



Editorial

Implementation of infection control bundles in intensive care units: which parameters are applicable in low-to-middle income countries?



Nosocomial infections (NIs) are devastating complications in intensive care units (ICUs) with high mortality and morbidity. NIs increase both the length of stay and hospital charges and may lead to the lifelong disability of patients. Millions of patients are affected by NIs every year and infection prevention and control (IPC) is necessary to increase healthcare quality in ICUs. Industrialized countries are well organized and have had IPC programmes since the 1950s. However, even in these countries up to 25% of patients in ICUs will experience at least one NI [1]. In recent years, the infection control bundle approach has been implemented to improve patient care and outcomes in industrialized countries. Several published studies have shown that implementation of infection control bundles improves care processes and clinical outcomes in ICUs [2].

Seventy-five percent of people in the world are living in low-to-middle income countries (LMICs) and these people have problems obtaining healthcare in their countries. In addition, NI rates are higher in these countries; more than 50% of ICU patients are affected by NIs, which indicates a low quality of care. Infection control problems (high NI rates and multidrug-resistant (MDR) pathogens) in LMICs are also a threat for high-income countries [3,4]. This is because, in today's global world, there are many people with tourist and business travel between high-income countries (HICs) and LMICs. Healthcare might be needed during their travel and they might be colonized with MDR pathogens when they return to their own country [5]. Also, wars, as well as economic and social pressures, have driven an unprecedented migration of people from LMICs to industrialized countries. During these movements, unusual infectious agents and MDR pathogens have 'migrated' to HICs [6]. Thus, infection control organization in LMICs is important for worldwide safety.

The extent of infection control problems is different between low-income and middle-income countries. The main problem in low-income countries, like Nepal, is the lack of an infection control programme, training, organization, and lack of basic resources (hand hygiene products, gloves, facemasks, etc.). In middle-income countries, the establishment of infection control programmes started at the beginning of the

21st century and many countries now have a National Surveillance Programme. However, there is often an absence of proper implementation of the programmes, a lack of infrastructure in ICUs, and lack of financial and administrative support for infection control activities. Continuous training programmes, observation, and feedback for basic infection control measures are important for the awareness of healthcare personnel in ICUs [7]. In our recent survey of infection control bundles in LMIC ICUs, 94.7% of MICs had an IPC committee in their hospital. However, 37% of MICs still do not have an annual agreed programme for IPC. Among the MICs included in this survey, 37% had no invasive device-related surveillance programme, 32% had no ventilator-associated pneumonia (VAP) surveillance programme, 37% had no catheter-associated urinary tract infection (CAUTI) surveillance programme, and 27% had no central line-associated bloodstream infection (CLABSI) surveillance programme. In the survey, there was only one centre (in Nepal) from an LIC and they reported that they had an IPC committee in their hospital, but they did not have an IPC programme or NI surveillance programme; nor did they have IPC bundles in their hospital [8]. Another major problem in these countries is the high numbers of patients and workload in the hospitals. The number and skills of healthcare workers are limited in LMICs and this shortage increases the size of the problem. Lack of trained, full-time equivalent infection control nurses and doctors is another problem for the IPC in LMICs. An adequately trained and supported infection control team is the mainstay for success in an IPC [4,8].

In ICUs, due to the severity of illnesses and underlying diseases, patients can have multiple devices that disrupt normal host defence and facilitate the development of life-threatening infections. An infection control bundle, combined with quality improvement or educational interventions, is highly recommended for reducing device-associated infections [2]. The International Nosocomial Infection Control Consortium (INICC) is a multi-centred, collaborative research network, established in 1998 in Argentina, which has prospective, targeted outcome and prospective surveillance in LMICs [9]. The INICC surveillance system showed that device-associated infection (DAI) rates are five to 16 times higher in LMICs than HICs [10]. In addition, the system found an association between the socio-economic level of countries and DAIs [11]. This consortium has a multi-dimensional bundle approach to control and reduce device-associated ICU-acquired infection. Moreover, in their various studies in LMICs, the multi-dimensional bundle approach led to a significant reduction in DAIs [12–14]. DAIs are preventable in LMICs with simple and low-cost measures. On the other hand, implementation of

bundle parameters is an important strategy to incorporate principles of precision medicine [15].

VAP is the most common nosocomial infection in ICUs. Current estimates of attributable mortality for VAP range from 9% to 15% and length of stay by approximately six days, and care bundles are associated with a decrease in the incidence of VAP [16,17]. The INICC multi-dimensional approach also includes bundles for peptic ulcer and deep vein thrombosis prophylaxis that are easily implementable in LMICs [18,19]. Units that have adopted this package of bundles have reported ~50% reduction in VAP rates [20].

Prevention of CLABSI is another priority in ICUs. A bundle including measures such as hand hygiene, maximal sterile barriers at insertion, optimal catheter insertion site, aseptic central venous line management, and removal of unneeded catheters are low-cost interventions [14]. Chlorhexidine for antisepsis is another candidate bundle parameter, but may be too costly in LMICs; povidone-iodine offers lower-cost skin antisepsis.

CAUTI is also common in ICU patients. Urinary catheters are frequently used unnecessarily and for unnecessarily long time-periods. Low-cost interventions include determination of appropriate indications for indwelling catheter usage, using strict aseptic technique for catheter insertion, assessing the ongoing need for a catheter, and appropriate management of indwelling catheters [21].

MDR bacteria are increasing worldwide and the incidence is higher in LMICs than in HICs. A low-cost bundle approach to controlling MDR bacteria in LMICs includes hand hygiene, environmental disinfection, isolation of patients, and use of contact precautions [22].

Development of bundles is easy, but their implementation is more challenging. Alves *et al.* suggested a '4E' strategy for the implementation of care bundles: Engage by developing a multi-disciplinary team, involving local champions and utilizing peer networks; Educate by providing education materials and sessions; Execute by standardizing care processes and creating redundancy; and Evaluate by measuring performance and providing feedback to staff [18].

In LMICs, establishment of infection control programmes and implementing NI surveillance are essential. This can underpin the implementation of care bundles that offer a low-cost and effective approach to preventing the types of NI frequently seen in ICUs.

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