Preventing Hospital-acquired Infections in Low-income and Middle-income Countries: Impact, Gaps, and Opportunities

Ana Cecilia Bardossy, MD[a], John Zervos, JD[b], Marcus Zervos, MD[a,c,*]

KEYWORDS

• Infection control • Developing countries • Health care–associated infections
• Capacity building • Gaps and recommendations • Resources-limited settings

KEY POINTS

- In low-income and middle-income countries (LMIC) health care–associated infections (HAIs) are a serious concern, with an estimated risk of up to 25% of hospitalized patients.
- Factors associated with HAIs, including prolonged hospital stay, disability, increased resistance to antimicrobial agents, increased costs, and excess deaths, are accentuated in those countries.
- The gaps are lack of infrastructure, paucity and inconsistency in surveillance, deficiency in trained personnel, and poverty-related factors such as basic sanitation.
- Building infection control capacity in LMIC is possible where strategies are tailored to the specific needs of LMIC.
- Strategies must start with simple and cost-effective measures, then expand to include more complicated measures. Resources should be prioritized.

INTRODUCTION

Health care–associated infections (HAIs) are a serious problem for patient safety and affect hundreds of millions of patients worldwide.[1,2] In low-income and middle-income countries (LMIC) there are often unique and formidable challenges to implementing

Disclosure: None (A.C. Bardossy and J. Zervos); M. Zervos has received research grants from Pfizer, Cerexa, Cubist, Merck, Tetraphase, Paratek, and Rempex.
[a] Division of Infectious Disease, Henry Ford Health System, 2799 West Grand Boulevard, CFP 302, Detroit, MI 48202, USA; [b] Division of Infectious Disease, The Global Health Initiative, Henry Ford Health System, 2799 West Grand Boulevard, CFP 302, Detroit, MI 48202, USA; [c] Wayne State University School of Medicine, Detroit, MI, USA
* Corresponding author. Division of Infectious Disease, Henry Ford Health System, 2799 West Grand Boulevard, CFP 302, Detroit, MI 48202.
E-mail address: Mzervos1@hfhs.org

Infect Dis Clin N Am 30 (2016) 805–818
http://dx.doi.org/10.1016/j.idc.2016.04.006 **id.theclinics.com**

effective prevention programs. The World Health Organization (WHO) "Report on the Burden of Endemic Health Care-Associated Infection Worldwide" indicates that, in high-income countries (HIC; gross national income per capita ≥$12,736), HAI surveillance systems are in place at a national/subnational level. However, in low-income countries (gross national income ≤$1045) and some middle-income countries (gross national income >$1045 but <$12,736) the burden of HAIs remains largely unknown.[3,4]

The principal goal of an infection control (IC) program is to reduce the risk of HAIs between patients, health care workers, and the environment, leading to a reduction in HAI-related morbidity, mortality, and avoidable costs.[5] Because of limited resources, LMIC face significant and often insurmountable challenges to accomplish this goal. Therefore, optimal approaches must be tailored for LMIC and balance effectiveness and cost.

HEALTH AND ECONOMIC IMPACT

The impact of HAIs is very high in LMIC. The often-cited factors associated with HAIs are accentuated in these countries and include prolonged hospital stay; disability; increased resistance of microorganisms to antimicrobial agents; increased costs for health care institutions, patients, and their families; and excess deaths.[2,3] In LMIC, although the magnitude and impact of the problem is more remarkable, there are few objective data on the financial burden, and this burden varies from country to country. The limitations in health care facilities, including infrastructure, patient load, and staff shortages, provide many challenges. Limitations in access to care, issues of sanitation, and poverty also complicate measures to control HAIs.

The WHO report on the burden of endemic HAIs worldwide in 2011 revealed that, in LMIC, the increased length of stay associated with HAIs (5–30 days) is greater than in HIC.[3] There is no information in this report on the risk of death attributable to HAIs, because most of the studies evaluated reported crude mortality without considering risk factors, confounders, or patients with HAIs compared with noninfected patients.[3] A study done in an intensive care unit (ICU) in northern India found that patients with ventilator-associated pneumonia (VAP) had longer hospital stays (21 days vs 11 days) and an attributable cost of US$5200.[6] A case-control study analyzing hospital-acquired bacteremia in a cardiothoracic unit in an Indian hospital found longer total hospital stay (mean, 22.9 days) and a significantly higher mortality (mean, 54%) with a cost of US$14.818 compared with controls.[7] In a study done in a medical ICU in Turkey, the mean length of stay was 4-fold higher for patients with VAP, and that the total costs were about 3 times higher than for patients without VAP.[8] Another study estimated that the length of stay caused by catheter-associated bloodstream infections (CLABSI) increased in 10 of 11 ICUs in Argentina, Brazil, and Mexico, varying from 1.23 days to 4.69 days.[9]

One study estimated an excess length of ICU stay of 1.59 days, and an increase of the risk of death by 15% caused by catheter-associated urinary tract infections (CAUTI).[10] The study, which was done in 29 ICUs in 10 developing countries, attributed the increased risk of death to confounding factors.[10] The International Nosocomial Infection Control Consortium (INICC) reported that device-associated infections increase length of stay 10 days, costs between US$5000 and US$12,000, and doubles the rate of mortality.[11]

GAPS AND OPPORTUNITIES

International guidelines have been developed for identification of gaps and for the control of HAIs.[12,13] Many LMIC have attempted to implement IC programs with