

Management of Antimicrobial-resistant
Microorganisms
In Long-Term-Care Facilities

Oregon ARM Taskforce

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**MANAGEMENT OF ANTIMICROBIAL-RESISTANT
MICROORGANISMS
IN LONG-TERM-CARE FACILITIES**

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INTRODUCTION

The widespread use of antimicrobials has led to microbial resistance to these therapeutic agents. Persons at high risk of infection by antimicrobial-resistant microorganisms (ARM) include those with chronic underlying diseases, such as diabetes and cardiovascular disease, immunosuppression, immobility, invasive medical devices, and incontinence. These risk factors are prevalent among patients in long-term-care facilities (LTCFs).

The Centers for Disease Control and Prevention (CDC) has issued recommendations to prevent the transmission of ARM among patients. The recommendations were designed for implementation in acute-care facilities, where private rooms have generally been available. The cost of hospitalization has led to the transfer of patients with ARM to LTCFs, where shortages of private rooms have made the adoption of some CDC isolation recommendations impractical.

The goal of this guideline is to prevent clinical ARM infections by proposing practical strategies to minimize transmission of such organisms within nursing facilities. We believe that existing recommendations can and should be modified for implementation in other settings, including LTCFs. The belief is based on five assumptions:

1. LTCFs may have sporadic or endemic occurrences of ARM infections, including those caused by methicillin-resistant *Staphylococcus aureus*, antimicrobial-resistant Gram-negative bacilli, vancomycin-resistant enterococci, and staphylococci with reduced susceptibility to vancomycin.
2. Within the next few years ARM colonization and infection will become more widespread and problematic for LTCFs.
3. LTCFs have few private rooms: therefore, isolating residents in private rooms may not be possible.
4. If nursing staff in LTCFs routinely adhere to standard precautions, few outbreaks of ARM infection will occur in these facilities.
5. Residents must be able to move from one level of care to another without restrictions. Persons with ARM can and should be admitted for care as necessary to LTCFs.

EXECUTIVE SUMMARY

The care of ARM-colonized and -infected residents in LTCF requires planning and the application of proven infection control practices. Requests for information motivated this review of ARM management recommendations and their applicability to LTCFs. In summary, the strategies to prevent clinical ARM infections and minimize transmission of ARM within LTCFs include the following:

1. Hand washing is the most important practice to decrease all institutionally acquired infections. Hand washing decreases the number of potential infection-causing microorganisms on the hands. If practiced faithfully by resident, care provider, and family, hand washing will interfere with and decrease the transmission of ARM. LTCFs should encourage, make convenient, and reinforce the practice of hand washing.
2. Communication between health-care facilities is crucial to providing quality health care to every resident. Identification of ARM in a potential resident is not an indication to deny admission to the LTCF.
3. Infection surveillance is essential in every LTCF to make effective infection prevention and control decisions. Surveillance data is used in understanding the endemic rates of ARM in the facility, in planning the facility's infection control program and staff education, and in preventing outbreaks of ARM-associated infections.
4. Identification of a resident with ARM-associated infection warrants common-sense infection control practices based upon the resources available at the LTCF. The unavailability of LTCF private rooms is not an indication for transfer to an acute-care facility.
5. When identified, outbreaks of ARM-associated infection warrant rapid, appropriate investigation and implementation of additional control measures. Reinforcing the importance of effective standard care precautions may control small outbreaks.

CONTROL MEASURES FOR ARM

Common-sense approaches should allow LTCF residents with ARM to socialize without need for isolation. Only outbreaks within LTCFs would require additional measures to control the spread of ARM. A number of infection control issues must be dealt with in order to isolate the "bug" rather than the patient. These are addressed below.

Hand Washing

Hands should be washed for 10-15 seconds with soap, water and friction, and dried with disposable paper towels. If the hands are not visibly soiled, a waterless alcohol-based product may be used and hands washed as soon as possible. Wash hands:

- < between noncasual resident contacts such as hands-on care, preparing food or feeding;
- < before providing care to a “clean” area of the body, e.g. assisting with mouth care, after handling wound drainage or body fluid soiling;
- < after contact with any body substances;
- < after removing gloves;
- < after changing an underpad;
- < after handling soiled linens;
- < after using the toilet; and
- < before eating, putting on makeup, or smoking.

Hand washing removes ARM and other microorganisms from the hands of the care provider and of the LTCF resident. Every effort should be made to encourage hand washing, to provide the necessary hand washing supplies, and to make it convenient.

Communication

Communication between facilities caring for persons with ARM cannot be overemphasized; it is essential. The transferring facility should notify the LTCF that the resident has ARM and is either colonized and/or infected. The notification should include the measures that have been used in the treatment facility to control the organism’s spread, e.g., isolation, antimicrobials, or information and education provided to the individual and his family. The notification should be done by a designated individual such as the discharge planner and/or social worker. Questions regarding ARM can be directed to the treatment facility’s Infection Control Department or Infection Control Practitioner (ICP).

The receiving facility should be notified by the transferring facility if a resident is transferred before the culture reports are finalized. The transferring facility should also notify the resident’s primary care provider when culture results are available. The transferring facility’s discharge planner can be used as a resource for follow up on such issues.

Education

Continuing education on ARM control measures is essential for LTCF staff, the resident with ARM, and the families of residents with ARM. Consideration should always be given to language barriers, cultural background, and educational level when training is provided.

Staff education in the LTCF should be directed toward:

- < reviewing the possible routes and transmission of specific ARM,
- < the difference between colonization and infection with ARM,
- < hand washing between resident contacts,
- < using standard precautions in caring for all residents,
- < wearing gloves for handling a resident's body substances, e.g., feces, wound drainage, urine, blood spills, or vomitus,
- < cleaning and disinfecting or sanitizing equipment that is shared among residents,
- < using appropriate cleaning agents for hand washing and equipment cleaning and for sanitization and/or disinfection, and using additional barriers as appropriate, e.g., gloves, aprons, gowns, face protection.

Resident, family, and visitor education in the facility should include:

- < information about the resident's ARM, especially for the resident and his family,
- < hand washing after visiting resident,
- < using tissues to cover the mouth when coughing or sneezing, and
- < an explanation that family members and visitors generally do not need to don gloves or other protective garb unless instructed to do so by the resident's care providers in assisting with the care of the resident, and
- < all necessary aspects of care for the resident to be discharged home for cared by family members.

Room Placement

Since a private room or the movement of residents to accommodate cohorting is not generally possible in LTCFs, the placement of a resident with ARM should be based on the risk of spread from that individual. The resident with stool, urine, wound drainage or sputum production that cannot be contained may be cohorted if possible. Private room placement for the resident who is unable to contain body substances is preferable.

Activities

Residents whose body substances are contained should be allowed to ambulate, socialize with other residents and participate in group activities. Prior to group activities, the resident should:

- < wash hands with soap and water or a waterless alcohol-based cleanser,
- < have wound or uncontained body substances covered with an effective barrier, and
- < if incontinent of urine or feces, wear a protective diaper or have an incontinence pad in place to help contain body substances.

Linen

All used linen should be handled in a manner that prevents contaminating surfaces such as bedside furniture and the floor and from soiling the care provider's own clothing. If linens are

heavily soiled with body substances or fecal waste, gloves may be used to minimize hand contamination. Hands must always be washed after handling soiled linens — even if gloves are worn. Used linen should be stored and transported in a closed container such as a covered laundry hamper. Fecal waste may be dumped into the resident's toilet. If linen must be rinsed to remove fecal waste, this should be done only in the soiled utility room and not in the resident's bathroom.

Infectious Waste

Medical waste from the care of a resident with ARM is not necessarily infectious waste. All waste should be handled carefully to minimize contamination, but only those items that fit the definition of infectious waste according to Oregon Revised Rules have specific disposal requirements.

In Oregon, infectious waste includes:

- < items saturated with blood or other body fluids to the point of dripping or oozing with or without compaction, and
- < needles and syringes, both used and clean. All other sharps, such as razor blades and lancets, must be placed in a rigid, puncture resistant, leakproof, red container for disposal.

Infectious waste does not include disposables such as dressing materials, underpads or incontinent pads. It does not include reusables such as soiled personal clothing, or other launderable or processable items that have become soiled with blood, wound drainage or other body substances.

Arrangements for disposal of infectious waste must be made with the facility's solid waste hauler or with a contractor providing infectious waste services. Infectious waste cannot be discarded into a standard dumpster or waste compactor. Liquid or semi-solid wastes may be discharged into a sewage treatment system that provides secondary treatment or into a septic tank system. Oregon Administrative Rules on Infectious Waste (333-18-040 through 333-18-070) contain additional specific definitions of infectious waste and requirements for its containment and disposal.

Equipment Cleaning and Disinfection

The role of the environment in the transmission of ARM has not been well established. It is known that ARM may contaminate environmental surfaces such as bedside rails and tables. Hands may be contaminated if these surfaces are touched. Routine equipment-cleaning procedures for all residents, including those with ARM, should include:

- < using an Environmental Protection Agency (EPA)-registered disinfectant on solid surfaces such as floors, furniture, bathrooms and utility rooms;
- < daily disinfection, or sanitization as appropriate, of shared areas such as community bathrooms, activity areas, dining rooms, and bedside equipment such as tables, bed rails, bedside commodes, wheelchairs and other assist devices. If residents are incontinent, more frequent cleaning may be needed; and
- < disinfection, or sanitization as appropriate, of recreational or physical therapy equipment when soiled with body substances and at the end of the day's activity session.

Transmission of ARM via multi-use, non-critical resident-care equipment has been documented. Electronic thermometers used for taking rectal temperatures have been implicated in VRE and *Clostridium difficile* outbreaks. Resident-care articles that must be shared should be thoroughly cleaned and disinfected with a disinfectant/germicide between residents. Examples are included in the table below.

| Equipment Cleaning | |
|---------------------------|---|
| Patient-Care Item | Cleaning Recommendation |
| Hoyer-type lift | cover the sling with an impervious barrier |
| thermometer | use glass or digital or for an electronic thermometer, sanitize the entire thermometer and change the probe cover |
| shower seat | sanitize after each use |
| blood pressure cuff | if arm has drainage, cover with barrier before taking pressure |
| stethoscope | wipe off bell with alcohol wipe |
| slide/transfer board | sanitize after each use |
| commode | sanitize between residents |

Barriers and Personal Protective Equipment

Health care workers should use an apron or gown and gloves when cleaning up large body-fluid spills that may contaminate the clothes or come in contact with the arms or hands of the worker. As required by the Oregon Occupational Safety and Health Administration (OR-OSHA), barriers or personal protective equipment, such as face protection, masks or eyewear, should be used to prevent body-fluid splashes to the mucous membranes of the eyes, nose and mouth of the care provider

SURVEILLANCE

CDC has stated that the frequency of infections among LTCF residents and their impact on resident outcomes highlight the need for infectious disease surveillance. Effective surveillance may lead to decreased morbidity, mortality, and cost of associated hospitalization.

The Joint Commission on Accreditation of Healthcare Organizations (JCAHO) recommends that surveillance involve five ongoing activities: identify, analyze, prevent, control, and report. Recommended components for an effective surveillance program include:

- < adequate staffing;
- < adequately trained staff;
- < direct resident observation;
- < review of lab or x-ray reports;
- < review of resident chart; and
- < staff communication.

The surveillance process should be designed to lower risks and improve the rates or trends of epidemiologically significant infections.

Surveillance data should be used to plan control activities and educational programs, minimize inter-resident cross contamination with ARM, establish endemic rates of infection, and prevent outbreaks of ARM-associated infections.

Infection surveillance in the LTCF traditionally involves the collection of data to document prevalence or incidence of nosocomial infections. Up-to-date surveillance should, additionally, involve recognition of ARM present in or on a resident without signs and symptoms of infection (*colonization*) as well as in a resident with signs and symptoms (*infection*). The occurrence of even a single verified case of an ARM-associated infection in the LTCF should prompt consideration that there may be an outbreak, with notification of appropriate individuals such as the administrator, medical director, or ICP, and a search for additional cases.

Colonization versus Infection

Colonization is the presence of a microorganism in or on a host, with growth and multiplication but without any overt clinical expression or detected immune response in the host. Infection refers to invasion of microorganisms into a host's tissues or body fluids and multiplication of the microorganisms, with subsequent disease. Elderly residents with diminished host defenses are predisposed to infection by colonizing microorganisms. In the absence of an outbreak, however, a focus on identifying potentially colonized roommates of infected residents, newly admitted residents, employees, or the environment is unwarranted. It is not recommended that any of these potential reservoirs be routinely cultured for the presence of ARM.

Data Collection

The LTCF should have a system for ongoing collection of infection data in the institution. The surveillance program should include written definitions of infections, effective case-finding measures, systematic analysis and reporting of data, and the ability to recognize ARM-associated infection outbreaks as early as possible. Early recognition requires timely surveillance. As such, prospective surveillance is preferable to retrospective surveillance. The frequency of surveillance for ARM infections should be based on factors such as the acuity level of the resident population, the facility census, above-named trends of either nosocomial infections or ARM-associated infections or outbreaks. Surveillance at least once a week is generally needed to collect timely data.

Definition of Infection

Infections in elderly residents are often difficult to detect at an early stage. The elderly resident does not always demonstrate clear signs and symptoms. The prescribing of an antimicrobial agent or the ordering of a culture does not define an infectious process. LTCF-specific definitions of nosocomial infections are necessary to standardize surveillance. LTCF-specific definitions were developed and published in 1991 by McGeer, et. al. (AJIC, 1991, Vol. 19, p.1-7). These definitions were written because of the unique limitations in physician visitations, and in laboratory and radiology services within LTCFs. Each facility should consider incorporating these definitions into the surveillance program and using them to document and differentiate colonization from infection.

Surveillance Process

The surveillance process consists of collecting data on individual cases and determining whether an ARM infection is present. One data-collection method in the LTCF is walking rounds. Timely infection data are collected by direct communication with the residents and nurses and by reviewing charts. Another method is the assignment of surveillance responsibility to the Charge Nurse of each nursing station. In smaller facilities, the Director of Nursing may be responsible for reviewing shift reports and targeted charts.

Review of medical progress notes, laboratory or radiology reports, nursing notes, treatment and medication records, physical assessment, follow-up information from transfers to acute-care hospitals, and clinical observation will ascertain the presence of ARM infections. Reviews of antimicrobial susceptibility reports, and of daily and end-of-month summary computer printouts may serve as initial means for investigation of potential outbreaks caused by ARM isolates. The facility's pharmacy service may provide an end-of-month antimicrobial usage summary. Routinely obtaining cultures of newly admitted residents, conducting periodic prevalence cultures, or environmental cultures for routine surveillance is not recommended.

An infection surveillance report form facilitates recording of data on residents with known or suspected nosocomial infections. A nosocomial infection log or form should document:

- < name of resident;
- < date of onset;
- < body site/origin of infection;
- < causative organism; and
- < precautionary measures used to prevent spread of the identified microorganism.

In addition, the facility should maintain a line listing for all ARM infections. The facility may consider adding to this log or form:

- < date of transfer into the facility;
- < name of transferring facility;
- < presence of invasive devices;
- < room assignment;
- < name of roommate(s); and
- < associated infection risks.

The facility should maintain the time of occurrence and location of the resident(s) having the ARM infection to detect clustering within the facility.

Data Analysis

Infection rates are preferable to absolute numbers. Calculation of ARM infection rates provides the most meaningful information. Nosocomial infection rates (IR) are typically calculated as nosocomial infections per 1,000 resident days. IR may be calculated using average resident census for the surveillance period, i.e., month, quarter, or year as the denominator.

$$IR = \frac{\text{No. of new nosocomial infections}}{\text{No. of resident days}} \times 1,000$$

Example:

In a facility with 150 residents, the number of resident days for September would be calculated by multiplying 30 (days) times 150 (residents) to equal 4,500 resident days. Fifteen new nosocomial infections are documented in September. Therefore, 15 (infections) is divided by 4,500 (resident days): $15/4500=0.0033$. Multiplying by a constant number, such as 10, 100, or 1000 provides whole number. In this example, the nosocomial infection of 0.0033 multiplied by 1000 results in an infection rate of 3.3 per 1000 resident days.

$$IR = \frac{15}{(30) \times (150) = 4500} = 0.0033 \times 1,000 = 3.3 \text{ per } 1000 \text{ resident days}$$

Routine analysis should establish baseline rates and indicate trends. Variations from baseline rates and trends should be investigated and explained. Surveillance data should be reviewed routinely with the explanation of variations and recommendations made for the prevention and control of additional cases. At a minimum, the facility should review these data on a quarterly basis during a quality assurance committee meeting.

The facility should consider distributing the information to appropriate committees and personnel, including administration, to assist in planning infection control efforts. When indicated, this information should lead to specific education and interventions with defined goals and objectives. Tables, graphs, and charts displaying rates, trends, and clusters may be used to facilitate staff education. All reviews and actions taken based on committee recommendations should be documented. The facility should periodically evaluate the implementation as a measure to assess the impact on new cases of ARM infection.

OUTBREAK MANAGEMENT

Definition

Although difficult to define, an “outbreak” is an increase above the baseline rate of infections with a specific ARM during a specified period of time. In a position paper addressing this subject, the Long-Term Care Committee of the Society for Healthcare Epidemiology of America (LTCC-SHEA) suggested that an outbreak be defined as greater than three infections in a week or twice the number of infections in a month than had been observed in each of the three preceding months. For example, in a facility that usually has 0-2 cases per year, 3 new cases in a month should be reviewed as a possible outbreak. The onset of an outbreak may be abrupt or gradual, and may involve a single unit, several units, or the entire facility. Outbreaks require immediate attention.

Identification of an Outbreak

The infection control professional (ICP) or person responsible for infection control establishes the presence of an outbreak during regular reviews of surveillance data. From these reviews the ICP can get an idea of the magnitude, location, and time course of the outbreak. The existence of an outbreak should be communicated promptly to the administrator, the director of nursing, the infection control or quality assurance committee chairperson, and the staff involved in resident care.

Consultation

An ICP unfamiliar with outbreak investigation should communicate with an experienced ICP as soon as possible to obtain guidance on measures needed for investigation and control. The consulting professional, usually a hospital epidemiologist, full-time infection control practitioner, or infectious diseases specialist, can help to evaluate the severity of the outbreak, ascertain the likely route(s) of transmission, and specify interventions needed. This professional can also make recommendations on whether public health authorities should be notified.

Enhanced Surveillance

The identification of an outbreak usually calls for enhanced surveillance to get a more comprehensive picture of the outbreak and to assess the efficacy of control measures. Such surveillance may involve creating a line listing of cases; seeking microbiologic data; and reviewing charts of residents colonized or infected with ARM to look for risk factors. Strains of microorganisms isolated may need to be saved for molecular typing studies at a later date.

Control Measures

1. Hand washing

The importance of **hand washing** cannot be overstated. No other single measure is likely to be as effective in limiting the spread of pathogens. Because hand washing tends to be inconsistent even among nursing and medical staffs, they need to be reminded of its importance in the face of an outbreak. Observation of staff, feedback regarding observed hand washing practices, and use of role models or mentors may improve compliance.

2. Informing staff

In virtually all outbreaks, the ICP should ensure that staff are informed about the problem and reinforce the importance of effective hand washing and barrier precautions. These measures alone may control small outbreaks.

3. Barrier precautions

Gloves should be used in handling infectious material, and aprons or gowns worn if soiling is likely. It should be emphasized to staff that gloves and gowns are never a substitute for good hand washing.

4. Environmental decontamination

Environmental decontamination may be performed in the context of daily cleaning or in cleaning the room after the resident has moved (terminal decontamination).

5. Additional precautions

Selection of additional control measures is an individualized decision based upon the organisms involved, the size and seriousness of the outbreak, and resources available to the facility. Measures that may be considered include:

- < placement of residents who are likely to shed large numbers of ARM into the environment. Private rooms may be used when available. Other options include segregating new admissions, putting two or more colonized or infected residents into the same room (cohorting), or establishing an isolation unit. The unavailability of private rooms is not an indication for transfer of residents with ARM infection to an acute-care facility.
- < segregation or cohorting staff to provide consistent resident care assignments.
- < selection of products used for hand washing. Antimicrobial soaps are of questionable added benefit to good hand washing. Nevertheless, it has been shown that counts of skin bacteria such as *S. aureus* are significantly lower after washing with antimicrobial soap or an alcohol-based rinse, compared to washing with soap and water alone.
- < dedication of resident-care equipment to a single resident. Many ARM survive for long periods of time on multiple-use equipment such as stethoscopes, blood pressure cuffs, gait belts, and thermometers. Dedicating them to a single resident may reduce the possibility that such items can expose other residents to ARM.
- < identification of potential reservoirs. In rare circumstances (e.g., an outbreak of MRSA infection that continues despite aggressive implementation of other measures), it may be reasonable to try to decolonize residents and staff with ARM.
- < restriction of antimicrobial agents. Restricting the use of antimicrobials should be considered since antimicrobial agents exert selective pressure for ARM. Obviously, such an approach can only be made in cooperation with the facility's medical staff.

6. Evaluation

Integral to controlling an outbreak is an ongoing assessment of whether chosen control measures are working. The ICP should establish a plan to determine the efficacy of control measures and, importantly, to determine when the outbreak is over. This will often be accomplished by little more than routine surveillance. In other situations it may require monitoring of staff compliance with hand washing, follow-up of residents transferred from the facility to hospitals, or other studies. Regardless, it is important that the ICP address these issues and make adjustments to the outbreak control plan as warranted.

APPENDIX A

DEFINITIONS

ARM: Antibiotic-resistant microorganisms.

cohort: two or more patients colonized or infected with a specific ARM who are physically separated from other patients who are not known to be colonized or infected with that same specific ARM.

cohort staff: the practice of assigning specific health care workers to care only for specific patients, in this case those known to be colonized or infected with ARM. These health care workers do not participate in the care of patients who are culture-negative or who have not been cultured for ARM.

colonization: the presence of microorganisms in or on a host with growth and multiplication but without tissue invasion or damage.

decolonization treatment: the administration of topical, oral or systemic antibiotic treatment for the purpose of eradicating ARM colonization.

decontamination: the process of removing microorganisms and making an object safe for handling.

disinfection: a process that kills or destroys nearly all microorganisms, with the exception of bacterial spores, on inanimate objects.

endemic: the usual or constant presence of ARM colonization or infection in a facility.

epidemic: an increase in the incidence (new cases) of ARM colonized or infected patients above the (baseline) endemic level in a defined period of time (e.g., month) established for a specific facility.

Enterococcus species (includes *E. faecium* and *E. faecalis*): ubiquitous Gram-positive microorganisms that commonly colonize the lower gastrointestinal tract of both men and women and the periurethra of women.

incidence: the number of new ARM-colonized or -infected cases identified in a defined population (e.g., ward) during a defined period of time (e.g., a month).

infection: the entry and multiplication of microorganisms in the tissues of the host and accompanied by clinical signs and symptoms.

MRSA (methicillin-resistant *Staphylococcus aureus*): a strain of *Staphylococcus aureus* resistant to methicillin (oxacillin, nafcillin), cephalosporin and imipenem.

nosocomial ARM case: a patient who develops infection with ARM while residing in a hospital or LTCF.

outbreak: a definite increase in the number of new ARM-infected patients above the endemic rate in a defined period of time (e.g., a month).

prevalence: the proportion of persons in the facility with ARM disease during a specific time period.

sanitation: a process that decreases microorganisms on an inanimate object to a safe or relatively safe level.

***Staphylococcus aureus*:** a ubiquitous species of Gram-positive bacteria found on the skin and in the anterior nares of many people. At any given time 20%-40% of adult population are colonized with *S. aureus* in their nares. A higher percentage may be colonized with this bacterial species on their skin..

surveillance: monitoring of the distribution of illnesses in a population.

transmission: the method or route by which microorganisms move from one location to another (e.g., by direct contact, airborne, droplet, or indirect contact with inanimate objects such as equipment).

vancomycin-resistant Enterococci (VRE): strains of *Enterococcus* species (including *E. faecalis* and *E. faecium*) resistant to vancomycin.

APPENDIX B

SUGGESTED READING

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