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# Impact of the International Nosocomial Infection Control Consortium (INICC)'s multidimensional approach on rates of ventilator-associated pneumonia in intensive care units in 22 hospitals of 14 cities of the Kingdom of Saudi Arabia

Hail M. Al-Abdely[a,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y], Yassir Khidir Mohammed[a,d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y], Victor D. Rosenthal[b,*], Pablo W. Orellano[b,c], Mohamed ALazhary[d,e,f,g,h,i,j,k,l,m,n,o,p,q,r,s,t,u,v,w,x,y], Eman Kaid[d], Anan Al-Attas[d], Ghadeer Hawsawi[d], Ashraf Kelany[d,j,l,o,y], Bedoor Hussein[d], Bayan Esam[d], Rami Altowerqi[d,l,o], Modhi A. Alkamaly[e,m,t], Nader A. Tawfic[e], Elinita Cruzpero[e], Raya M. Al Rashidi[e], Reny Thomas[e], Apsia M. Molano[f], Hessa A. Al Enazy[f], Fatima M. Al Adwani[f], Arlu M. Casuyon Pahilanga[f], Sharifa Alatawi[f], Raslan Nakhla[f], Fatma M. Al Adwani[f], Rosita Gasmin Aromin[g], Evangelina Balon Ubalde[g], Hanan Hanafy Diab[g,h], Nahla A. Kader[g], Ibtesam Y. Hassan Assiry[g], Fahad A. Sawan[h], Hassan E. Ammari[h], Alhasan M. Mashiakhy[h], Elaine B. Santiago[h], Christian M.S. Chua[h], Imee M. Dalis[h], Haider M. Arishi[h], Ruthelma Lozada[h], Ibrahim A.M. Al-Zaydani Asiri[i], Hala Ahmed[i], Al Jarie[i], Ali S.M. Al-Qathani[i], Halima Y. Al-Alkami[i], Mervat AlDalaton[i,r,s], Siti J.B. Alih[i], Mohammed J. Alaliany[i,r,s], Najla J. Helali[j], Grace Sindayen[j], Annalyn A. Malificio[j], Haya B. Al Dossari[j], Abdulmajid G. Algethami[j,y], Dia Mohamed[j], Leigh Yanne[j], Avigail Tan[j], Sheema Babu[j], Shatha M. Abduljabbar[j], Hala Rushdi[k,q,u,w], Janice Fernandez[k], Waleed M. Hussain[k], Renuga D. Rajavel[k], Syed Z. Bukhari[k], Abdullah A. Turkistani[k,w], Jeyashri J. Mushtaq[k,w], Eida Albeladi[l], Sally Aboushoushah[l], Nahed Qushmaq[l], Leide Shyrine[m], Jomol Philipose[m], Mohamed Raees[m], Nawal S. AbdulKhalik[m], Marjory Madco[n], Mohd Abdulghany[n], Athena Manao[n], Catherine Acostan[n], Rania Safwat[n], Muhammad Halwani[n], Nahla A.H. Abdul Aal[n], Anumol Thomas[n], Shaymaa M. Abdulatif[n], Nelia C. Ariola[o], Aisha H. Mutwalli[o], Nelia Ariola[o], Eatedal Bohlega[p], Saly Simon[p], Estelita Damlig[p], Sherin G. Elsherbini[p], Ilama T. Krishne[p], Sheela Abraham[p], Mohammed A. Ali Karrar[q], Nisreen A. Gosn[q], Abdulaziz A. Al Hindi[q,u], Rasha N. Jaha[q], Saeda M. AlQahtani[r], Ali O. Abdul Aziz[s], Nadia L. Demaisip[s], Elizabeth Laungayan Cortez[s], Analen F. Cabato[s], Jerlie M. Gonzales Celiz[s], Mohammed A. Al Raey[s], Saeed A. Al Darani[s], Misbah R. Aziz[s], Batool A. Manea[s], Eslam Samy[s], Solita Briones[t], Radhika Krishnan[t], Saman S.M. Raees[t], Kehkashan Tabassum[t], Khalid M. Ghalilah[u], Mohamed Alradady[u], Abdulrahim Al Qatri[u], Mafaten Chaouali[u], Magdy Elsisi[u], Hajer A. Aldossary[v], Shehab Al-Suliman[v], Amina A. Al Talib[v,x], Nadira Albaghly[v], Mohammad E. Haqlre Mia[v], Manal M. Al-Gethamy[w], Dhafer M. Alamri[w], Adnan S. Al-Saadi[w], Evelyn P. Ayugat[x], Nawaf A. Al Hazazi[x], Modi I. Al Hussain[x], Yvonne Caminade[y], Ann J. Santos[y], Mohamed H. Abdulwahab[y], Bushra T.A. Al-Garni[y]

* Corresponding author at: 11 de Septiembre 4567, Floor 12th, Apt. 1201. Buenos Aires, ZIP 1429, Argentina.
*E-mail address:* victor_rosenthal@inicc.org (V.D. Rosenthal).
*URL:* http://www.inicc.org (V.D. Rosenthal).

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[a] General Directorate of Prevention and Infection Control, Ministry of Health, Riyadh, Saudi Arabia
[b] International Nosocomial Infection Control Consortium (INICC), Buenos Aires, Argentina
[c] Universidad Tecnológica Nacional, Facultad Regional San Nicolás and Consejo Nacional de Investigaciones Científicas y Técnicas, San Nicolás, Argentina
[d] King Fahad Hospital, Jeddah, Kingdom of Saudi Arabia
[e] King Khalid Hospital, Hail, Kingdom of Saudi Arabia
[f] King Khalid Hospital, Tabuk, Kingdom of Saudi Arabia
[g] King Khalid Hospital, Najran, Kingdom of Saudi Arabia
[h] King Fahad Central Hospital, Jizan, Kingdom of Saudi Arabia
[i] Abha Maternity and Children Hospital, Assir, Kingdom of Saudi Arabia
[j] King Abdulaziz Specialist Hospital, Taif, Kingdom of Saudi Arabia
[k] Hera General Hospital, Makkah, Kingdom of Saudi Arabia
[l] King Abdullah Medical Complex, Jeddah, Kingdom of Saudi Arabia
[m] King Saud Hospital, Qassim, Kingdom of Saudi Arabia
[n] King Fahad Hospital, Al Baha, Kingdom of Saudi Arabia
[o] King Abdulaziz Hospital and Oncology Center, Jeddah, Kingdom of Saudi Arabia
[p] King Salman Hospital, Riyadh, Kingdom of Saudi Arabia
[q] Yanbou General Hospital, Madina, Kingdom of Saudi Arabia
[r] Khamis Mushayt General Hospital, Assir, Kingdom of Saudi Arabia
[s] Assir Central Hospital, Assir, Kingdom of Saudi Arabia
[t] King Fahad Specialist Hospital, Qassim, Kingdom of Saudi Arabia
[u] King Fahad Hospital, Madina, Kingdom of Saudi Arabia
[v] Dammam Medical Complex, Dammam, Kingdom of Saudi Arabia
[w] Al Noor Specialist, Makkah, Kingdom of Saudi Arabia
[x] Al Jubail General Hospital, Al Jubail, Kingdom of Saudi Arabia
[y] King Feisal Hospital, Taif, Kingdom of Saudi Arabia

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ABSTRACT

*Background:* To analyze the impact of the International Nosocomial Infection Control Consortium (INICC) Multidimensional Approach (IMA) and use of INICC Surveillance Online System (ISOS) on ventilator-associated pneumonia (VAP) rates in Saudi Arabia from September 2013 to February 2017.
*Methods:* A multicenter, prospective, before–after surveillance study on 14,961 patients in 37 intensive care units (ICUs) of 22 hospitals. During baseline, we performed outcome surveillance of VAP applying the definitions of the CDC/NHSN. During intervention, we implemented the IMA and the ISOS, which included: (1) a bundle of infection prevention practice interventions, (2) education, (3) outcome surveillance, (4) process surveillance, (5) feedback on VAP rates and consequences and (6) performance feedback of process surveillance. Bivariate and multivariate regression analyses were performed using generalized linear mixed models to estimate the effect of intervention.
*Results:* The baseline rate of 7.84 VAPs per 1000 mechanical-ventilator (MV)-days—with 20,927 MV-days and 164 VAPs—, was reduced to 4.74 VAPs per 1000 MV-days—with 118,929 MV-days and 771 VAPs—, accounting for a 39% rate reduction (IDR 0.61; 95% CI 0.5–0.7; P 0.001).
*Conclusions:* Implementing the IMA was associated with significant reductions in VAP rates in ICUs of Saudi Arabia.


## Introduction

Ventilator-associated pneumonia (VAP) is among the most serious device-associated infections (DAI) in the intensive care unit (ICU) setting [1,2]. According to studies from developed [3] and limited-resource countries [1,4], the most important clinical consequences attributable to VAP are increased mortality rates [4], significant morbidity [5], and increased length of stay (LOS) [4] and healthcare costs, as reported in developed [3] and limited-resource countries [4,6,7]. The burden posed by VAP has not been systematically analyzed in limited-resource countries [1]. Although hospitals in limited-resource countries do implement basic infection control programs, compliance with infection control practices is variable [1]. As reported by the International Nosocomial Infection Control Consortium (INICC) in pooled studies [8–13], and as shown in particular studies from Saudi Arabia, VAP rates are from 3 to 5 times higher than in Western countries [14,15].

In Western countries, it was shown the incidence of VAP can be reduced by more than 30% through basic but effective measures [1,16], such as those described in the bundle for VAP prevention developed by the Institute for Healthcare Improvement (IHI) [17]: (1) elevation of the head of the bed between 30–45 degrees; (2) daily sedative interruption and daily assessment of readiness to extubate; (3) peptic ulcer disease prophylaxis; (4) deep venous thrombosis prophylaxis; and (5) daily oral care with chlorhexidine.

Founded in Argentina in 1998, the INICC the was the first multinational research network established to control and reduce healthcare-associated infections (HAIs) at international level through systematic surveillance with standardized definitions of CDC/NHSN [18], promote evidence-based infection control practices, and perform research to reduce HAI rates, associated mortality, excess LOS, costs and bacterial resistance [19].

We implemented the INICC Multidimensional Approach (IMA) for the reduction of VAP rates, which included: (1) a bundle of

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