



INTERNATIONAL
SOCIETY
FOR INFECTIOUS
DISEASES

GUIDE TO INFECTION CONTROL IN THE HEALTHCARE SETTING

Other Enterobacteriaceae

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KEY ISSUES

- CPEs remain largely nosocomial although community prevalence have been documented.
- In an endemic situation, ESBLE colonization or infection among hospitalised patients results primarily from the patients' preexisting indigenous flora.
- Hospital transmission of MDREs frequently involves the hands of healthcare workers or contaminated inanimate surfaces.
- Outbreaks of MDRE have been linked to understaffing, overcrowding and poor hygiene practices in the hospital.
- Risk factors for acquiring MDRE varies between endemic and outbreak setting. Reported risk factors include severity of illness, mechanical ventilation, antibiotic pressure and presence of indwelling devices.
- CPE acquisition outside of healthcare institutions has been linked to food products, travel to high risk areas and medical tourism.
- Patients with CRE bacteremia have mortality as high as 50%
- Alcohol-based hand rubs are the most efficacious agents for reducing the number of Enterobacteriaceae on the hands of healthcare providers.

CONTROVERSIAL ISSUES

- Risk factors associated with prolonged CRE carriage is not clearly known but may vary in different groups of patients.
- Criteria that can be used to declare a patient cleared of CRE is unknown. These criteria may vary depending on epidemiology.
- The impact of antibiotic restriction on the emergence and spread of multiresistant Enterobacteriaceae in the hospital is under

investigation. Several studies examined the effect of restricted use of antibiotics particularly third-generation cephalosporins and carbapenems on the prevalence of resistant Enterobacteriaceae offering conflicting results.

- Cost effectiveness of various laboratory methods used to detect CPE is unknown.
- Evidence supporting environmental cleaning for control of CRE are limited to observational studies in outbreak settings. Regardless, most experts consider this as a vital step in CRE control.

SUGGESTED PRACTICE

Prevention of Transmission

- Strict hand hygiene compliance
- Surveillance for CRE carriers, if possible genotyping to identify specific carbapenemases
 - Surveillance cultures for early identification and isolation of CRE carriers should be conducted.
 - Risk stratification should be done at institution-level to identify population needing surveillance. Some groups of patients to be considered for surveillance include contacts of CRE colonized/infected patients and patients with history of recent hospitalization in an endemic setting.
 - Surveillance cultures can be done with rectal swabs or stool samples.
 - Regular monitoring for CRE from clinical cultures should be undertaken.
- Physical separation of CRE carriers
 - Single room isolation is available; or

- Cohorting of CRE carriers with dedicated nursing, especially in an outbreak situation
- Contact precautions for CRE carriers
 - Should include: ensuring appropriate patient placement, usage of personal protective equipment including gloves and gown, and use of disposable or dedicated patient-care equipment.
 - Pre-emptive contact precaution can be considered for high risk patients
- Environmental cleaning
 - Cleaning of the patient zone is important to prevent transmission of CRE.
 - For single rooms, the entire room should be terminally cleaned after discharging a CRE carrier before admitting another patient.
 - Cleaning staff should be adequately trained.
 - Surveillance cultures of the environment may be considered especially in outbreak setting.
- Antibiotic stewardship program to reduce unnecessary antibiotic utilization
- Monitoring, audit and feedback

SUGGESTED PRACTICE IN UNDER-RESOURCED SETTINGS

- Adequate staffing to ensure adequate staff-to-patient ratio as poor staffing is associated with transmission of MDRE
- Ensuring availability of alcohol-based hand rubs
- Ensuring availability of microbiology laboratory to be able to identify CREs
- Monitoring of CREs from clinical cultures should be conducted and trend should be monitored to identify outbreaks

- In settings where single rooms are not available, strict adherence to contact precautions are vital. Within ward cohorting of CRE carriers may be considered e.g. placing CRE patients at the end of the ward

SUMMARY

The predominant genera of Enterobacteriaceae are *Escherichia*, *Klebsiella*, *Enterobacter*, *Citrobacter*, *Proteus*, *Serratia*, *Salmonella* and *Shigella*. Enteric pathogens are not discussed in this chapter. Incidence of CRE is increasing worldwide. Screening of high risk patients to identify CRE carriers early and physical separation while in the hospital are important CRE control strategies. Modification and adaptation of international guidelines are necessary to control CREs in resource limited settings.

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