniel Rosenthal, Ruijie Yin, Eric Christopher Brown, Brandon Hochahn Lee, Camilla Rodrigues, Sheila Nainan Myatra, Mohit Kharbanda, Prasad Rajhans, Yatin Mehta, Subhash Kumar Todi, Sushmita Basu, Suneeta Sahu, Shakti Bedanta Mishra, Rajesh Chawla, Pravin K. Nair, Rajalakshmi Arjun, Deepak Singla, Kavita Sandhu, Vijayanand Palaniswamy, Arpita Bhakta, Mohd-Basri Mat Nor, Tai Chian-Wern, Ider Bat-Erdene, Subhash P. Acharya, Aamer Ikram, Nellie Tumu, Lili Tao, Gustavo Andres Alvarez, Sandra Liliana Valderrama-Beltran, Luisa Fernanda Jiménez-Alvarez, Claudia Milena Henao-Rodas, Katherine Gomez, Lina Alejandra Aguilar-Moreno, Yuliana Andrea Cano-Medina, Maria Adelia Zuniga-Chavarria, Guadalupe Aguirre-Avalos, Alejandro Sassoe-Gonzalez, Mary Cruz Aleman-Bocanegra, Blanca Estela Hernandez-Chena, Maria Isabel Villegas-Mota, Daisy Aguilar-de-Moros, Alex Castañeda-Sabogal, Eduardo Alexandrino Medeiros, Lourdes Dueñas, Nilton Yhuri Carreazo, Estuardo Salgado, Safaa Abdulaziz-Alkhawaja, Hala Mounir Agha, Amani Ali El-Kholy, Mohammad Abdellatif Daboor, Ertugrul Guclu, Oguz Dursun, Iftihar Koksal, Merve Havan, Suna Secil Ozturk-Deniz, Dincer Yildizdas, Emel Okulu, Abeer Aly Omar, Ziad A. Memish, Jarosław Janc, Sona Hlinkova, Wieslawa Duszynska, George Horhat-Florin, Lul Raka, Michael M. Petrov and Zhilin Jin

Show author details

CATHETER-ASSOCIATED URINARY TRACT INFECTION RATES STRATIFIED PER REGION

Country [a]	Patients, n	Patient-days, n	UC-days, n	CAUTI, n	CAUTI rate [b]	95% CI
Eastern Europe	4,009	45,127	36,993	519	14.03	13.99-14.07
Asia	93,403	917,352	378,297	1,484	3.92	3.91-3.93
Middle East	60,239	711,140	469,906	1,555	3.31	3.30-3.31
Latin America	42,711	386,857	216,088	706	3.27	3.26-3.28

CATHETER ASSOCIATED URINARY TRACT INFECTIONS RATES PER ICU TYPE

	Patients, n	Patient-days, n	UC-days, n	CAUTI, n	CAUTI rate [b]	95% CI
ICU type [d]						
Trauma	471	2,319	1,004	8	7.97	7.79-8.14
Neurologic	1,522	10,538	6,524	41	6.28	6.22-6.35
Neuro-surgical	2,513	22,244	14,536	72	4.95	4.92-4.99
Medical	19,614	141,124	8,1472	292	3.58	3.57-3.60
Coronary	10,571	65,390	24,840	87	3.50	3.07-3.11
Surgical	5,250	30,947	21,588	70	3.24	3.22-3.27
Adult-oncology	3,312	15,980	14,080	41	2.91	2.88-2.94
Respiratory	517	6,087	3,634	10	2.75	2.70-2.81
Pediatric	10,812	84,205	28,182	73	2.59	2.57-2.61
Medical-surgical	105,009	732,719	505,173	1285	2.54	2.53-2.55
Cardio-thoracic	7,964	46,265	27,321	30	1.09	1.08-1.11
Pediatric-oncology	1,481	8,775	4,304	1	0.23	0.22-0.25
Pooled	169,036	1,166,593	732,658	2010	2.74	2.74-2.75

CATHETER ASSOCIATED URINARY TRACT INFECTIONS RATES PER PER FACILITY OWNERSHIP TYPE, PER WORLD BANK COUNTRY CLASSIFICATIONS BY INCOME LEVEL

	Patients, n	Patient-days, n	UC-days, n	CAUTI, n	CAUTI rate [b]	95% CI
Lower-middle income						
Pooled	84,911	513,215	292,972	893	3.05	3.04-3.05
Publicly owned facilities	9,666	58,831	34,300	202	5.89	5.86-5.92
For-profit privately owned facilities	37,046	213,442	133,382	441	3.31	3.29-3.32
Teaching hospitals	28,875	190,686	101,767	193	1.89	1.88-1.91
Not-for-profit privately owned facilities	9,324	50,256	23,523	57	2.42	2.40-2.44

CATHETER ASSOCIATED URINARY TRACT INFECTIONS RATES STRATIFIED PER FACILITY OWNERSHIP TYPE, PER WORLD BANK COUNTRY CLASSIFICATIONS BY INCOME LEVEL AND PER URINARY CATHETER TYPE

	Patients, n	Patient-days, n	UC-days, n	CAUTI, n	CAUTI rate [b]	95% CI
Upper-middle income						
Pooled	50,470	351,025	228,264	733	3.21	3.20-3.22
Publicly owned facilities	12,205	88,166	52,152	157	3.01	2.99-3.02
For-profit privately owned facilities	20,227	122,886	74,232	161	2.17	2.16-2.18
Teaching hospitals	17,855	139,297	101,479	411	4.05	4.03-4.06
Not-for-profit privately owned facilities	183	676	401	4	9.98	9.67-10.29
High income						
Pooled	33,655	302,353	211,422	384	1.82	1.81-1.83
Publicly owned facilities	30,313	272,711	190,017	341	1.79	1.78-1.80
For-profit privately owned facilities	2,507	22,027	14,303	10	0.70	0.69-0.71
Teaching hospitals	835	7,615	7,102	33	4.65	4.60-4.70
Urinary catheter type**						
Indwelling urethral	113,790	862,028	707,150	1,794	2.54	2.53-2.54
Suprapubic	431	4,099	3,055	12	3.93	3.86-4.00

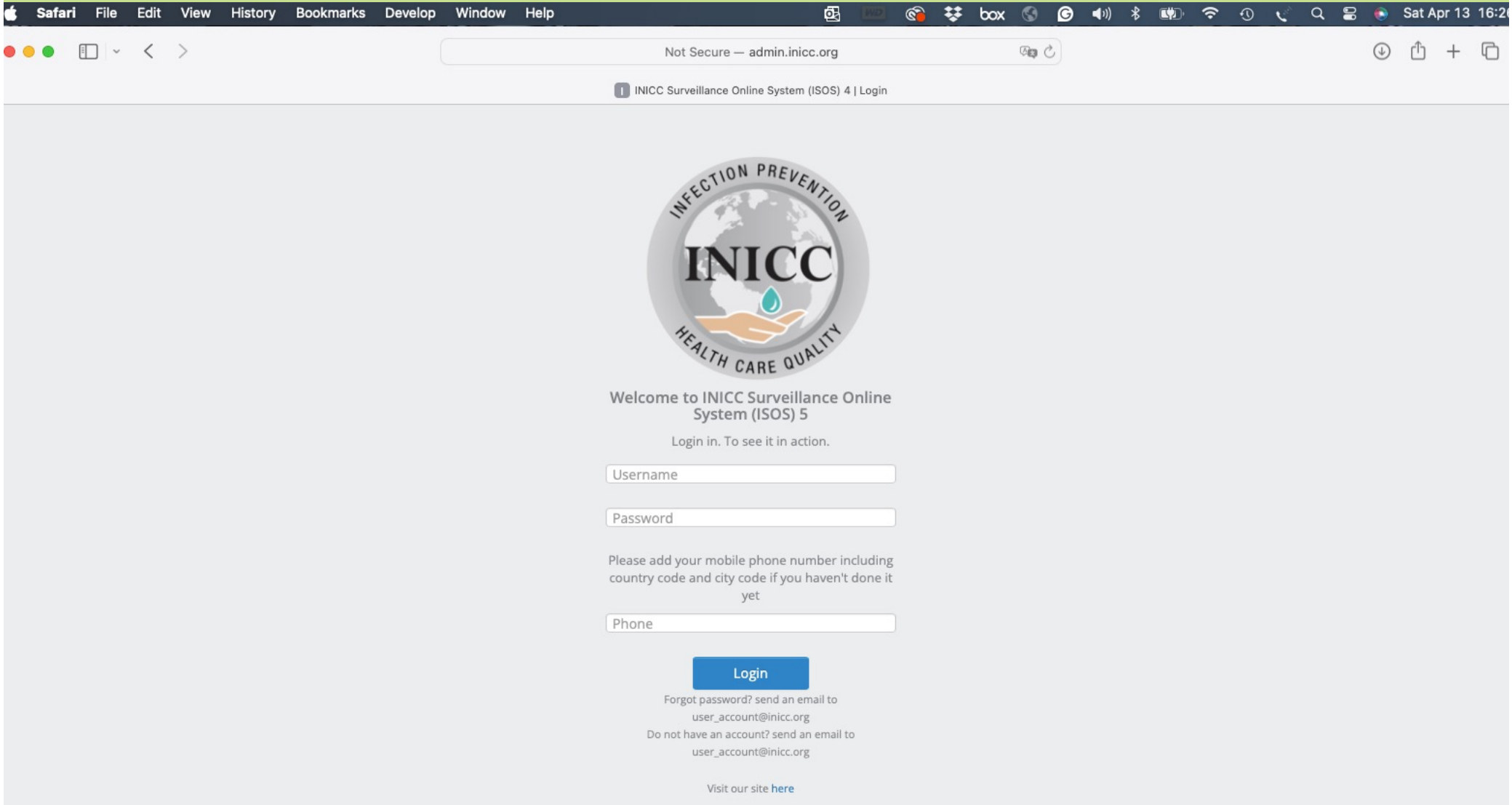
MULTIPLE LOGISTIC REGRESSION ANALYSIS OF RISK FACTORS FOR CATHETER ASSOCIATED URINARY TRACT INFECTIONS

	aOR	95% CI	P value
Age	1.01	1.01-1.02	<0.0001
Sex, female	1.39	1.26-1.51	<0.0001
Length of stay	1.05	1.05-1.06	<0.0001
UC DU ratio	1.09	1.07-1.12	<0.0001
Reference: Lack of use of UC			
Indwelling urethral catheter	4.34	3.69-5.09	<0.0001
Suprapubic catheter	6.42	3.45-11.95	<0.0001
Reference: Not-for-profit privately owned facilities			
Publicly owned facilities	2.24	1.66-3.01	<0.0001
For-profit privately owned facilities	1.27	0.95-1.69	0.11
Teaching hospitals	1.67	1.25-2.23	<0.0001
Reference: High income country			
Lower middle income country	1.71	1.44-2.01	<0.0001
Upper middle income country	1.94	1.66-2.26	<0.0001

MULTIPLE LOGISTIC REGRESSION ANALYSIS OF RISK FACTORS FOR CATHETER ASSOCIATED URINARY TRACT INFECTIONS

	aOR	95% CI	P value
Reference: Cardiothoracic ICU			
Neurologic ICU	11.49	6.92-19.11	<0.0001
Trauma ICU	7.99	3.58-17.84	<0.0001
Neuro-Surgical ICU	6.78	4.31-10.65	<0.0001
Medical ICU	4.95	3.31-7.39	<0.0001
Adult-Oncology ICU	4.94	2.96-8.25	<0.0001
Surgical ICU	4.08	2.61-6.37	<0.0001
Medical-Surgical ICU	3.82	2.61-5.61	<0.0001
Pediatric ICU	3.55	2.22-5.66	<0.0001
Coronary ICU	3.38	2.17-5.26	<0.0001
Respiratory ICU	3.11	1.46-6.61	<0.0001
Pediatric-Oncology ICU	0.46	0.06-3.42	0.44
Reference: Time period 3 (2020-2022)			
Time Period 1 (2014-2016)	2.21	1.79-2.71	<0.0001
Time Period 2 (2017-2019)	2.09	1.69-2.56	<0.0001

INICC Surveillance Online System (ISOS)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HEALTH CARE QUALITY
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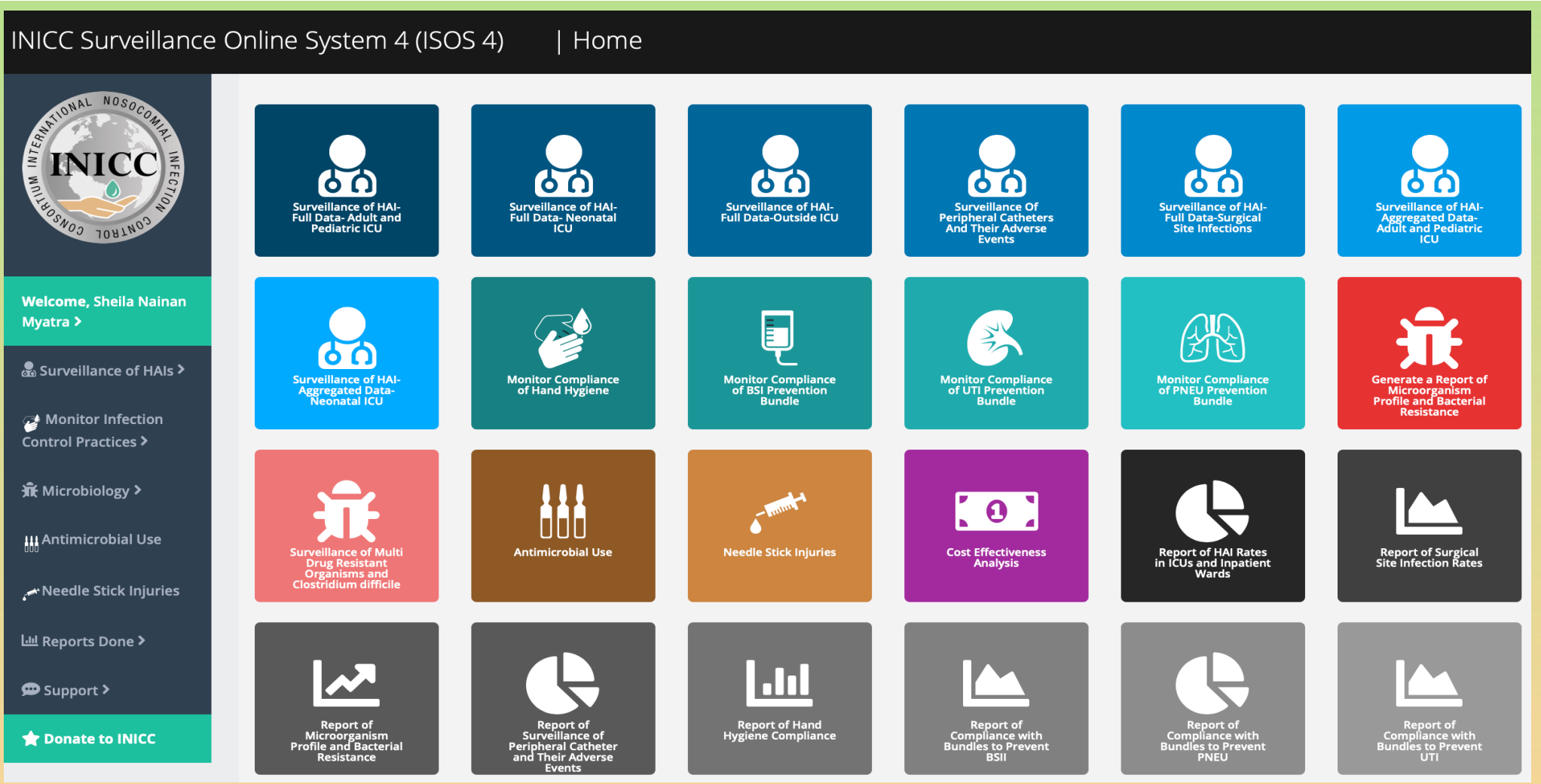
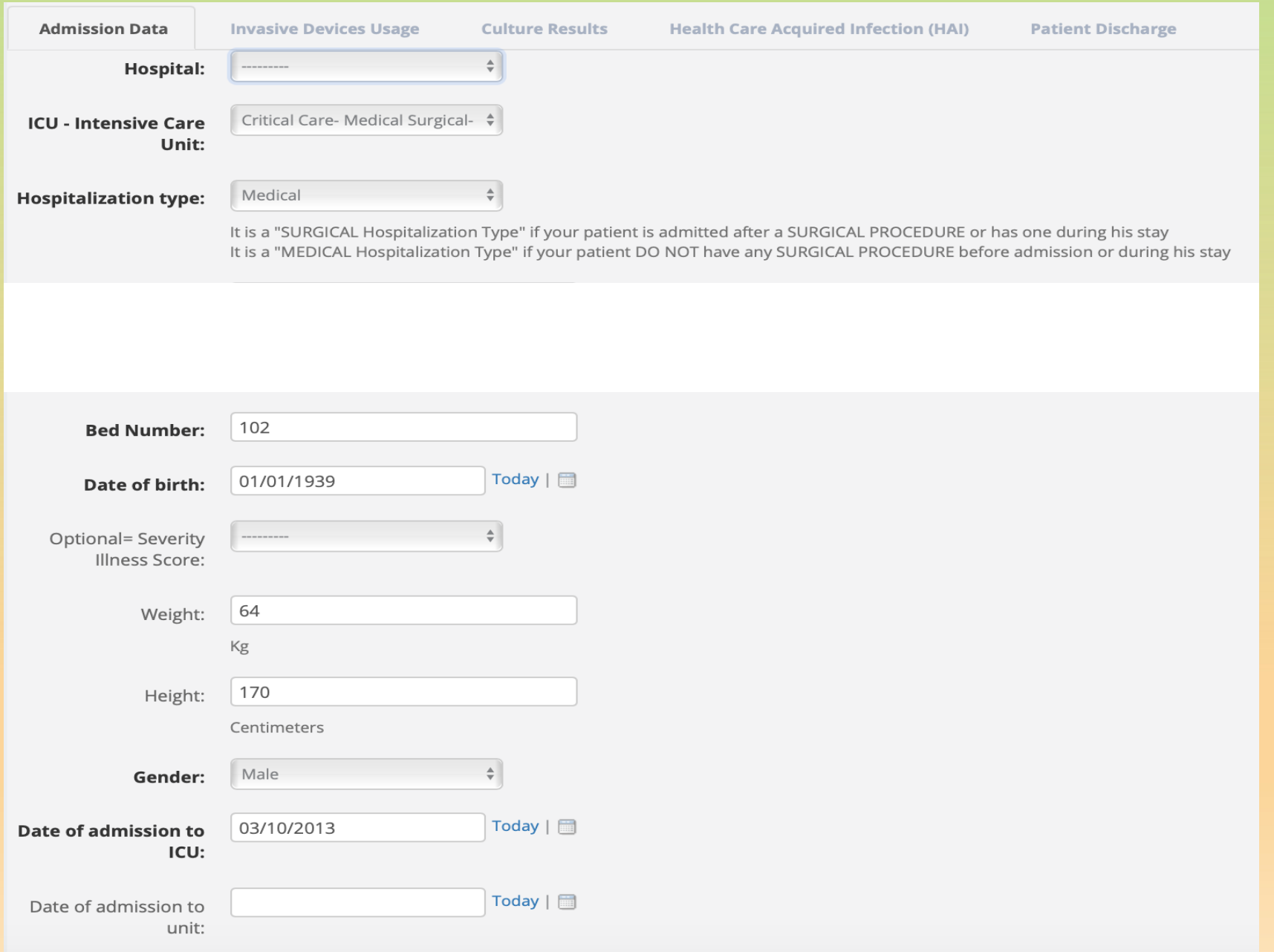


With INICC surveillance online system (ISOS), INICC members worlwide have been conducting:
Agregated Basic Surveillance And / Or Advanced Cohort Surveillance Of:
"HAIs In ICU", "HAIs In Inpatient Wards And Step Down Units", "SSIs",
" Benchmark With CDC NSHN And With INICC"
"Hand Higiene Compliance",
"Compliance Of Bundles To Prevent CLAB, VAP, CAUTI, And SSI",
"Microorganism Profile And Bacterial Resistence",
"Extra Mortality Of HAIs", "Extra Lenght Of Stay Of HAIs", "Risk Factors Of HAIs",
"Robot To Make Diagnosis Of HAI According With CDC NHSN Recent Crietria";
"Making Report In Four (4) Seconds", And "Much More."

OUTCOME SURVEILLANCE
HAIs in ICU:
HAI RATES, BENCHMARK, MICROOGANISM PROFILE, BACTERIAL RESISTANCE, EXTRA MORTALITY, ETC

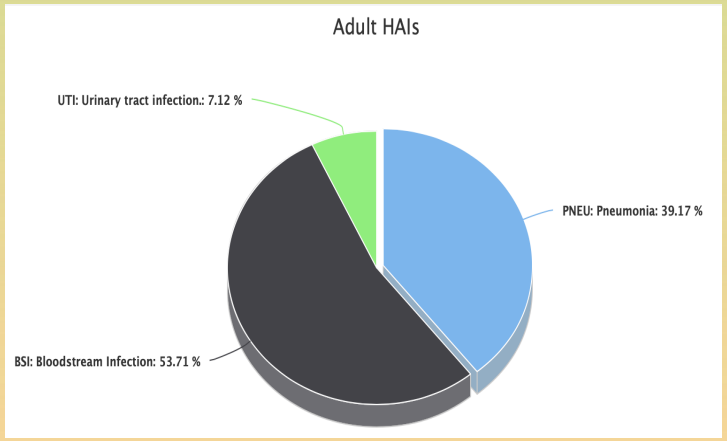
OUTCOME SURVEILLANCE
HAIs in ICU: DATA ENTRY PROCESS
With 5 Tabs. For data entry: 30 to 60 seconds per patient per day

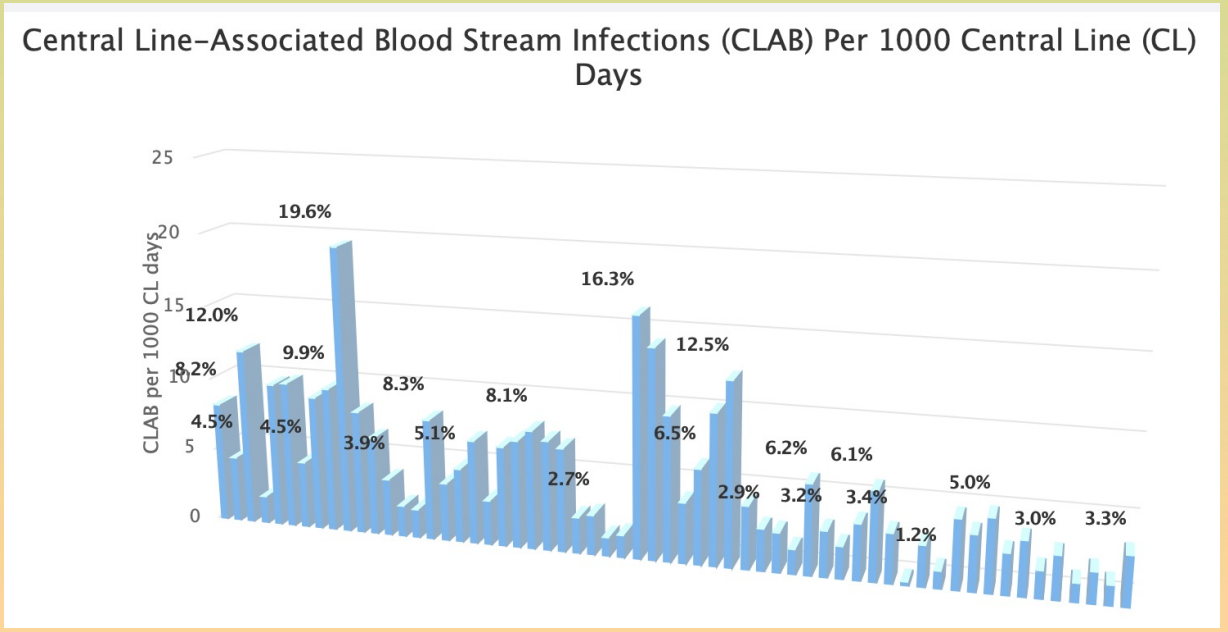


REPORT AND FEEDBACK OF OUTCOME SURVEILLANCE:

CLABSI in ICU
Report with 70 charts and tables

PROPORTION OF HAI AND HAI RATES PER 1000 DEVICE DAYS



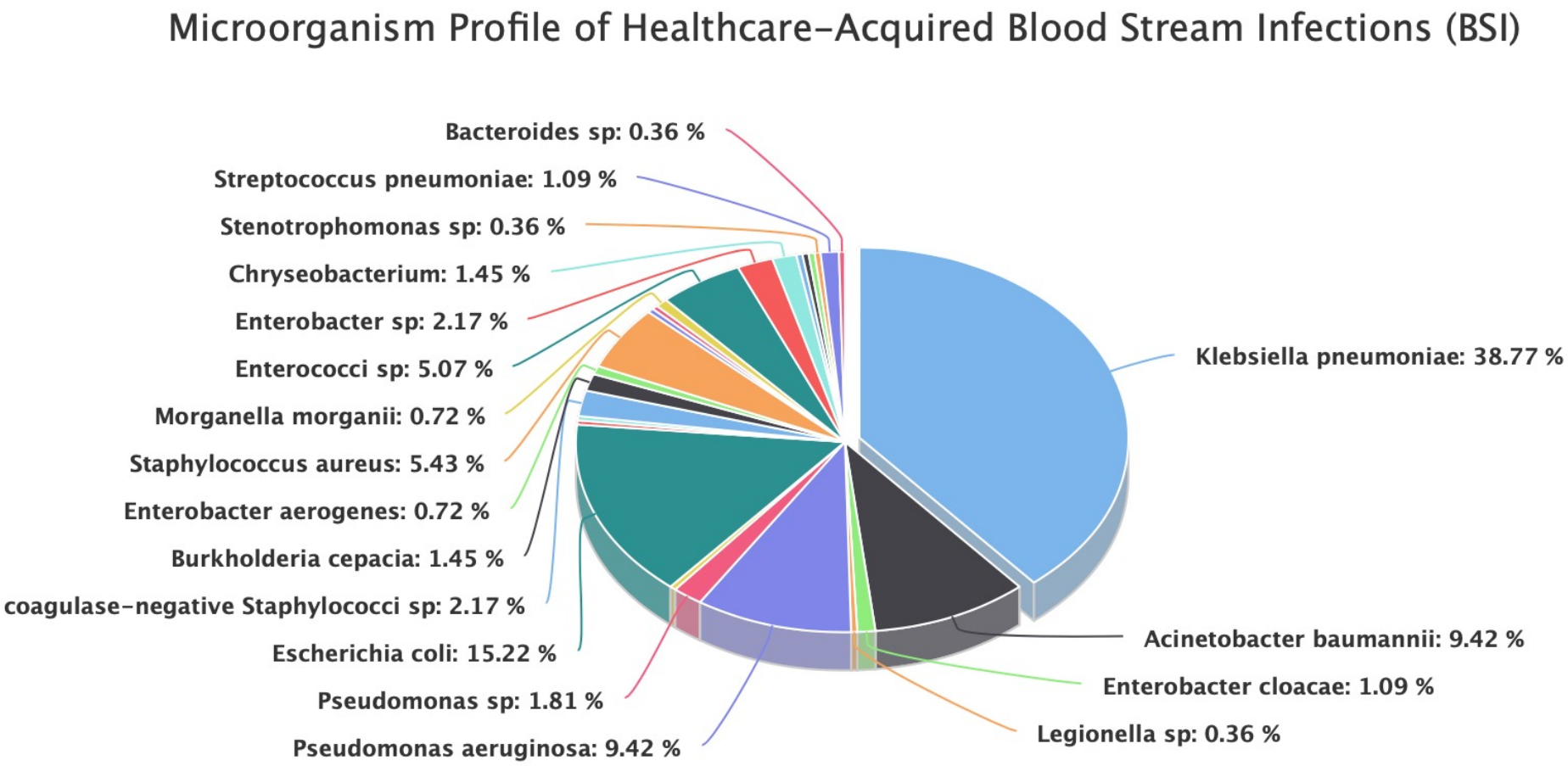


REPORT AND FEEDBACK OF OUTCOME SURVEILLANCE:
HAIs in ICU.
Report with 70 charts and tables
BENCHMARK

Pooled means of central line-associated BSI rates, central line utilization ratios, DA module. Benchmark with Standards

	This Hospital	CDC-NHSN Report "2012" (U.S.A.). Last published and available data: Peer Review Manuscript Published at AJIC 2014	International INICC Report "2010-2015" (50 Countries). Last published and available data: Peer Review Manuscript Published at AJIC 2016	SAUDI ARABIA INICC Report 2013-2015. Last published and available data: Peer Review Manuscript In Press at CJIC 2016	Argentinean National Surveillance Program of HAI (VIHDA). Ministry of Health. 2014	INDIA INICC Report 2004-2013. Last published and available data: Peer Review Manuscript Published at ICHE 2015	Mexican National Surveillance Program of HAI (RHOVE). Secretary of Health. 2015	MEXICO INICC Report 2002-2004. Last published and available data: Peer Review Manuscript Published at AJIC 2006	TURKEY INICC Report 2003-2012. Last published and available data: Peer Review Manuscript Published at ACMA 2014
Number of Patients	5813	--	--	--	--	--	--	--	--
Number of Bed Days	35651	--	--	--	--	--	--	--	--
Number of BSIs	181	--	--	--	--	--	--	--	--
Central line-days	37703	--	--	--	--	--	--	--	--
Central line utilization ratio	1.06	0.55	0.64	0.73	0.67	0.39	NA	0.98	0.65
Central line-associated BSI rate	4.80	1.20	4.11	4.50	4.10	4.82	4	16.90	8.50

REPORT AND FEEDBACK OF OUTCOME SURVEILLANCE:
HAIs in ICU:
Report with 70 charts and tables
MICROORGANISM PROFILE



REPORT AND FEEDBACK OF OUTCOME SURVEILLANCE: HAIs in ICU Report with 70 charts and tables

- **EXTRA LENGTH OF STAY**
- **EXTRA MORTALITY**
- **EXTRA COST**

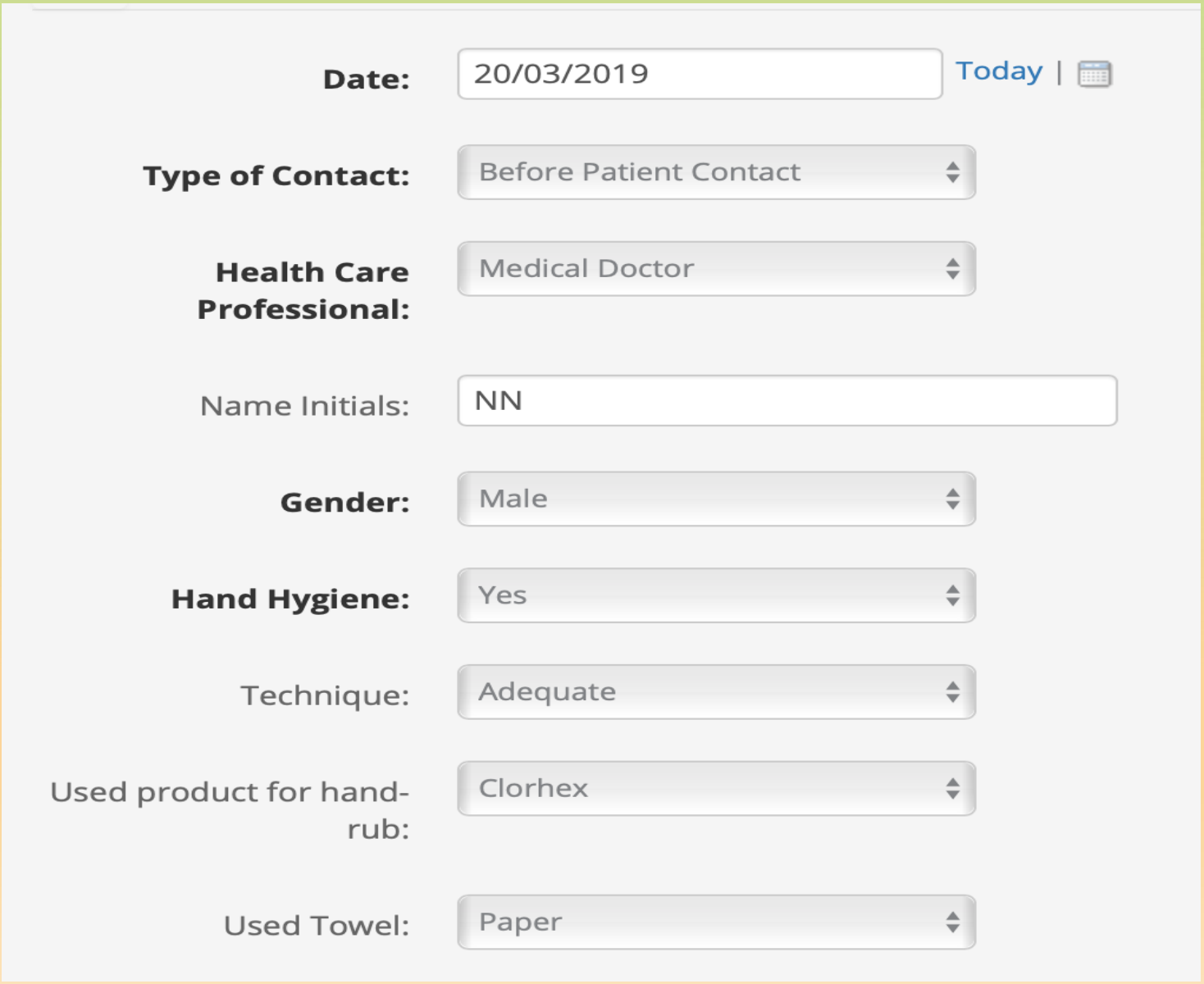
Type of patient	Average length of stay	Extra length of stay
Length of stay of patient wihout HAI	5.69	0.00
Length of stay of patient BSI	11.78	6.09
Length of stay of patient PNEU	16.81	11.12
Length of stay of patient UTI	13.06	7.37
Length of stay of patient with several HAIs	16.86	11.17

Type of patient	Percentage of deaths (%)	Extra mortality (%)
Mortality of patient wihout HAI	19.17	0.00
Mortality of patient BSI	57.14	37.97
Mortality of patient PNEU	74	54.83
Mortality of patient UTI	17.65	0.00
Mortality of patient with several HAIs	71.43	52.26

Type of patient	Average length of stay	Extra length of stay	Cost of Bed day of my Institution in USD	Average cost per each patient with this condition in USD	Average extra cost per each patient with this condition in USD
Patient without HAI	5.69	0.00	1000	5690	0
Patient with BSI	11.78	6.09	1000	11780	6090
Patient with PNEU	16.81	11.12	1000	16810	11120
Patient with UTI	13.06	7.37	1000	13060	7370
Patient with several HAIs	16.86	11.17	1000	16860	11170

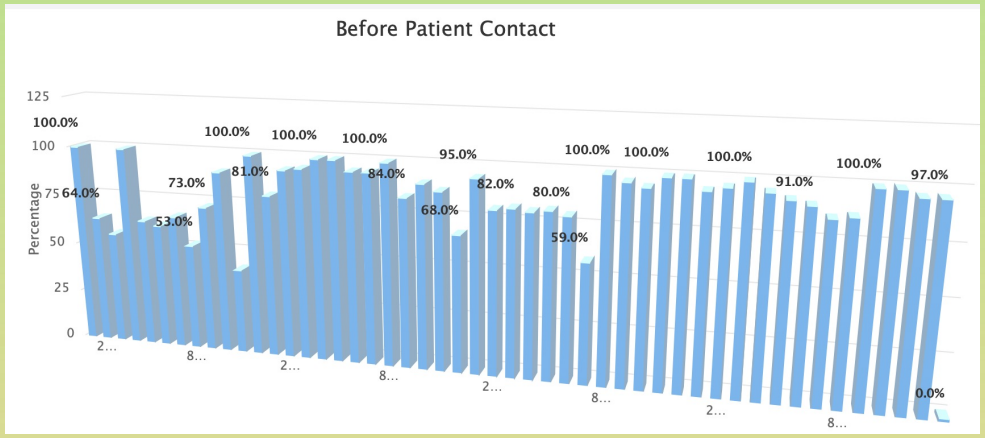
PROCESS SURVEILLANCE: MONITORING BEHAVIOUR OF HEALTH CARE WORKERS

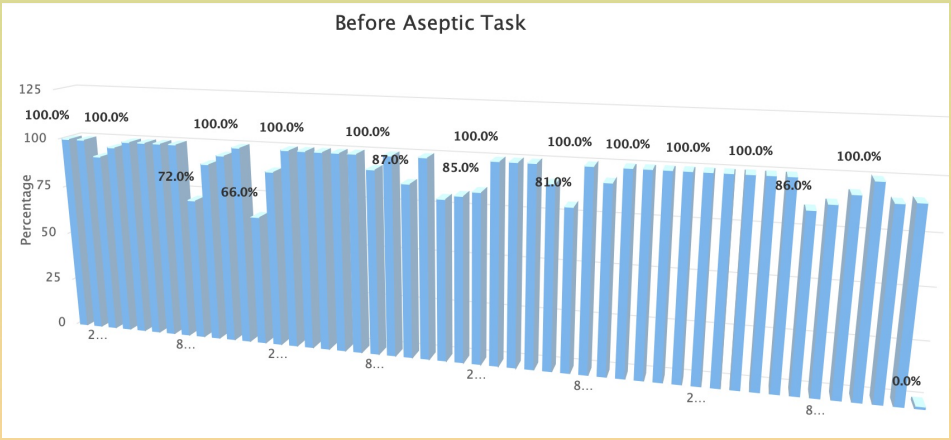
PROCESS SURVEILLANCE: MONITORING COMPLIANCE WITH HAND HYGIENE DATA ENTRY PROCESS

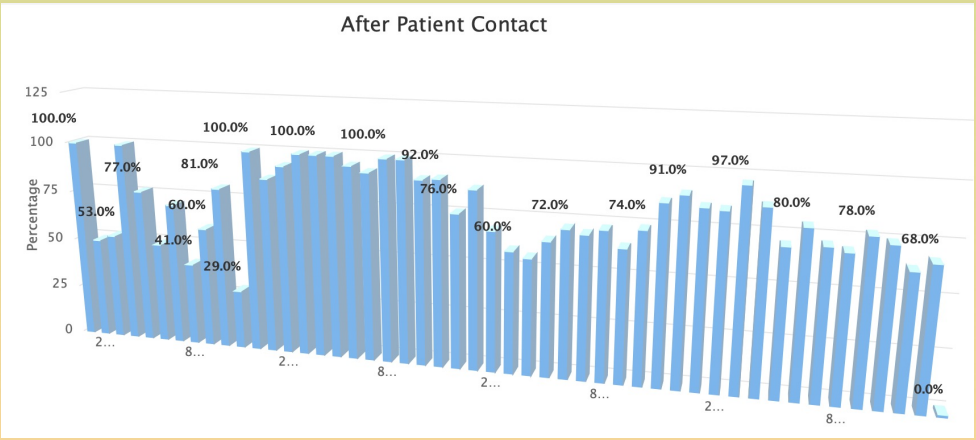


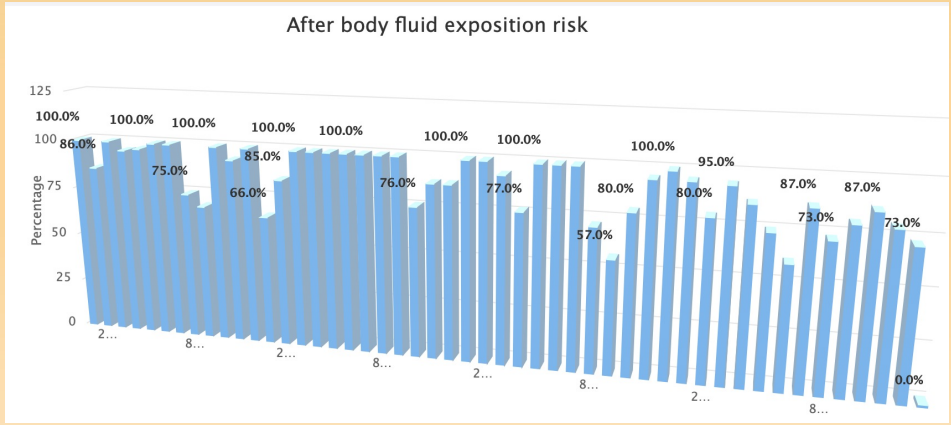
REPORT AND FEEDBACK OF PROCESS SURVEILLANCE / PERFORMANCE FEEDBACK: HAND HYGIENE COMPLIANCE

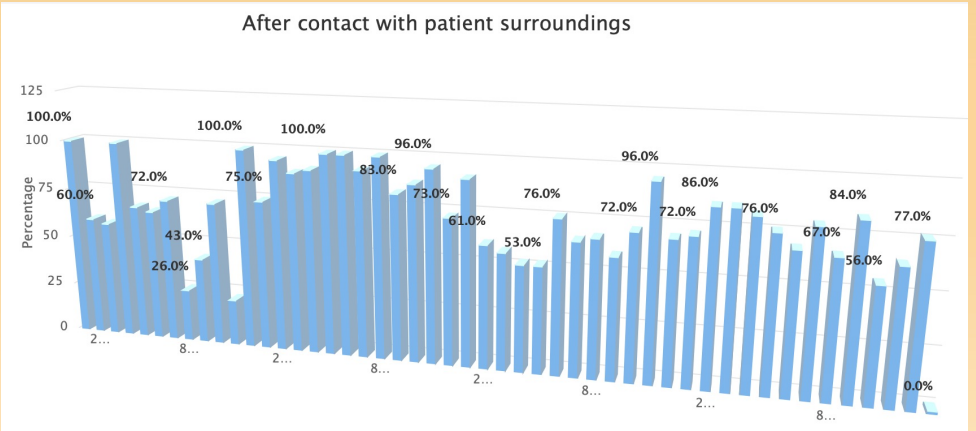
Report with 20 Charts





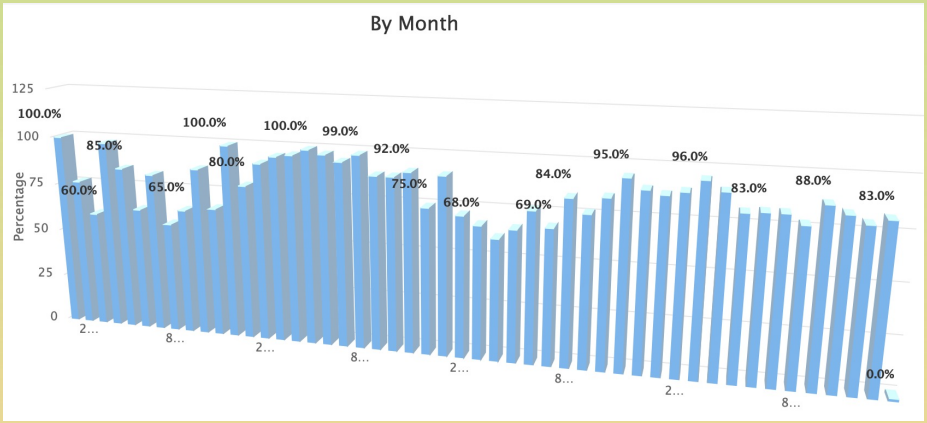


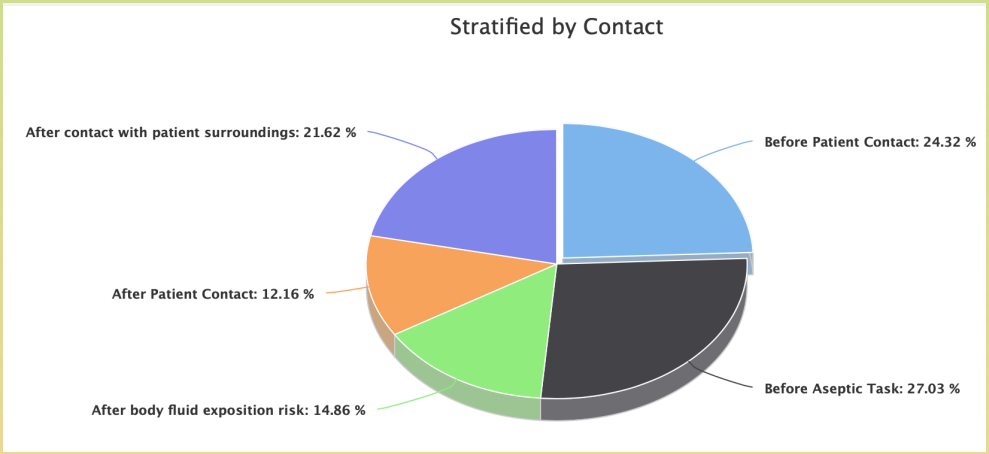


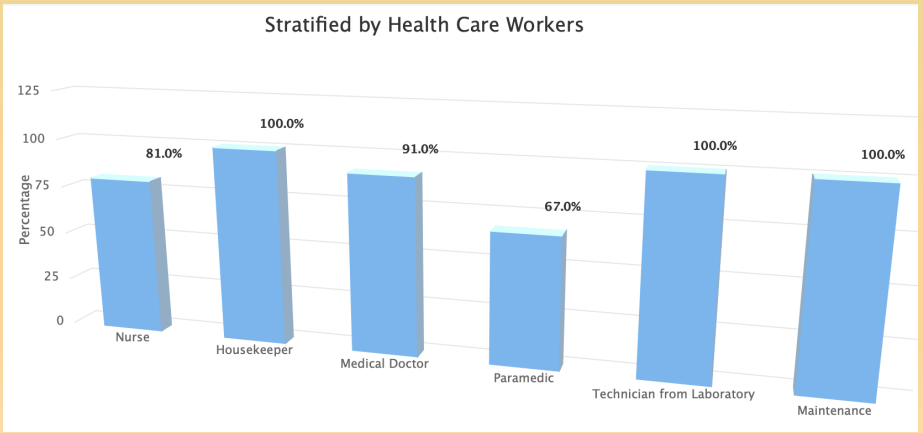


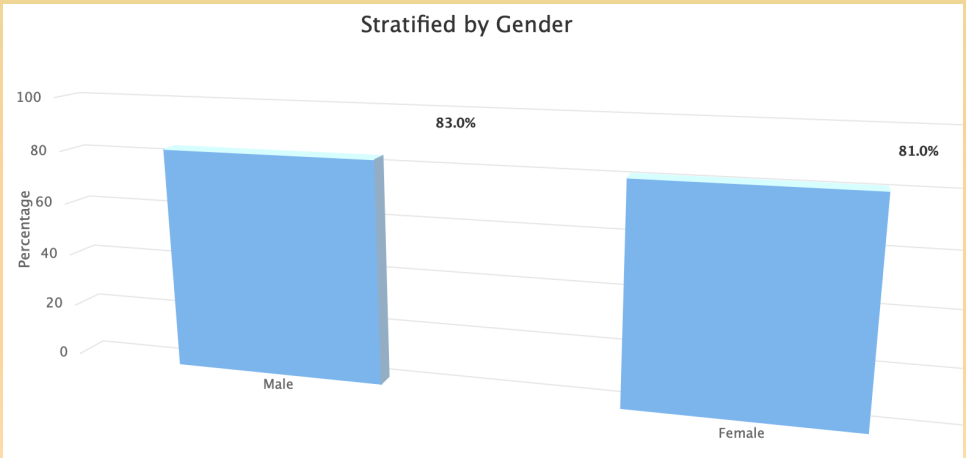
REPORT AND FEEDBACK OF PROCESS SURVEILLANCE / PERFORMANCE FEEDBACK: HAND HYGIENE COMPLIANCE

Report with 20 Charts





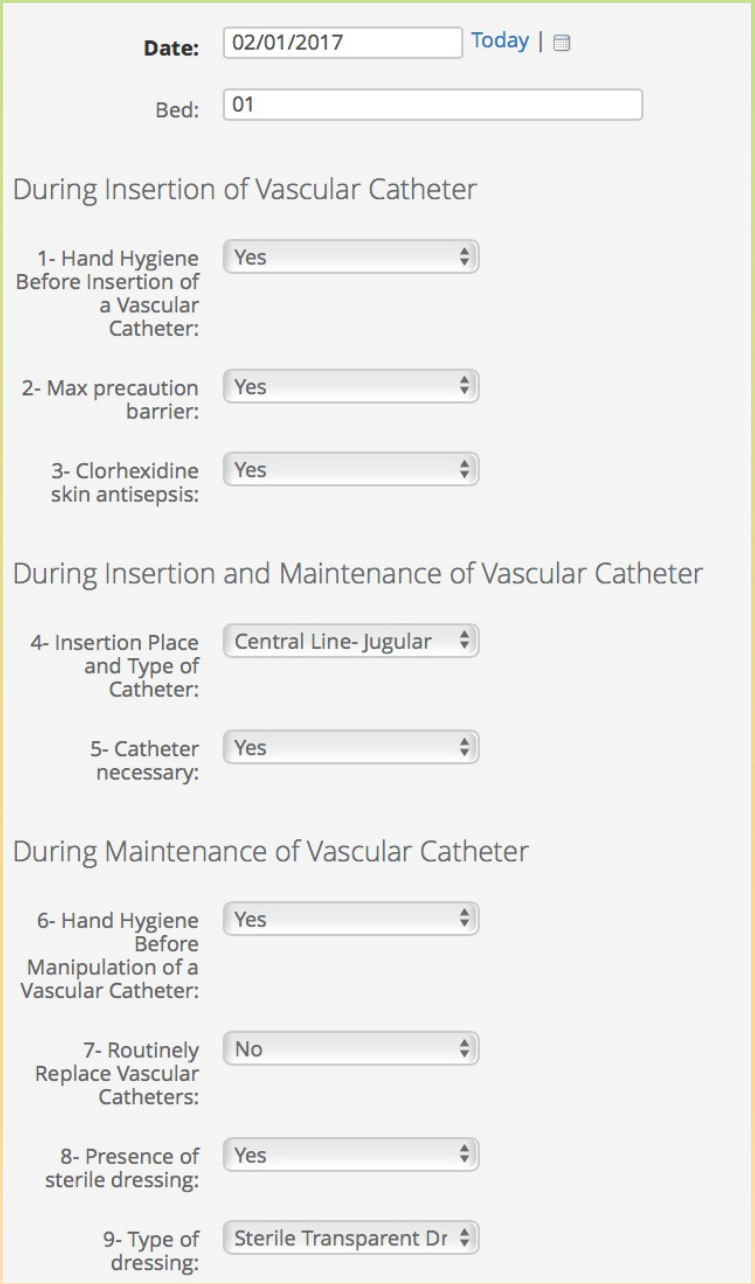


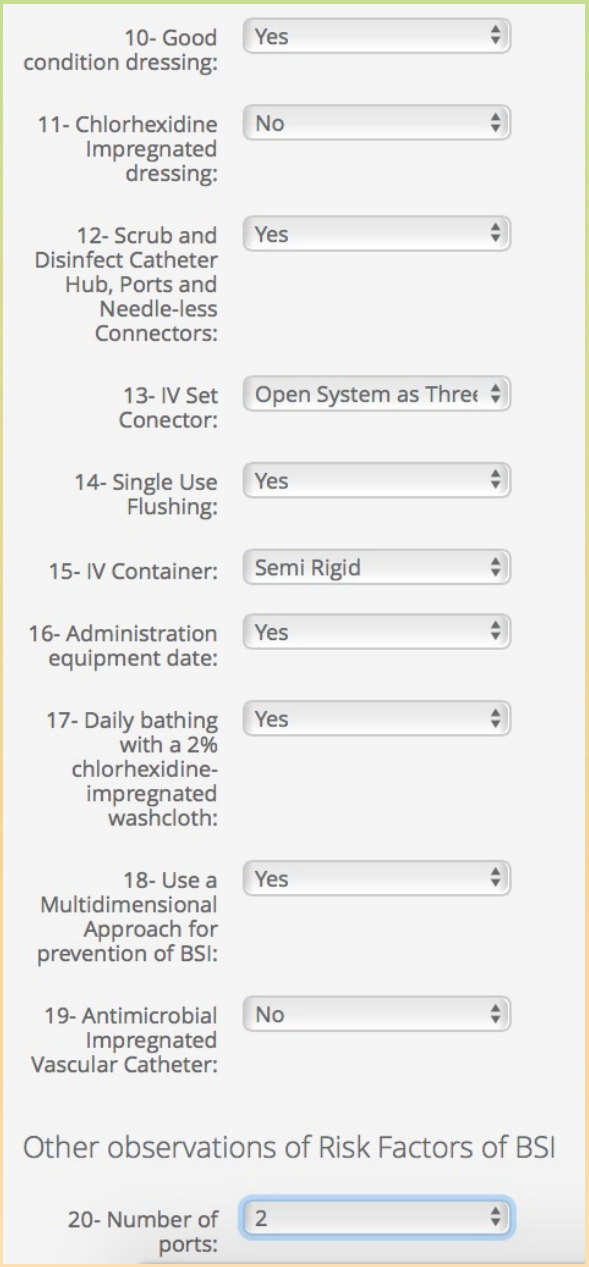


PROCESS SURVEILLANCE: MONITORING COMPLIANCE WITH BUNDLE TO PREVENT CLABSI and PLABSI, During Insertion and Maintenance

INICC Surveillance Online System (ISOS)

Uploading Monitoring Compliance with Bundles of Care of CRBSI





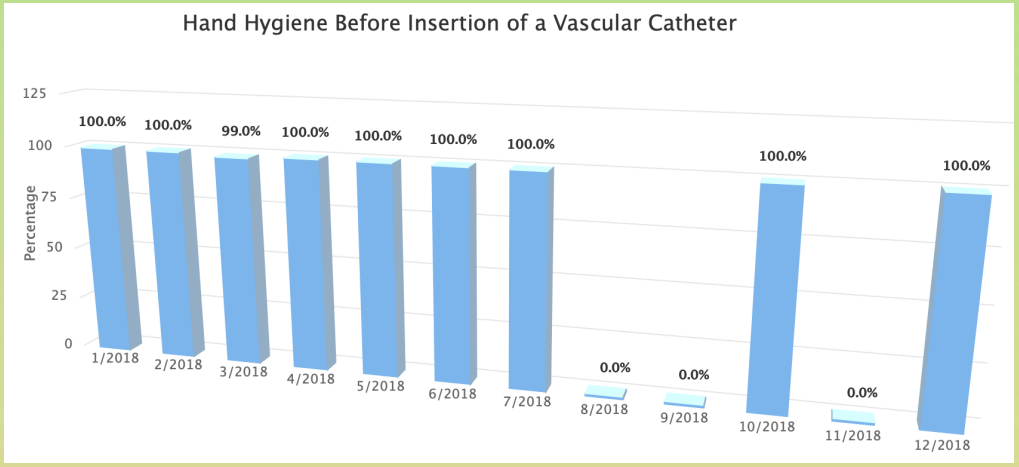
PROCESS SURVEILLANCE:

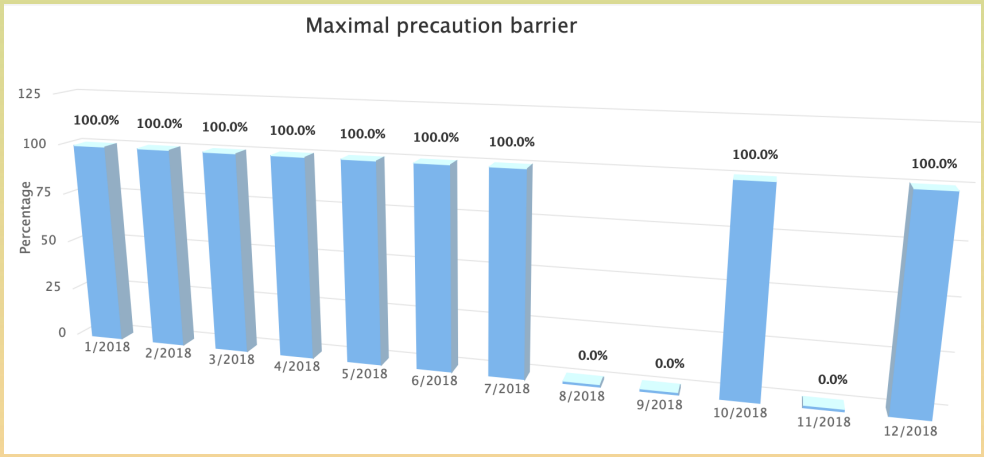
MONITORING COMPLIANCE WITH BUNDLE TO PREVENT CR-BSI:

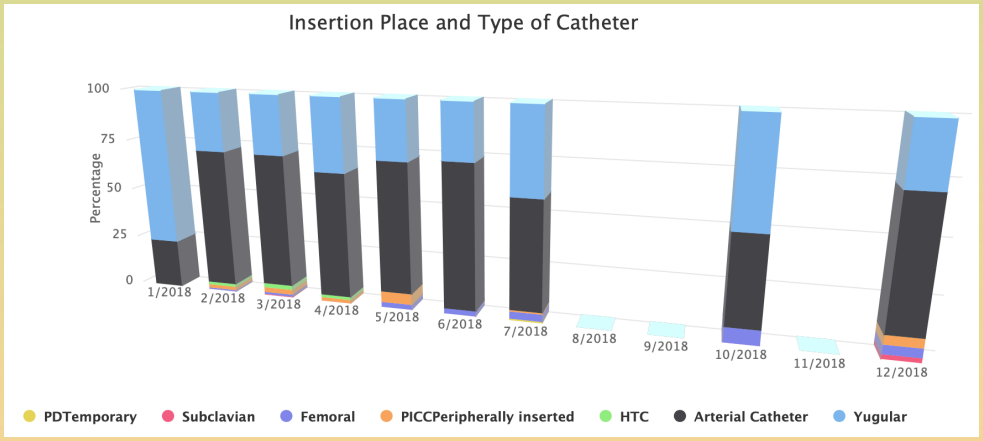
DATA ENTRY PROCESS

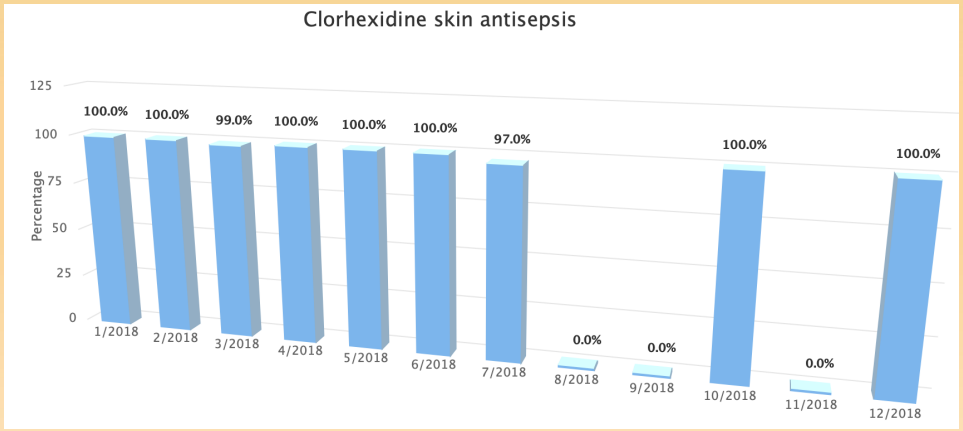
REPORT AND FEEDBACK OF PROCESS SURVEILLANCE / PERFORMANCE FEEDBACK: COMPLIANCE OF BUNDLE TO PREVENT CR-BSI

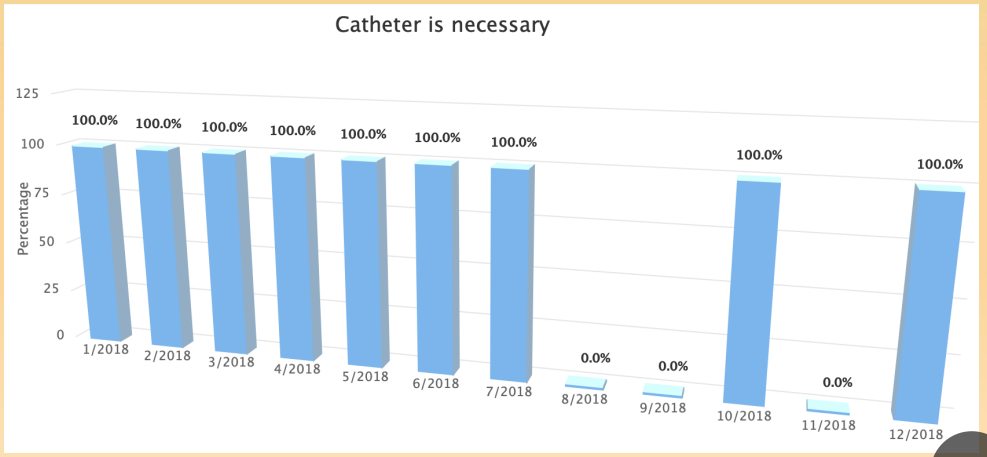
Report with 20 Charts











Multi-Dimensional Approach and BUNDLE to Prevent CLABSI

INICC multidimensional approach and software

1. Guidelines to Prevent HAIs
2. Education and training of HCWs.

3. Surveillance of HAIs & Clinical Outcomes (Mortality, Stay, Cost, Bacterial Resistance).
4. Monitoring Compliance with HH and Guidelines

5. Feedback on HAI Rates, & Clinical Outcomes
6. Feedback on Compliance with HH and HAI Prevention Guidelines

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Decreasing central line-associated bloodstream infections rates in intensive care units in 30 low- and middle-income countries: An INICC approach

Victor D. Rosenthal MD, PhD [a,b,*], Zhilin Jin PhD [a], Eric C. Brown PhD [a], Reshma Dongol RN [c], Daisy A. De Moros RN [d], Johana Alarcon-Rua RN [e], Valentina Perez [f], Juan P. Stagnaro MD [g], Safaa Alkhawaja MD [h], Luisa F. Jimenez-Alvarez MD [i], Yuliana A. Cano-Medina MD [j], Sandra L. Valderrama-Beltran MD [k], Claudia M. Henao-Rodas MD [l], Maria A. Zuniga-Chavarria MD [m], Amani El-Kholy MD [n], Hala Agha MD [o], Suneeta Sahu MD [p], Shakti B. Mishra MD [q], Mahuya Bhattacharyya MD [r], Mohit Kharbanda MD [s], Aruna Poojary MD [t], Pravin K. Nair MD [u], Sheila N. Myatra MD [v], Rajesh Chawla MD [w], Kavita Sandhu MD [x], Yatin Mehta MD [y], Prasad Rajhans MD [z], Mohammad Abdellatif-Daboor MD [aa], Tai Chian-Wern MD [ab], Chin Seng Gan MD [ac], Mat Nor Mohd-Basri MD [ad], Guadalupe Aguirre-Avalos MD [ae], Blanca E. Hernandez-Chena MD [af], Alejandro Sassoe-Gonzalez MD [ag], Isabel Villegas-Mota MD [ah], Mary C. Aleman- Bocanegra MD [ai], Ider Bat-Erdene MD [aj], Nilton Y. Carreazo MD [ak], Alex Castaneda-Sabogal MD [al], Jarosław Janc MD [am], Sona Hlinkova MD [an], Dincer Yildizdas MD [ao], Merve Havan MD [ap], Alper Koker MD [aq], Hulya Sungurtekin MD [ar], Ener C. Dinleyici MD [as], Ertugrul Guclu MD [at], Lili Tao MD [au], Ziad A. Memish MD [av], Ruijie Yin PhD [a]

ADVANCED BUNDLE TO PREVENT CLABSI

1. Adherence to hand hygiene before CL insertion or manipulation
2. Implementation of maximum sterile barrier precautions during CL insertion
3. Utilization of alcoholic chlorhexidine antiseptic for skin preparation
4. A preference for avoiding the femoral site
5. Reduction of CL-days by eliminating nonessential CLs
6. Maintenance of proper insertion site dressing, changing it when it becomes loose, wet, dirty, or bloody
7. Minimization of the length of stay by promptly discharging eligible patients
8. Daily chlorhexidine preparation bathing for ICU patients aged over 2 months
9. Prioritization of NC connectors over three-way stopcocks
10. A preference for collapsible closed IV fluid systems over semi-rigid open systems
11. A focus on single-use flushing over manual admixture

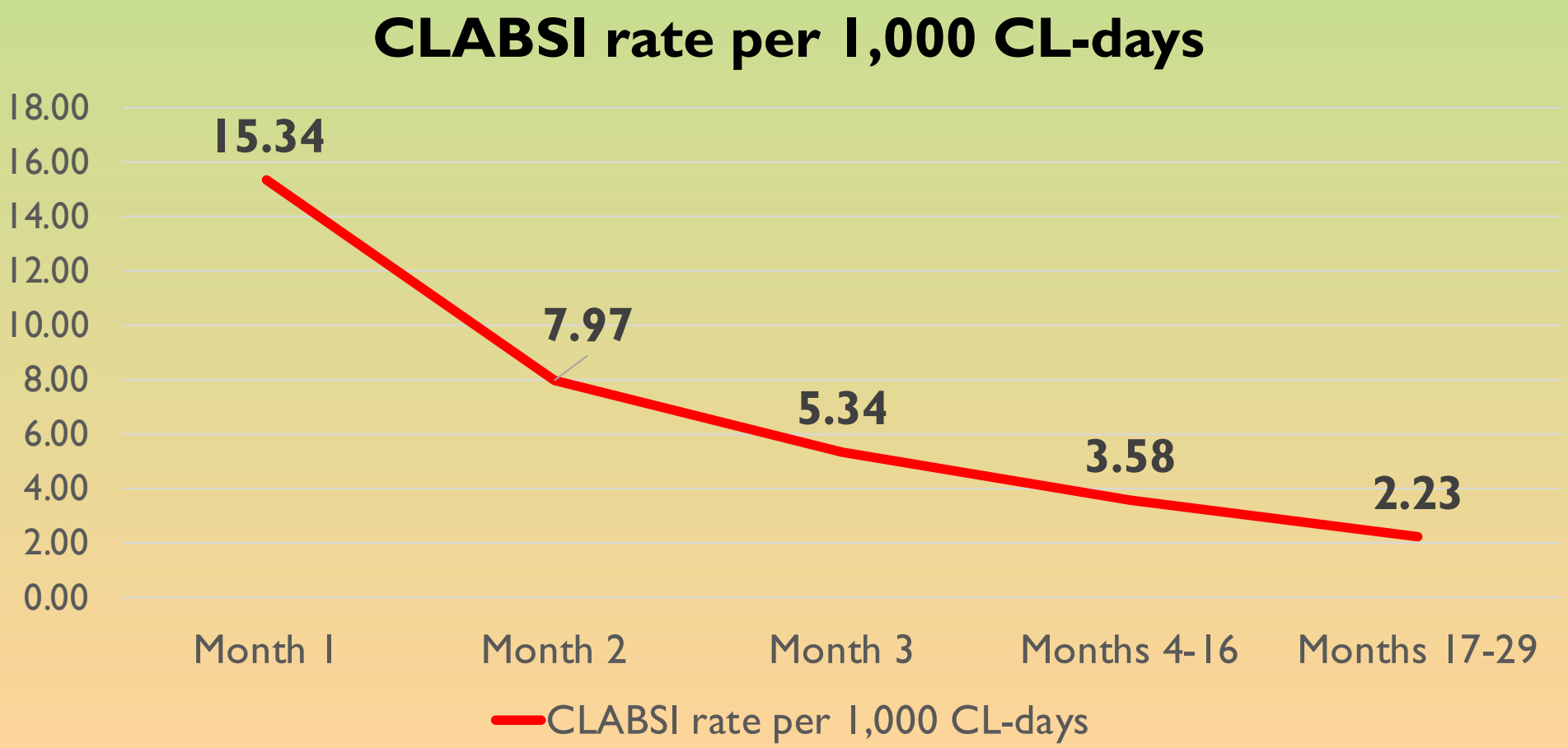
SETTING AND PATIENT CHARACTERISTICS

ICUs, n	**316**
Hospitals, n	286
Cities, n	100
Countries, n	30
Total patients, n	283,087
Total patients-days, n	1,837,750
Gender, n (%)	
Male	171,692 (60.65%)
Female	111,395 (39.35%)
Age, mean, SD	Mean= 52.18
Average LOS, mean, SD	Mean= 6.49
CLABSI, n	3,040
Device-days and device utilization ratio	
CL-DU ratio, mean, SD	Mean= 0.64
Total CL-days, n, mean, SD	1,218,882, Mean= 4.31
Survival status, n (%)	
Alive	245,531 (86.73%)
Death	37,556 (13.27%)
Number of patients per Hospitalization type, n (%)	
Medical hospitalization	206,340 (72.89%)
Surgical hospitalization	76,747 (27.11%)

SETTING AND PATIENT CHARACTERISTICS

Number of ICUs, number and percentage of patients admitted per type of ICU, n (%)	
Cardio-thoracic ICU	25 ICUs; 7,987 patients (2.82%)
Coronary ICU	13 ICUs; 26,858 patients (9.49%)
Medical ICU	52 ICUs; 31,696 patients (11.20%)
Medical-Surgical ICU	126 ICUs; 169,932 patients (60.03%)
Neuro-Surgical ICU	17 ICUs; 5,628 patients (1.99%)
Neurologic ICU	7 ICUs; 1,697 patients (0.60%)
Adult-Oncology ICU	6 ICUs; 3,442 patients (1.22%)
Pediatric-Oncology ICU	4 ICUs; 1,483 patients (0.52%)
Pediatric ICU	34 ICUs; 15,547 patients (5.49%)
Surgical ICU	29 ICUs; 15,265 patients (5.39%)
Trauma ICU	2 ICUs; 2,708 patients (0.96%)
Respiratory ICU	1 ICU; 844 patients (0.29%)
Number of patients admitted per facility ownership, n (%)	
Publicly owned facilities	66,158 (23.37%)
For-profit privately owned facilities	119,687 (42.28%)
Teaching hospitals	84,994 (30.02%)
Not-for-profit privately owned facilities	12,248 (4.33%)
Number of countries, stratified per income level according to World Bank, n (%)	
Lower middle-income country	10 (33.33%)
Upper middle-income country	15 (50.00%)
High income country	5 (16.67%)

CLABSI RATE REDUCTION IN 30 COUNTRIES



Rosenthal VD, Jin Z, Brown EC, Dongol R, De Moros DA, Alarcon-Rua J, Perez V, Stagnaro JP, Alkhawaja S, Jimenez-Alvarez LF, Cano-Medina YA, Valderrama-Beltran SL, Henao-Rodas CM, Zuniga-Chavarria MA, El-Kholy A, Agha H, Sahu S, Mishra SB, Bhattacharyya M, Kharbanda M, Poojary A, Nair PK, Myatra SN, Chawla R, Sandhu K, Mehta Y, Rajhans P, Abdellatif-Daboor M, Chian-Wern T, Gan CS, Mohd-Basri MN, Aguirre-Avalos G, Hernandez-Chena BE, Sassoe-Gonzalez A, Villegas-Mota I, Aleman-Bocanegra MC, Bat-Erdene I, Carreazo NY, Castaneda-Sabogal A, Janc J, Hlinkova S, Yildizdas D, Havan M, Koker A, Sungurtekin H, Dinleyici EC, Guclu E, Tao L, Memish ZA, Yin R. **Decreasing central line-associated bloodstream infections rates in intensive care units in 30 low- and middle-income countries: An INICC approach. Am J Infect Control. 2023 Dec** 26:S0196-6553(23)00871-4. doi: 10.1016/j.ajic.2023.12.010. Epub ahead of print. PMID: 38154739.

MORTALITY RATE COMPARING BASELINE WITH INTERVENTION PERIODS, WITH 29 MONTHS FOLLOW UP.

Study period	Mortality rate, % (95%CI)	P-value
Baseline	16.17 % (15.22 -17.17)	
2nd month	14.82 % (13.93- 15.76)	0.02
3rd month	13.80 % (12.92-14.73)	<0.0001
4th to 16th mo	14.05 % (13.15-15.00)	<0.0001
17th to 29th mo	13.68 % (13.39-13.97)	0.0013

Rosenthal VD, Jin Z, Brown EC, Dongol R, De Moros DA, Alarcon-Rua J, Perez V, Stagnaro JP, Alkhawaja S, Jimenez-Alvarez LF, Cano-Medina YA, Valderrama-Beltran SL, Henao-Rodas CM, Zuniga-Chavarria MA, El-Kholy A, Agha H, Sahu S, Mishra SB, Bhattacharyya M, Kharbanda M, Poojary A, Nair PK, Myatra SN, Chawla R, Sandhu K, Mehta Y, Rajhans P, Abdellatif-Daboor M, Chian-Wern T, Gan CS, Mohd-Basri MN, Aguirre-Avalos G, Hernandez-Chena BE, Sassoe-Gonzalez A, Villegas-Mota I, Aleman-Bocanegra MC, Bat-Erdene I, Carreazo NY, Castaneda-Sabogal A, Janc J, Hlinkova S, Yildizdas D, Havan M, Koker A, Sungurtekin H, Dinleyici EC, Guclu E, Tao L, Memish ZA, Yin R. **Decreasing central line-associated bloodstream infections rates in intensive care units in 30 low- and middle-income countries: An INICC approach. Am J Infect Control. 2023 Dec** 26:S0196-6553(23)00871-4. doi: 10.1016/j.ajic.2023.12.010. Epub ahead of print. PMID: 38154739.

Multi-Dimensional Approach and BUNDLE to Prevent VAP

VAP RATE REDUCTION

Contents lists available at ScienceDirect

Journal of Critical Care

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

Assessing the impact of a multidimensional approach and an 8-component bundle in reducing incidences of ventilator-associated pneumonia across 35 countries in Latin America, Asia, the Middle East, and Eastern Europe

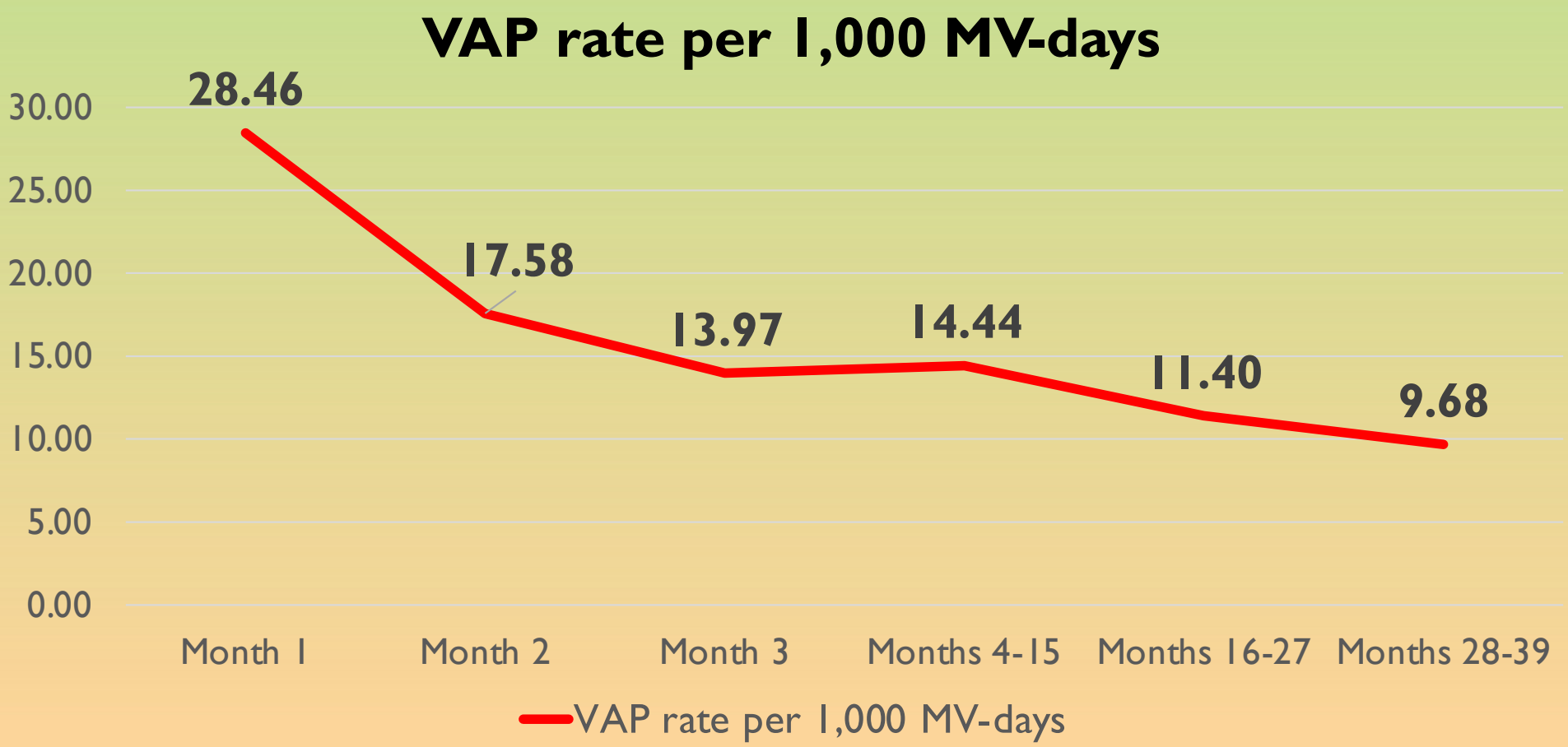
Victor Daniel Rosenthal MD, PhD [a, b, *], Zhilin Jin PhD [a], Zhilin Jin PhD [a], Ruijie Yin PhD [a], Suneeta Sahu MD [c], Prasad Rajhans MD [d], Mohit Kharbanda MD [e], Pravin K. Nair MD [f], Shakti Bedanta Mishra MD [g], Rajesh Chawla MD [h], Rajalakshmi Arjun MD [i], Kavita Sandhu MD [j], Camilla Rodrigues MD [k], Reshma Dongol RN [l], Sheila Nainan Myatra MD [m], Mat Nor Mohd-Basri MD [n], Tai Chian-Wern MD [o], Arpita Bhakta MD [p], Ider Bat-Erdene MD [q], Subhash P. Acharya MD [r], Gustavo Andres Alvarez MD [s], Lina Alejandra Aguilar Moreno MD [t], Katherine Gomez RN [u], Luisa Fernanda Jimenez-Alvarez MD [v], Claudia Milena Henao-Rodas MD [w], Sandra Liliana Valderrama-Beltran MD [x], Maria Adelia Zuniga-Chavarria MD [y], Guadalupe Aguirre-Avalos MD [z], Blanca Estela Hernandez-Chena MD [aa], Alejandro Sassoe-Gonzalez MD [ab], Mary Cruz Aleman-Bocanegra MD [ac], Maria Isabel Villegas-Mota MD [ad], Daisy Aguilar De Moros RN [ae], Alex Castaneda-Sabogal MD [af], Nilton Yhuri Carreazo MD [ag], Safaa Alkhawaja MD [ah], Hala Mounir Agha MD [ai], Amani El-Kholy MD [aj], Mohammad Abdellatif-Daboor MD [ak], Oguz Dursun MD [al], Emel Okulu MD [am], Merve Havan MD [an], Dincer Yildizdas MD [ao], Suna Secil Ozturk-Deniz MD [ap], Ertugrul Guclu MD [aq], Sona Hlinkova MD [ar], Aamer Ikram MD [as], Lili Tao MD [at], Abeer Aly Omar MD [au], Souad BelKebir MD [av], Naheed Elahi MD [aw], Ziad A. Memish MD [ax], Michael M. Petrov MD [ay], Lul Raka MD [az], Jarosław Janc MD [ba], George Horhat-Florin MD [bb], Eduardo Alexandrino Medeiros MD [bc], Estuardo Salgado MD [bd], Lourdes Dueñas MD [be], Monica Coloma [a], Valentina Perez [bg], Eric Christopher Brown PhD [a]

BUNDLE TO PREVENT VAP

1. Optimize hand hygiene compliance
2. Assess readiness to extubate daily in patients without contraindications
3. Maintain cuff pressure and volume at the minimal occlusive settings to prevent clinically significant air leaks around the endotracheal tube, typically 20 cm of water
4. Minimize the duration of mechanical ventilation
5. Minimize the duration of the ICU stay
6. Elevate the head of the bed to 30–45°
7. Provide oral care with toothbrushing but without chlorhexidine
8. Prevent condensate from reaching the patient

Ref: Rosenthal VD, Jin Z, Yin R, et al. Assessing the impact of a multidimensional approach and an 8-component bundle in reducing incidences of ventilator-associated pneumonia across 35 countries in Latin America, Asia, the Middle East, and Eastern Europe. J Crit Care. 2024 Apr;80:154500. doi: 10.1016/j.jcrc.2023.154500. Epub 2023 Dec 20. PMID: 38128216.

VAP RATE REDUCTION IN 35 COUNTRIES



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Multi-Dimensional Approach and BUNDLE to Prevent CAUTI

CAUTI RATE REDUCTION

Contents lists available at ScienceDirect

American Journal of Infection Control

journal homepage: www.ajicjournal.org

Major Article

Examining the impact of a 9-component bundle and the INICC multidimensional approach on catheter-associated urinary tract infection rates in 32 countries across Asia, Eastern Europe, Latin America, and the Middle East

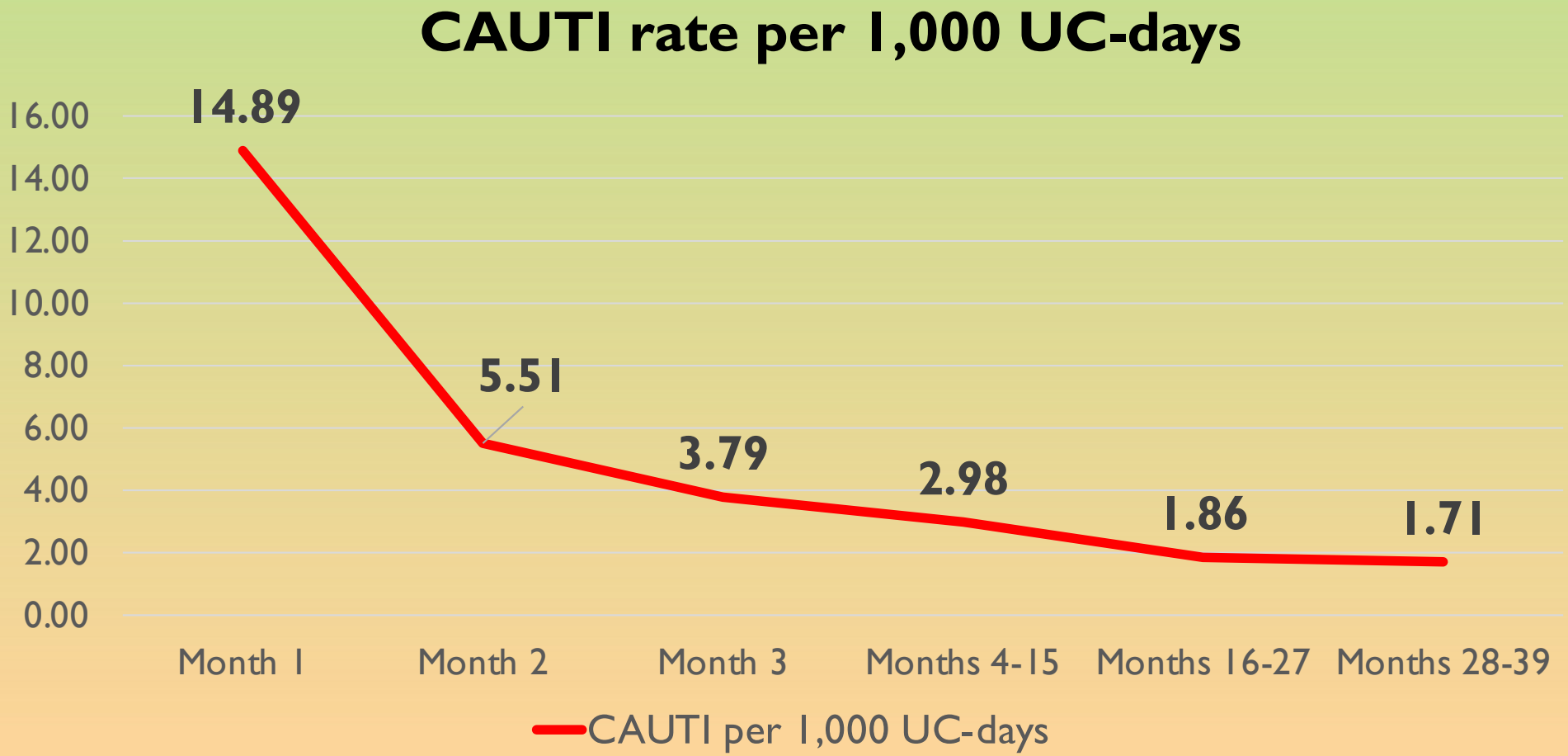
Victor D. Rosenthal MD, PhD [a,b,*], Ruijie Yin PhD [c], Zhilin Jin PhD [c], Valentina Perez [d], Matthew A. Kis BS [c], Safaa Abdulaziz-Alkhawaja MD [e], Sandra L. Valderrama-Beltran MD [f], Katherine Gomez RN [g], Claudia M.H. Rodas MD [h], Amal El-Sisi MD [i], Suneeta Sahu MD [j], Mohit Kharbanda MD [k], Camilla Rodrigues MD [l], Sheila N. Myatra MD [m], Rajesh Chawla MD [n], Kavita Sandhu MD [o], Yatin Mehta MD [p], Prasad Rajhans MD [q], Rajalakshmi Arjun MD [r], Chian-Wern Tai MD [s], Arpita Bhakta MD [t], Mohd-Basri Mat Nor MD [u], Guadalupe Aguirre-Avalos MD [v], Alejandro Sassoe-Gonzalez MD [w], Ider Bat-Erdene MD [x], Subhash P. Acharya MD [y], Daisy Aguilar-de-Moros RN [z], Nilton Yhuri Carreazo MD [aa], Wieslawa Duszynska MD [ab], Sona Hlinkova MD [ac], Dincer Yildizdas MD [ad], Esra K. Kılıc MD [ae], Oguz Dursun MD [af], Caglar Odek MD [ag], Suna S.O. Deniz MD [ah], Ertugrul Guclu MD [ai], Iftihar Koksal MD [aj], Eduardo A. Medeiros MD [ak], Michael M. Petrov MD [al], Lili Tao MD [am], Estuardo Salgado MD [an], Lourdes Dueñas MD [ao], Mohammad A. Daboor MD [ap], Lul Raka MD [aq], Abeer A. Omar MD [ar], Aamer Ikram MD [as], George Horhat-Florin MD [at], Ziad A. Memish MD [au], Eric C. Brown PhD [c]

BUNDLE TO PREVENT CAUTI

1. Follow appropriate indications for indwelling UC use
2. Perform hand hygiene immediately before and after insertion or any manipulation of the catheter device or site
3. Use an aseptic technique and a single-use packet of lubricant jelly for insertion
4. Properly secure indwelling catheters after insertion to prevent movement and urethral traction
5. Maintain the UC and collecting bag as a closed drainage system
6. Maintain unobstructed urine flow
7. Keep the collecting bag below the level of the bladder at all times, and do not rest the bag on the floor
8. Empty the collecting bag regularly, avoiding reaching 75% of the volume of the bag
9. Minimize UC use and duration.

Ref: Rosenthal VD, Yin R, Jin Z, et al. Examining the impact of a 9-component bundle and the INICC multidimensional approach on catheter-associated urinary tract infection rates in 32 countries across Asia, Eastern Europe, Latin America, and the Middle East. Am J Infect Control. 2024 Mar 2:S0196-6553(24)00105-6. doi: 10.1016/j.ajic.2024.02.017. Epub ahead of print. PMID: 38437883

CAUTI RATE REDUCTION IN 32 COUNTRIES



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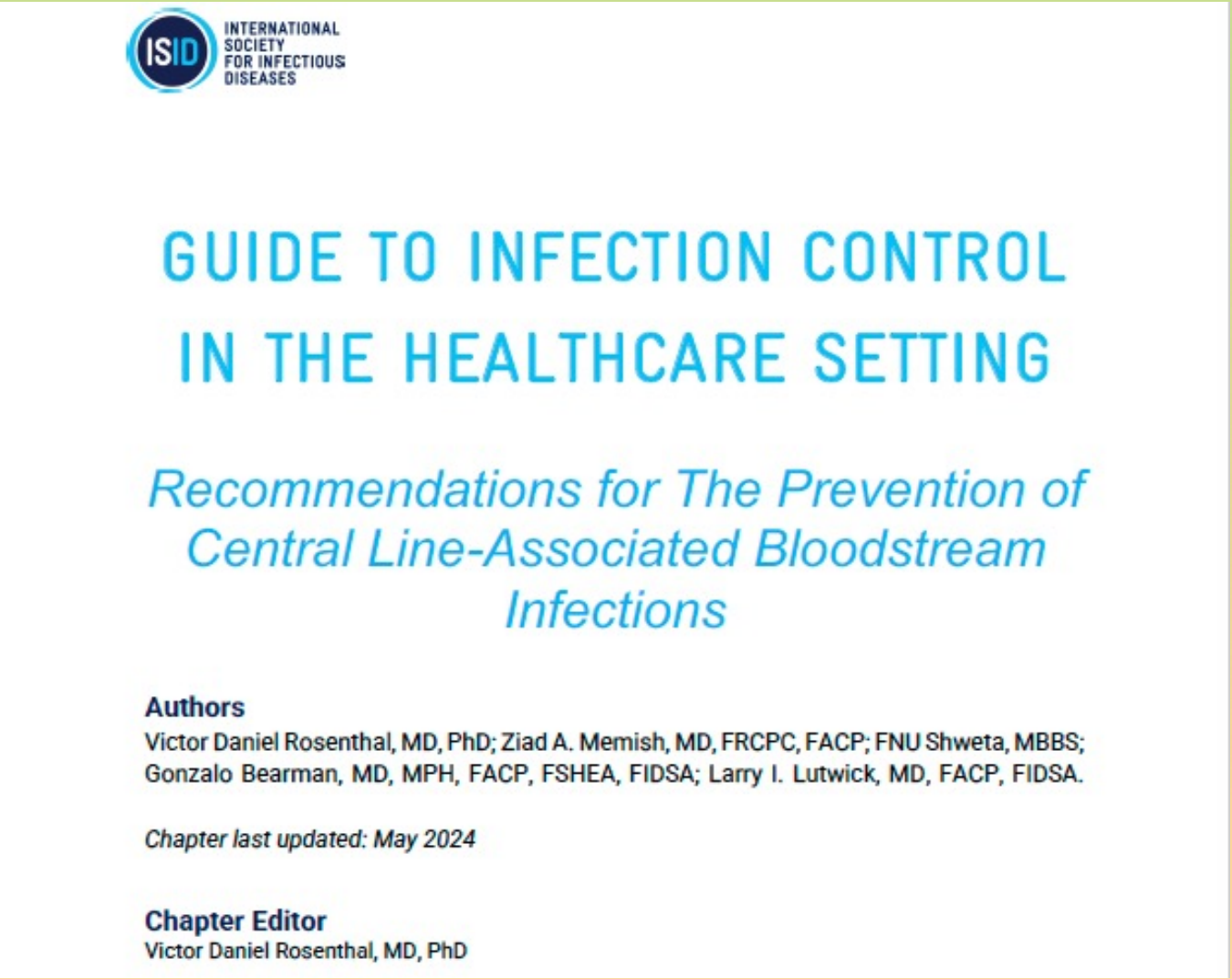
Recently, the International Society of Infectious Diseases (ISID) guideline to prevent CLABSI was released.



INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES

GUIDE TO INFECTION CONTROL IN THE HEALTHCARE SETTING

Recommendations for The Prevention of Central Line-Associated Bloodstream Infections

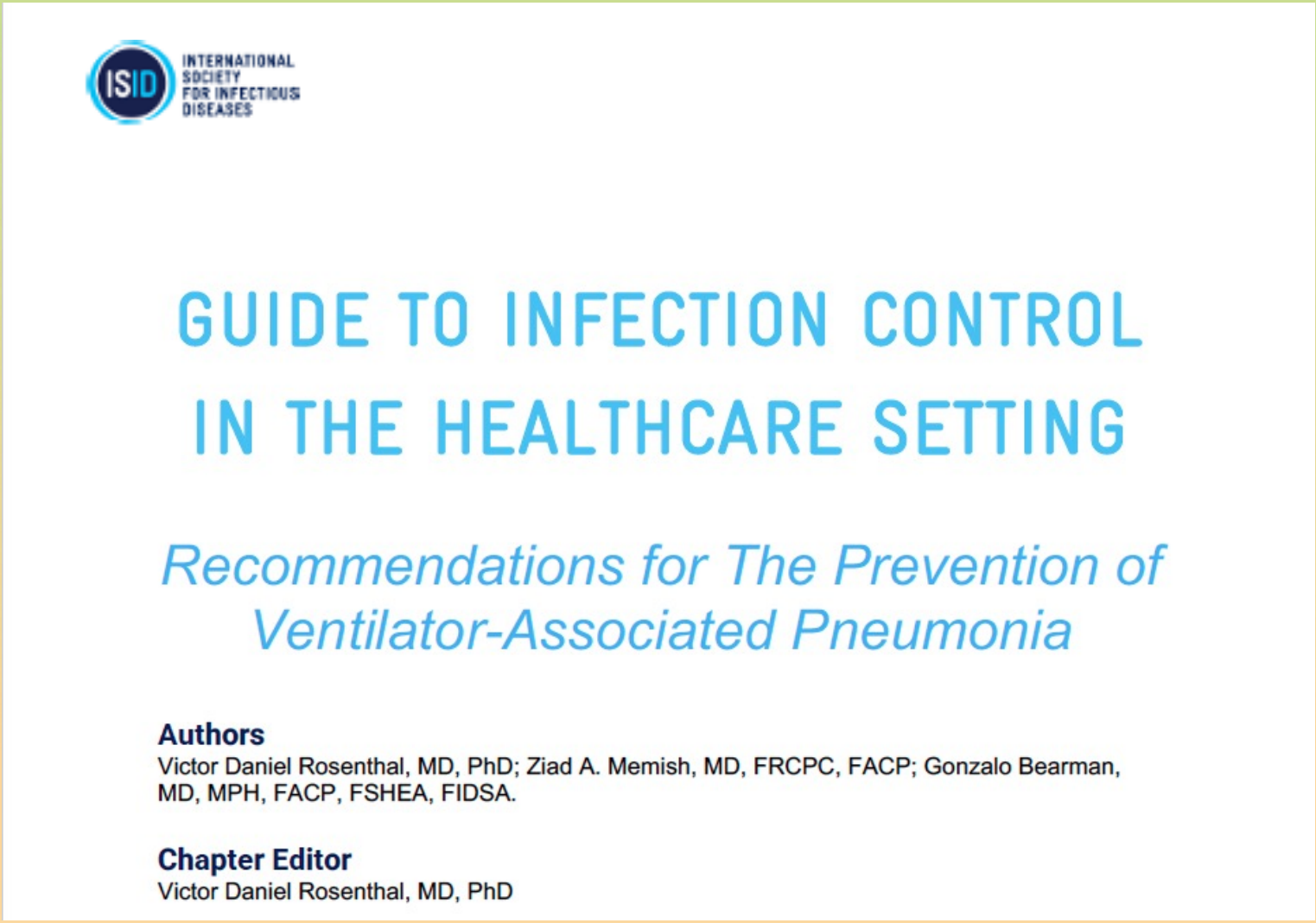
Authors
Victor Daniel Rosenthal, MD, PhD; Ziad A. Memish, MD, FRCPC, FACP; FNU Shweta, MBBS; Gonzalo Bearman, MD, MPH, FACP, FSHEA, FIDSA; Larry I. Lutwick, MD, FACP, FIDSA.

Chapter last updated: May 2024

Chapter Editor
Victor Daniel Rosenthal, MD, PhD

Link: https://isid.org/guide/hospital/recommendations-for-the-prevention-of-central-line-associated-bloodstream-infections/

Recently, the International Society of Infectious Diseases (ISID) guideline to prevent VAP was released.



INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES

GUIDE TO INFECTION CONTROL IN THE HEALTHCARE SETTING

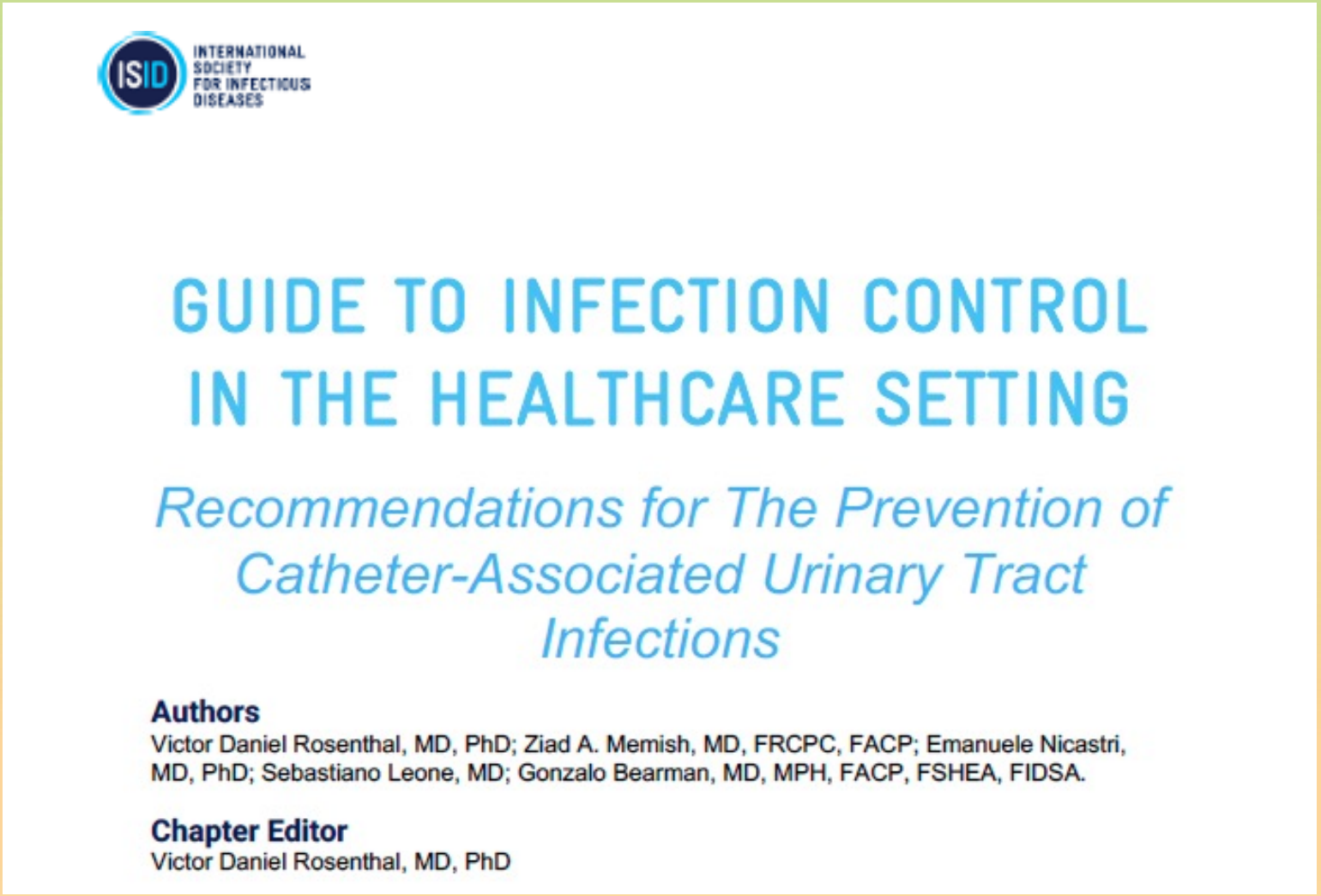
Recommendations for The Prevention of Ventilator-Associated Pneumonia

Authors
Victor Daniel Rosenthal, MD, PhD; Ziad A. Memish, MD, FRCPC, FACP; Gonzalo Bearman, MD, MPH, FACP, FSHEA, FIDSA.

Chapter Editor
Victor Daniel Rosenthal, MD, PhD

Link: https://isid.org/guide/hospital/recommendations-for-the-prevention-of-ventilator-associated-pneumonia/

Recently, the International Society of Infectious Diseases (ISID) guideline to prevent CAUTI was released.



INTERNATIONAL SOCIETY FOR INFECTIOUS DISEASES

GUIDE TO INFECTION CONTROL IN THE HEALTHCARE SETTING

Recommendations for The Prevention of Catheter-Associated Urinary Tract Infections

Authors
Victor Daniel Rosenthal, MD, PhD; Ziad A. Memish, MD, FRCPC, FACP; Emanuele Nicastri, MD, PhD; Sebastiano Leone, MD; Gonzalo Bearman, MD, MPH, FACP, FSHEA, FIDSA.

Chapter Editor
Victor Daniel Rosenthal, MD, PhD

Link: https://isid.org/guide/hospital/recommendations-for-the-prevention-of-catheter-associated-urinary-tract-infections/

Conclusions I

- For over 27 years, INICC has been providing training and software to measure HAIs in LMICs, starting in 1998.
- Using these tools, we have identified that rates of CLABSI, VAP, CAUTI, PLABSI, SSI, and Antimicrobial Resistance are significantly higher than standards such as those set by CDC/NHSN.
- CLABSI, VAP, and CAUTI are an independent risk factor for mortality.
- By employing ISOS, a multidimensional approach, and a bundle tailored for LMICs, we reduced the rates of HAIs, including CLABSI, VAP, and CAUTI.

Conclusions II

- The INICC Surveillance Online System (ISOS) is software available at no cost to any hospital worldwide that wishes to use it.
- All hospitals worldwide are invited to use our free online platform and publish evidence with us so that other hospitals can adopt them and be included as components of infection control guidelines.


Thank you!
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www.webbertraining.com/schedulep1.php

August 23, 2024	*(FREE Australasian Teleclass ... Broadcast live from the New Zealand IPCNC conference)* **HOW TO CLEAN THE OCCUPIED BED SPACE EFFECTIVELY** Speaker: **Prof. Stephanie Dancer**, Edinburgh Napier University, Scotland
September 12, 2024	**SIMPLE QUESTION, COMPLEX ANSWER: DETERMINING THE DURATION OF CONTAGIOUSNESS OF INDIVIDUALS WITH COVID-19** Speaker: **Prof. Yves Longtin**, McGill University, Montreal
September 17, 2024	*(European Teleclass)* **THE PROCESS AND PITFALLS OF CREATING A GLOBAL SELF-ASSESSMENT TOOL** Speaker: **Alexandra Peters**, University of Geneva, Switzerland
September 19, 2024	**THE PHYSICS OF FLYING FECES** Speaker: **James Gauthier**, Webber Training
October 10, 2024	**RELATIONSHIPS AMONG PATIENT SAFETY CLIMATE, STANDARD PRECAUTION ADHERENCE, HEALTHCARE WORKER AND PATIENT OUTCOMES** Speaker: **Prof. Amanda J. Hessels**, Columbia University, School of Nursing
October 17, 2024	**LONGITUDINAL GENOMIC SURVEILLANCE TO TRACK PATHWAYS LEADING TO *CLOSTRIDIODES DIFFICILE* COLONIZATION AND INFECTION IN AN ICU** Speaker: **Prof. Evan Snitkin**, University of Michigan Medical School
October 18, 2024	*(FREE European Teleclass)* **SPECIAL LECTURE FOR CLEAN HOSPITALS DAY** Speaker: **Prof. Didier Pittet**, University of Geneva, Switzerland

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