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Vancomycin-resistant Enterococcus, Connecticut, 2000-2011

Enterococci are part of the normal flora of the gastrointestinal and female genital tracts, and are also found in the environment. These bacteria can cause infections of the urinary tract, bloodstream, and wounds. Vancomycin is an antibiotic often used to treat infections caused by enterococci. As a consequence, some enterococci have become resistant to vancomycin (vancomycin-resistant enterococci or VRE). Most VRE infections occur in patients in acute care hospitals, and treatment options are limited (*1*).

In addition to being a cause of nosocomial infection, VRE are also of public health interest because they can transfer resistance genes to staphylococci, bacteria commonly found on the skin that can also cause infection. This can potentially give rise to vancomycin-resistant staphylococci (VRSA), which would be highly resistant to treatment and would increase the use of newer antibiotics for multidrug resistant organisms in hospitals, potentially providing additional selective pressure favoring the emergence of highly-resistant organisms. VRE has been a reportable laboratory finding to the Connecticut Department of Public Health (DPH) since 1994. The purpose of VRE surveillance is to monitor trends of VRE incidence over time. Laboratories are required to report VRE-positive sterile site isolates, and beginning in 2009, surveillance moved from passive to active reporting with routine review of monthly microbiology printouts by DPH staff to identify previously unreported VRE. This report summarizes VRE surveillance in Connecticut from 2000 - 2011.

During this period, laboratories reported a total of 2,754 VRE-positive sterile site isolates. Overall, incidence was higher with increasing age, ranging from 0.5 cases per 100,000 population to 24.1 cases per 100,000 population (0-24 year age group vs. those aged ≥ 65 years respectively) (p<.001). Incidence was also higher in males than females (7.0 vs. 5.3 cases per 100,000 population respectively) (p<.001). Annual statewide incidence increased by 179% from 2000 to 2011 (2.9 and 8.1 cases per 100,000 population respectively) (p<.001) and was characterized by a sharp increase of 3.3 per 100,000 between 2004 and 2005 (Figure 1), with smaller increases in the periods before and after. Incidence increased in all age groups (p<.01) (Figure 2), and for both men and women (p<.001). Incidence increased the most in those aged 65 years and over, from 12.3 cases per 100,000 population in 2000 to 25.2 cases per 100,000 population in 2011.

Beginning in 2003, VRE incidence per 100,000 patient days started to become higher in larger compared to smaller hospitals. Between 2003 and 2011, annual incidence increased in all hospital size

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Figure 1. VRE Incidence Rate, Connecticut, 2000-2011

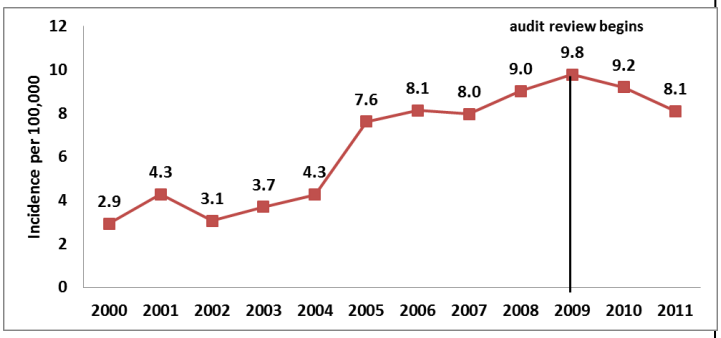
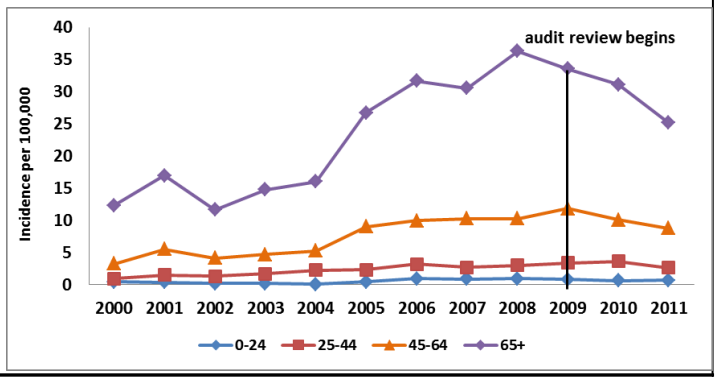


Figure 2. VRE Incident Rate by Age, Connecticut, 2000 -2011



categories (p<.001). Hospitals with ≥ 500 staffed beds experienced the largest increase from 3.6 to 19.5 cases per 100,000 patient days, followed by medium sized hospitals (3.3 to 12.5), and smaller hospitals (3.1 to 8.5). Small hospitals were defined as having fewer than 200 staffed beds, while medium sized hospitals were defined as having 200 -499 staffed beds.

Approximately 83.3% of sterile site isolates positive for VRE were from blood cultures. Peritoneal fluid was the second most commonly reported isolate site (8.7%), followed by pleural fluid (2.9%), bone (2.5%) and other (2.5%). "Other" sterile site isolates consisted of cultures from internal body sites (i.e., liver, pancreas, kidney, or other normally sterile sites). Data on the type of enterococcus species reported were not available before 2005. During 2005-2009, approximately 78.0% of isolates were *Enterococcus faecium*, 6.7% were *Enterococcus faecalis*, 3.9% were other, and 11.5% were unknown.

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Editorial

Major VRE surveillance findings over the past 11 years are that VRE incidence has increased, particularly between 2003 and 2009, and the overall rate has increased much more in hospitals with higher bed counts. These findings may be due to several factors including selective antibiotic pressure over time and inpatient services progressively treating more complex patients with newer treatment methods. We postulate that a factor in increasing selective antibiotic pressure is increased use of vancomycin for two purposes: to empirically treat possible methicillin-resistant staphylococcal bloodstream infections, and to treat *C. difficile* infections, which have become more common and severe in hospitals during the past decade. Although the exact reasons why VRE has increased more in larger than in smaller hospitals is unclear, it is likely a result of a combination of factors which are magnified in larger hospitals: more complex patients due to an older in-patient population, slower recovery time, more need to use antibiotics such as vancomycin, and a higher percentage of patients with indwelling lines and bladder catheters that promote invasive VRE infections.

The sharp increase in VRE between 2004 and 2005 was previously examined in more detail. Using a subset of Connecticut's surveillance data from 2002-2007, an epidemiological investigation was conducted to assess factors that may have been associated with the increase. Hospitals were surveyed for the 2002-2007 time period to assess changes in laboratory VRE detection methods, the amount of vancomycin purchased or dispensed via inpatient pharmacies, and infection prevention practices regarding VRE infection or colonization, including screening. In addition, medical records of cases were reviewed to assess differences in risk factors for VRE infection between cases over time. Further, review of hospital laboratory records was done to see if reporting systematically increased from 2004 to 2005. It was concluded that while changes in VRE detection methods and increases in vancomycin use in some hospitals likely contributed, the unusually sharp increase could not be fully explained by changes observed in these factors (*2).*

The future of control of VRE infections is promising despite the increasing needs to treat complex medical patients and to use vancomycin as a therapeutic agent. Beginning in 2007, legislation passed in Connecticut resulting in the mandatory public reporting of healthcare associated infections (HAI) and the creation of an HAI program at the state health department *(CGS Sec.19a-490n)*. This, in combination with subsequent legislation mandating hospitals to develop a plan to reduce the incidence of MRSA *(CGS Sec. 19a-490p)*, and the global interest in controlling the spread of *C. difficile*, has placed added emphasis on infection prevention activities in hospitals, antimicrobial stewardship, and hand-hygiene. Already, this increased attention may be paying off. VRE incidence has shown a steady decrease since 2009, and hospital onset MRSA incidence has been steadily decreasing *(3)*. These initiatives and findings emphasize the importance of continued VRE surveillance to monitor the incidence of VRE as an indicator of multi-drug resistant infection risk and infection prevention efforts.

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Infection Control Resources and Practices in Connecticut Long-Term Care Facilities, 2011

Acute-care hospitals have traditionally been the focus of federal and state efforts to prevent healthcare-associated infections (HAI). However, there has been a growing population of residents who seek increasingly complex care at long-term care facilities (LTCFs), and who are now considered to be at comparable risk of developing HAIs as patients in acute care hospitals (*1*). LTCFs are increasingly expected to join HAI prevention efforts (*2*), including the Department of Health and Human Services (HHS) *National Action Plan for the Elimination of HAIs*, which has a LTCF-specific section, and Centers for Disease Control and Prevention (CDC)'s National Healthcare Safety Network (NHSN) surveillance system, which is launching a new LTCF module.

During September - November 2011, the Connecticut Department of Public Health (DPH) conducted a survey of chronic and convalescent nursing homes in Connecticut, assessing their baseline infection control (IC) resources and practices. The survey instrument used was CDC's Long-Term Care Baseline Prevention Practices Assessment Tool. To encourage accuracy of responses, the survey was anonymous and web-based at SurveyMonkey™. Of 240 licensed chronic and convalescent nursing homes, 159 (66%) completed the survey. The median capacity of the facilities was 120 beds (range 22-455).

The survey included questions on the professional qualifications and infection control training of infection preventionists (IP) (Table 1). The DPH encourages IPs to pursue infection control-specific training. The gold standard for IC training is the Certification in Infection Prevention and Control (CIC) offered by the Association for Professionals in Infection Control and Epidemiology (APIC). Of the respondents that completed the survey, 42 (26%) had IPs with CIC, and 123 (77%) reported an IP with at least some formal infection control training. The survey also assessed whether the long-term care facility had an IC committee, and the frequency of committee meetings. Public health code §19-13-D8t(t)(1) requires nursing homes to have an IC committee that meets at least quarterly; 150 (95%) facilities met this requirement, 3 (2%) facilities had committees that met less frequently than quarterly, and 6 (4%) facilities reported not having a committee.

For the most part, nursing homes divided their IC program time the same way amongst different program activities. On average, the greatest proportion of time was spent on surveillance (34%), followed by staff education (21%), and monitoring adherence to policies (19%). Larger facilities (>150 beds) devoted a greater percentage of time to surveillance than smaller facilities (48% vs. 32% respectively). Data were also gathered on the total number of hours spent on infection control, which allowed for a calculation of the number of beds per 40 hour full-time equivalent (FTE). The median

Table 1. LTCF Infection Control Infrastructure and Staff

Ownership	LTCFs N = 159	(%)
For-Profit	124	(78)
Non-Profit	35	(22)
IP Qualifications / Licensure Status		
Certified Nursing Assistant	1	(1)
Licensed Nurse	5	(3)
Registered Nurse*	150	(94)
Physician	1	(1)
Other	2	(1)
IP Training**		
None	36	(23)
State or Local	123	(77)
APIC (CIC)	42	(26)

** CT Public Health Code §19-13-D8t(t)(3) requires that long-term care facilities' infection control practitioners be at least an RN.*
*** The different levels of infection control training are not mutually exclusive.*

bed/FTE ratio was 217. Currently, no standard exists for beds/FTE ratios in long-term care facilities, but acute-care hospital bed/FTE ratio recommendations range from 65-178 (*3,4*).

Clostridium difficile was the HAI most identified as being challenging to facility IC programs (48 facilities; 30% of respondents), associated with greater size of facilities, part-time IC coordinator, and lack of electronic data monitoring of infections. The aspect of IC itself most identified as being challenging was isolation precautions or managing multidrug-resistant organisms (34 facilities; 21%). This challenge was consistent across all stratifications - for-profit/non-profit status, size, infection control training, and use of electronic data systems. Other prominent challenges included environmental cleaning (30 facilities, 19%), and hand hygiene (23 facilities, 15%).

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Editorial

Long-term care facilities share a set of IC challenges different than those experienced by acute care hospitals, due to their older, more vulnerable residents, and their generally more limited resources (*2*). Infection control in LTCFs is also complicated by their home-like atmosphere encouraging resident ambulation, group activities, visiting, and communal dining.

Although the survey findings have limitations because of the anonymity and limited number of responses, they still provide insight into the infrastructure and staffing needs of IC programs in LTCFs. Paper data systems are still being used in a majority of LTCFs, precluding the possibility of "meaningful use" of electronic data systems that can provide interactive feedback. Only a small minority of IC coordinators have the "best practice" CIC training. A resource gap exists for many facilities, where the beds/FTE ratio is relatively high compared to the standard for acute-care hospitals.

Beginning in mid-2012, the DPH's *C. difficile* Prevention Collaborative will focus on facilitating and supporting long-term care facilities, and addressing their specific needs and challenges. The collaborative will take into consideration findings from the survey, including the challenges in managing isolation precautions, cohorting, and consistent surveillance across LTCFs. Ultimately, the collaborative exists to help IC programs in LTCFs incorporate best practice guidelines of maximum benefit to their residents in a way that is both realistic and sustainable. Additional steps may be taken by the DPH to focus resources and highlight training opportunities for those facilities that have undertrained IPs, and on aspects identified in the survey as challenging for local long-term care facilities.

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