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Infection Control Best Practices in Clinical Research in Resource-Limited Settings

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Abstract

Infection control (IC) activities in the international research setting include the development of meaningful and effective policies on specific topics such as hand and respiratory hygiene. Prevention of infection in health care workers and management of occupational exposure to transmissible agents are important aspects of the role of an IC practitioner. Hand hygiene reduces health care associated infections and practices may be implemented in the research setting.

Keywords

infection control; resource limited setting; hand hygiene; occupational health

Introduction

Well-conceived and carefully implemented infection control (IC) programs reduce illness, prevent death and save money.^{1–3} Yet proven interventions have not been widely adopted in resource-limited settings (RLS) and standards of IC vary widely. A recent survey of international research sites conducting human immunodeficiency virus (HIV) therapeutic clinical trials suggested that there were significant differences between clinical sites. Sites that did not have dedicated resources to IC organization were unlikely to have established policies and procedures for isolation, hand hygiene, respiratory hygiene and injection safety.⁴ Monitoring activities, prevention of infection in health care workers (HCW), specific policies regarding hand and respiratory hygiene, safe injection practices and ongoing education of IC practitioners, have all been shown to be important in reducing health care-associated infections.^{5–7} In the international RLS, well-established IC committees with regulatory oversight are uncommon and few resources are deployed in this area. Educational opportunities for IC practitioners are limited, and regulatory bodies that assess and monitor IC outcomes are uncommon.⁸ This article describes best practices for IC in the RLS and makes specific recommendations about selected practices in the research setting.

Organizational aspects

Arguably, the most important feature of a successful IC program is a supportive organizational structure emphasizing a commitment to a culture of safety that allows for successful monitoring of the appropriate components of IC.^{9–13} In the acute care setting,

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good evidence demonstrates that nosocomial infections are significantly reduced by IC programs that include trained personnel.¹⁴ Historically, incipient programs have focused on structure: the careful development of meaningful and effective policies, procedures, and tight administrative controls. Growing programs focus on process: the implementation and adherence to those policies, procedures and administrative controls; and advanced programs have focused directly on outcomes associated with the implementation of the policies procedures and administrative controls (i.e., measurable reductions in healthcare-associated infections associated with the structural and process interventions). In the research setting, pre-employment screening, management of workplace exposures to infectious agents, policies concerning respiratory and hand hygiene, surveillance and outbreak management, where appropriate, and the development of guidelines for best practice are appropriate tasks for an IC practitioner (Table 1). Most importantly though, implementation plans for each protocol considered for a site should explicitly consider infection risk reduction and should be fully integrated into the planning for each protocol.^{15–19} An identified person who has IC expertise should be tasked with the implementation of IC policies at the research site and should liaise with local IC organizations and laboratories in order to develop and monitor the implementation of appropriate policies and procedures and provide feedback to practitioners on a regular basis. The research community has the opportunity to model best practice, but IC practice in research cannot happen in isolation from the clinical setting. A culture of considering infection risk reduction in all aspects of protocol development and implementation embraced by staff, research participants and the community is likely to produce meaningful results.

Occupational Health

HCW are at risk for acquiring infections from patients and put patients at risk if they have a transmissible infection. HCW acquisition and transmission of tuberculosis is well described in RLS. The estimated tuberculin skin test conversion rate among nursing students in Harare is triple that of students who are not training in health care.²⁰ Newer methodologies for screening, such as interferon- γ release assays (IGRAs)^{21–23} may facilitate screening in a BCG-exposed population and may be cost effective.²⁴ Pre-employment screening followed by repeated testing at defined intervals and after exposure facilitates management of inadvertent exposures and treatment of early disease; all may reduce transmission in the research setting. Vaccine-preventable illnesses (VPIs) in HCW are an important focus of occupational health strategies.²⁵ Hepatitis B (HBV) is a potentially fatal illness and non-immune HCW are at risk for acquisition. There are strong recommendations in the United States to exclude non varicella-immune exposed HCW from patient care in order to minimize respiratory transmission to patients.^{26–29} Disseminated varicella infection with fulminant pneumonitis is a well-recognized and potentially lethal complication of primary varicella infection in pregnant women.³⁰ Staff working in obstetrics, and researching aspects of the prevention of maternal to child transmission of HIV might be targeted for intensive surveillance. Occupationally-acquired rubella is an important consideration for female HCW with reproductive potential and measles and mumps are important sources of morbidity.³¹ Strategies for pre-employment screening of VPIs include a questionnaire, targeted serological testing, and either mass vaccination without testing or targeted vaccination.^{32–34} Influenza vaccination in HCW has been shown to reduce mortality in the hospital environment and skilled nursing facilities. HIV-infected patients are at greater risk for complications of influenza,³⁵ and vaccination of their care givers has been recommended yearly,³⁶ a practice that could be recommended in the research setting. Automated systems for tracking the health status of employees have been developed for resource-rich settings and are easily adapted for RLS.

Hand Hygiene

Attention to hand hygiene prevents many healthcare-associated infections. A recent review documented more than 20 studies in the acute care setting in which improved hand hygiene was associated with measurable reductions in carefully defined hospital-associated infections.³⁷ Hand hygiene is an important component of the infection control “bundles” which have proven efficacy for the prevention of catheter-related infections, ventilator-associated pneumonias, and urinary catheter sepsis. Although the best efficacy measurements have occurred in the hospital setting where endpoints such as bacteremia are more easily detected and measured, improved hand hygiene is also associated with significant reductions in diarrheal and respiratory illnesses. In the outpatient setting,³⁸ alcohol and chlorhexidine-based products are more effective than soap and water for removing bacteria from hands, but soap and clean water remain important interventions.³⁹ The World Health Organization (WHO) has developed an inexpensive method for local manufacture of antiseptic hand rub, and has shown this to be acceptable and feasible in RLS.^{40,41} Despite proven efficacy, adherence to hand hygiene recommendations is generally low with rates of adherence to best practice between 40 and 60%.^{42,43} Removing the barriers to hand hygiene may be the single most important intervention to improve adherence to recommendations. Products should be accessible and available without cost and hand washing supplies such as soap and single use towels should be readily available. In particular, the use of hand basins with standing water should be actively discouraged. Several tools and methodologies are available that measure hand hygiene practices and regular surveys may improve practice.^{44,45}

Injection safety

Inappropriate and outdated injection practices, such as the re-use of needles and syringes, and the use of multi-dose vials have been implicated in the transmission of HBV, Hepatitis C (HCV) and HIV in RLS.⁴⁶ Despite the availability of needle safe systems and disposal sharp containers, needle stick injuries are still common even in resource-rich settings.⁴⁷ The global impact of outdated needle practices combined with high prevalence rates of HIV, hepatitis B, and hepatitis C means that the absolute risk of exposure to a blood borne pathogen for a HCW in RLS is significant.⁴⁸ A large multicenter survey of HCW in West Africa estimated an incidence of percutaneous injuries of 0.33/HCW/year, a value that the authors note is triple that of a prospective European study.⁴⁹ Modeling data from the WHO suggests that up to 5% of HIV infections and nearly half of HCV and HBV infections in HCW in Africa may be attributable to occupational exposure.⁵⁰ Re-capping needles after use has been shown to be an important risk factor for occupational exposure; a strict re-capping policy and easy availability of sharps containers reduces the risk of percutaneous exposures and are low cost interventions that can be systematically adopted.^{51, 52} Reprocessing and reuse of single use medical devices especially injection equipment are practices to be discouraged, the use of needle safe systems may add further value.⁵³ Unnecessary injections should be avoided and the preferential use of oral agents, when appropriate may reduce needle stick injuries. Finally, pre-employment vaccination for hepatitis B and secondary prevention with post exposure prophylaxis for both HIV and hepatitis B may also be important in preventing disease when injuries occur.⁵⁴

Research

Most IC data are generated from inpatient settings where endpoints, such as nosocomial bacteremia and ventilator-associated pneumonia, can be collected and the effect of an intervention or interventions (“multimodal” or “bundled” interventions) can be assessed using these endpoints. In the outpatient setting where most HIV clinical research is

performed, assessing the impact of an IC intervention is more difficult because endpoints are rare, and when they do occur, the patient may no longer be in the health care environment. Good data on the impact of IC interventions in the outpatient setting are therefore limited. Process measures, such as opportunities for hand hygiene, have sometimes been used as surrogate markers for “hard” endpoints in infection control, but these have not been rigorously validated and the approach is still in development. Finally, IC standards for outpatient care have been developed for the North American context, but these standards may not always be achievable in the international research RLS. Importantly, there are no regulatory requirements that mandate participation in these activities. The international research community has the opportunity to add to this discussion by designing trials with an infection prevention package in order to define the appropriate “bundle” of interventions and test their effectiveness. Such a strategy can be initiated in the context of assessing program quality and can be a powerful tool for improving patient outcomes.

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Table 1

Functions of an Infection Control Practitioner in the Research Setting

Develop Infection risk reduction plan for each protocol considered at site	
Pre-employment screening	
Manage occupational exposures	
Ensure adherence with hand and respiratory hygiene and personal protective equipment (masks)	Ensure appropriate and adequate supplies Ensure appropriate use
Develop and deploy site-specific educational tools	
Participate in national surveillance efforts for communicable diseases where applicable	