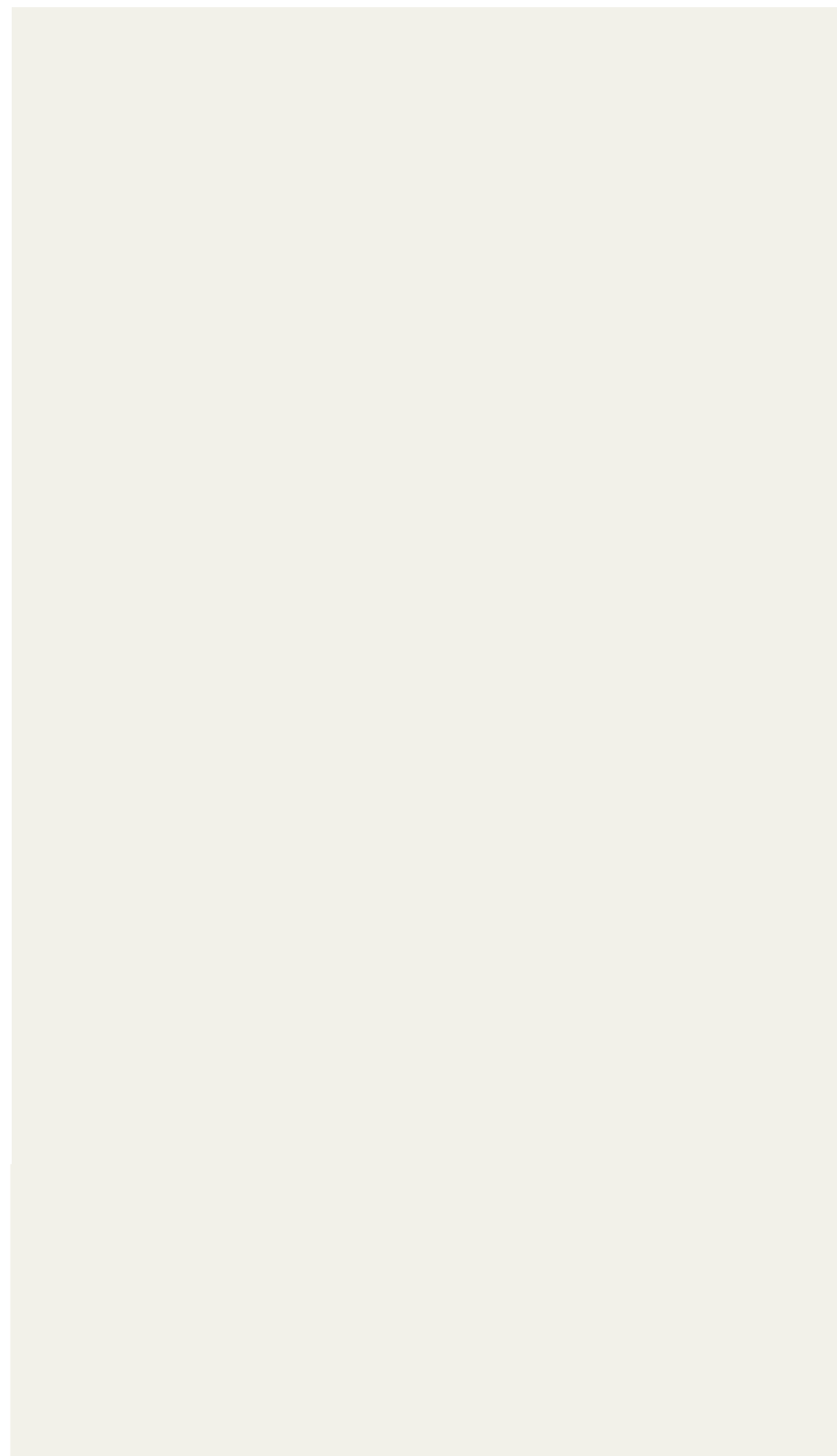


Antimicrobial Use in a Cohort of US Nursing Homes, 2017

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The control and prevention of antimicrobial resistance infections is a public health priority. Due to a confluence of risks for colonization or infection with antimicrobial-resistant organisms among residents, nursing homes are a potential reservoir for antimicrobial resistance. Traditional long-term residential care is provided alongside a growing number of residents admitted for short-term postacute care encompassing skilled nursing, rehabilitation, wound care, and invasive medical devices. There is a recognized need for evidence-based nursing home–focused antimicrobial stewardship policies.

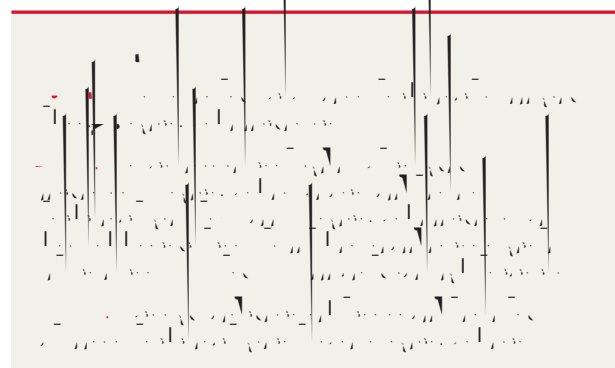
In response to the National Action Plan for Combating Antibiotic-resistant Bacteria goal to improve antibiotic stewardship in health care to slow the emergence of resistant bacteria, federal efforts aim to strengthen US nursing homes' infection prevention– and antibiotic stewardship–infrastructure and policies. These efforts include a framework promulgated by the Centers for Disease Control and Prevention (CDC) to identify and implement antibiotic stewardship practices and the Centers for Medicare & Medicaid Services (CMS) requirement that nursing homes develop an antibiotic stewardship program.

The effect of these initiatives on the use of antimicrobials in nursing homes remains largely unknown. There is no national surveillance infrastructure to report nursing home antimicrobial use data, and because nursing homes typically do not have on-site pharmacies, obtaining antimicrobial use data sets is challenging. Antimicrobial stewardship activities coupled with measurement of antimicrobial use is necessary for effective prevention of antimicrobial resistance in nursing homes. Prevalence surveys are useful for generating data about the essential measures of antimicrobial use frequency and descriptive epidemiology in health care settings. A point-prevalence survey was conducted to estimate the prevalence and describe the epidemiology of antimicrobial use in US nursing homes.

In 2017, the CDC and the Emerging Infections Program (EIP)—a network of state health departments in California, Colorado, Connecticut, Georgia, Maryland, Minnesota, New Mexico, New York, Oregon, and Tennessee, and their academic partners—performed a multisite point-prevalence survey in nursing homes. The CDC National Center for Emerging Zoonotic and Infectious Diseases human subjects advisor determined the prevalence survey to be a public health surveillance activity. Participating EIP state health departments or academic partners submitted the prevalence survey protocol in accordance with their local human subjects research requirements or determined it was not human subjects research, with individual informed consent not required.

Nursing Homes and Residents

Each EIP site determined their nursing home recruitment areas using county or state geographic boundaries. A list of the CMS-certified nursing homes in recruitment areas were



created by CDC staff using data from the CMS Nursing Home Compare website. EIP staff contacted facilities in random order to provide information about the prevalence survey and request voluntary participation. Nursing homes were contacted up to 10 times. If no participation decision was obtained after the tenth contact attempt, the nursing home was classified as a nonresponder.


All survey dates occurred on Monday through Friday between April 2017 and October 2017 (to limit the effect of seasonal influenza), with the last survey date on October 2017 and included all residents of the nursing home at 11:59 AM on the survey date. Newly admitted residents (admission on the same day or day before the survey date) were excluded.

Data Collection

Standardized data collection forms with detailed form instructions were used and developed with input from investigators for the European Centre for Disease Prevention and Control (ECDC) Long-term Care Prevalence Survey Team and informed by a CDC pilot prevalence survey.

In each nursing home, a staff member served as the prevalence survey coordinator, and this role was typically filled by the infection prevention and control lead, director of nursing, or medical director. This individual completed a short, self-guided learning module on prevalence survey objectives, timeline, procedures, and responsibilities, and also completed a facility assessment survey on facility characteristics and resident services provided. Additional data about facility characteristics was obtained from Nursing Home Compare by CDC staff.

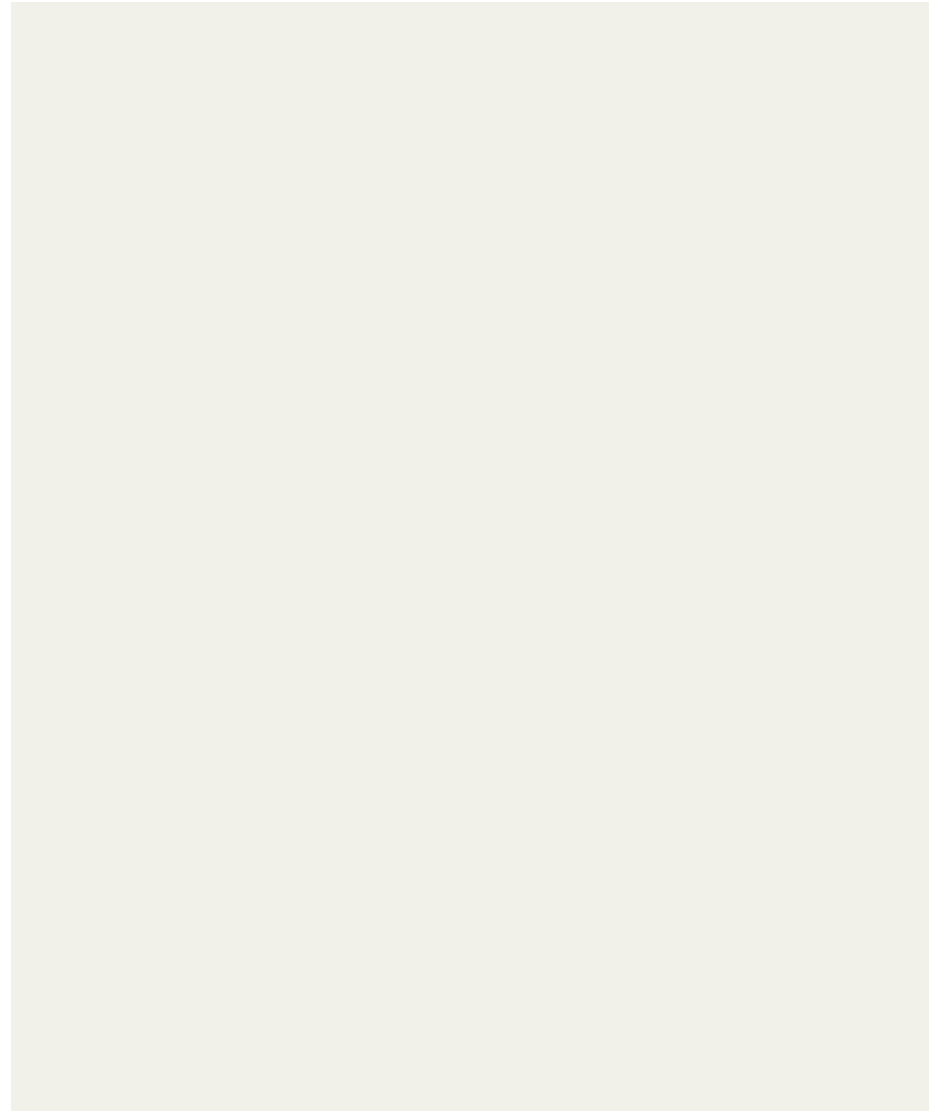
Trained EIP staff completed all remaining data collection for each eligible resident by reviewing the nursing home written or electronic documentation and medical records. Data collected from medical records included resident admission date, age, race/ethnicity (using fixed categories), and basic clinical data representing each resident's status at the time of the survey. EIP staff determined if each eligible resident received or was scheduled to receive a systemic antimicrobial on the survey date or day before using medical and medication administration records. Systemic was defined as administration via the oral/enteral (including gastrostomy, nasogastric or orogastric, jejunostomy, or gastrojejunum tubes), intramuscular, intravenous, or inhalation route. The World Health Organization Anatomic Therapeutic Chemical (ATC) classification system was used to categorize eligible antimicrobials, which



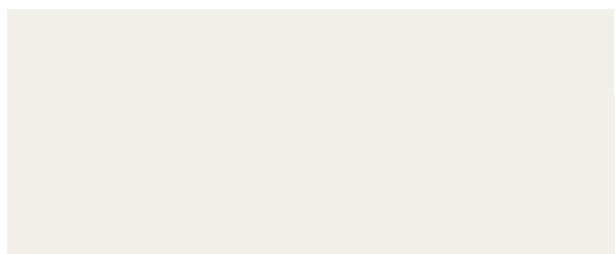
were primarily antibacterials (J), antimycotics (J), antibiotics used for tuberculosis (J AB), or antivirals (J) sourced from and available in the United States.

For residents who received a systemic antimicrobial drug at the time of the survey, EIP staff completed a second form to collect data on the antimicrobial name(s), route of administration, site of infection, rationale for use, and the date the drug was first administered in the nursing home. Antimicrobials were considered unique at the drug and route combination. If a drug was known to be started before nursing home admission, the first date of drug use was recorded as the nursing home admission date. Rationale was categorized as either treatment of active infection including empirical treatment of suspected infections, medical prophylaxis including antimi-

receiving an antimicrobial via the intravenous route. Logistic regression modeling of facility and resident characteristics, adjusted for resident age, race/ethnicity, and diabetes status (**Table 2**), revealed the odds of antimicrobial use to be significantly higher among residents with a central venous catheter (adjusted odds ratio [OR], . . [% CI, . - . .]), any urinary catheter (adjusted OR, . . [% CI, . - . .]), or receiving wound care (adjusted OR, . . [% CI, . - . .]) at the time of the survey. Two facility characteristics remained significant in the multivariable model: the percentage of short-stay residents readmitted to hospital after a nursing home admission



detailed, person-level information on why and how antimicrobials were used. To illustrate, a series of prevalence surveys among long-term care facilities in European countries recently measured the prevalence of antimicrobial use to be . . . per residents. Through these surveys, it was identified that approximately one-fourth of antimicrobials were given for urinary tract infection prophylaxis; urinary tract infection prophylaxis subsequently became a focus for antibiotic use quality improvement. Earlier antimicrobial use prevalence survey efforts have been performed in nursing homes in Norway (. . . ; prevalence . . . per residents) and Northern Ireland (twice in . . . ; prevalence of . . . and . . . per residents),



Concept and design:

Acquisition, analysis, or interpretation of data:

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Statistical analysis:

Obtained funding:

Administrative, technical, or material support:

Supervision:

Other:

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