CD Summary

November 13, 2007
Vol. 56, No. 23

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OREGON PUBLIC HEALTH DIVISION • DEPARTMENT OF HUMAN SERVICES

MRSA – PART 2: INVASIVE MRSA INFECTION IN OREGON

Although methicillin-resistant *Staphylococcus aureus* (MRSA) infection is not reportable by law in Oregon, the Public Health Division's Active Bacterial Core surveillance program (ABCs) has since 2004 collected data on invasive infection — defined as isolation of the organism from a normally sterile site — by (*inter alia*) MRSA in residents of Clackamas, Multnomah, and Washington Counties (combined 2006 estimated population 1,569,170). This issue of the *CD Summary* describes the epidemiology of invasive MRSA infection in the first three years of this surveillance.

DATA

In 2006, 327 invasive MRSA cases were reported in the tri-county area for an incidence of 20.8/100,000 — a decrease from the 353 cases (22.9/100,000) reported in 2005. Overall, 207 cases (63%) reported in 2006 were male. Fifty-three percent of cases were white, and 33% were non-Hispanic, although conclusions about race and ethnicity are tenuous, given that data on these demographics were missing for 38% and 64% of cases, respectively. The average annual incidence during the three years (2004–2006) was highest in Multnomah (33 per 100,000), followed by Clackamas (17 per 100,000) and Washington Counties (14 per 100,000). The mean and median ages for cases in 2005 were 60 and 59, respectively, while those in 2006 were 57 for both. The decrease in average age from 2005 to 2006 was statistically significant (p=0.039).

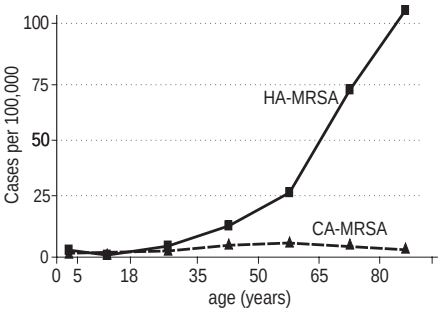
Table 1 provides results for invasive MRSA cases reported, by infection type.* Overall, 81% of cases were HA-MRSA. CA-MRSA cases tended to be younger than those with HA-MRSA (mean ages of 45 and 61 years, respectively, p<0.0001). More striking, however, is that while the incidence of CA-MRSA peaks in those 50–64 years of age, the incidence of HA-MRSA increases dramatically with age—presumably because hospitalization itself is strongly associated with age (Figure 1).

Table 1: Demographic, outcome, and clinical characteristics of MRSA infections, by year and infection type, Oregon ABCs, 2004–2006.

	2004		2005		2006	
	CA n=76 No (%)	HA n=329 No (%)	CA n=68 No (%)	HA n=285 No (%)	CA n=59 No (%)	HA n=268 No (%)
Sex						
Female	46 (61)	192 (58)	45 (66)	151 (53)	39 (66)	168 (66)
Male	30 (39)	137 (42)	23 (34)	134 (47)	20 (34)	100 (37)
Mortality	11 (14)	51 (16)	8 (12)	39 (14)	6 (10)	30 (11)
Infection Types**						
Bacteremia	57 (75)	281 (85)	47 (69)	246 (86)	41 (69)	220 (82)
Pneumonia	9 (12)	56 (17)	12 (18)	39 (14)	8 (14)	31 (12)
Endocarditis	17 (22)	22 (7)	10 (15)	16 (6)	12 (20)	14 (5)
Abscess (not skin)	16 (21)	30 (9)	12 (18)	24 (8)	12 (20)	16 (6)
Cellultis	16 (21)	27 (8)	14 (21)	26 (9)	12 (20)	26 (10)
Underlying Conditions						
Current smoker	35 (46)	84 (26)	30 (44)	81 (28)	27 (46)	59 (22)
IV drug use	30 (39)	37 (11)	19 (28)	35 (12)	24 (41)	30 (11)
Cardiovascular disease	2 (3)	100 (30)	3 (4)	70 (25)	5 (8)	73 (27)
Diabetes	11 (14)	140 (43)	13 (19)	102 (36)	9 (15)	115 (43)
Renal insufficiency	3 (4)	4 (26)	1 (1)	73 (26)	1 (2)	66 (25)

**These categories are not mutually exclusive and sum to >100%.
HA = Health care-associated MRSA
CA = Community-associated MRSA

Figure 1: Incidence of Health Care-Associated (HA-) and Community-Associated (CA-) MRSA infections, by age in 2006.



The overall case fatality rate of invasive MRSA infections from 2004–2006 was 13%. Case fatality due to MRSA increased with age, from 0% in those less than 20 years of age to 31% in those 80 years and older. While the case fatality was similar for CA- and HA-MRSA infections, (12% vs. 14% respectively), the fact that HA-MRSA cases are older may mask an association of poor outcome with community-associated infection. Indeed, in a multivariate logistic model controlling for age, the odds of death for CA-MRSA were 1.7 times as high as that for HA-MRSA (95% confidence interval 1.0–2.8).

HA-MRSA infections were significantly more likely to manifest as bacteremia, while CA-MRSA infections were more likely to manifest as internal abscess, cellulitis, or endo-

* Health care-associated MRSA (HA-MRSA) cases are those in which one or more established risk factors were reported. Established risk factors include: prior MRSA infection or colonization; culture collected >48 hours after hospital admission; hospitalization, surgery, dialysis, or residence in a long-term care facility in the year prior to culture date; and central vascular catheter in place at the time of evaluation.

The **CD Summary** (ISSN 0744-7035) is published biweekly, free of charge, by the Oregon Dept. of Human Services, Office of Communicable Disease and Epidemiology, 800 NE Oregon St., Portland, OR 97232 Periodicals postage paid at Portland, Oregon.
Postmaster—send address changes to:
CD Summary, 800 NE Oregon St., Suite 730, Portland, OR 97232

CD SUMMARY
November 13, 2007
Vol. 56, No. 23

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carditis (Table 1). HA-MRSA infections were more likely to occur in those with underlying chronic conditions, such as diabetes, cardiovascular disease, renal insufficiency, or chronic obstructive pulmonary disease, while CA-MRSA infections were more likely to occur in those with underlying behavioral risk factors, such as smoking and intravenous drug use (IDU). The higher proportion of CA-MRSA cases reported with endocarditis is driven by IDU: 44% of IDU cases but only 5% of non-IDU cases had a diagnosis of endocarditis. Bacteremia was also more common among those reporting IDU than other CA-MRSA cases. Internal abscesses and cellulitis, although more common in CA-MRSA cases, did not differ by IDU status (Table 2).

Table 2: Infections among CA-MRSA cases, by intravenous drug use (IDU), Oregon ABCs, 2004–2006.

	IDU +	IDU -
Bacteremia	61 (84)	83 (64)
Pneumonia	11 (15)	18 (14)
Endocarditis	32 (44)	7 (5)
Abscess (not skin)	19 (26)	21 (16)
Cellulitis	14 (19)	28 (22)
TOTAL	73	129

Table 3 shows the percentages of invasive MRSA isolates resistant to selected antibiotics against which 70% or more of isolates were tested. Clindamycin resistance was identified among a higher proportion of HA-MRSA than CA-MRSA isolates ($p<0.0001$). No other differences in antibiotic susceptibility profiles by place of acquisition were seen.

Table 3: Percentage of MRSA isolates resistant* to listed antibiotics, by infection type, Oregon ABCs 2004–2006.

	CA	HA
Clindamycin	18	60
Erythromycin	93	95
Rifampin	0	2
Tetracycline	8	5
TMP-Sulfa	0	2
Vancomycin	0	0

*Percentages based on isolates for which susceptibility to the listed antibiotic is known.
HA = Health care-associated MRSA
CA = Community-associated MRSA

DISCUSSION

MRSA is a huge problem: the organism is common, pyogenic, and resistant to many of our best antibiotics. It is mildly comforting that Oregon data from 2004 to 2006 show neither an increase in invasive MRSA incidence nor in resistance of MRSA isolates to other antimicrobial agents. Unfortunately, the rates remain high (2.2 times as high as invasive infection by *Streptococcus pneumoniae,* for example), no vaccine against this pathogen is available, and there is no other "magic bullet" to employ for prevention. We are left with the common-sense approaches outlined in our previous issue—chiefly, washing hands, not sharing personal items, and covering wounds.

These take on special importance in health care settings, where MRSA is more prevalent and where patients are at higher risk for both infection and complications thereof. MRSA is also a reminder to use antibiotics judiciously so as to minimize selective pressure in favor of populations of bacteria that are resistant.

Understandably, many people ask why ABCs limits its surveillance for MRSA to invasive infections. Consider, however, national data showing that for every 10,000 persons, there are >400 outpatient visits annually for skin and soft tissue infections.[1] If Oregon's rate is similar, it would mean >150,000 outpatient visits in our State annually, and many of these infections would certainly be staphylococcal. Because there are no immediate public health interventions to recommend (other than the above), it is difficult to see how the benefits of such reporting would justify the burden on physicians, who would be required to report, and on local public health departments, which would be expected to investigate the reports.

FOR MORE INFORMATION

Our 2006 MRSA Surveillance Report, to be available in early 2008, will incorporate additional epidemiological analyses as well as a description of circulating MRSA strains. This report (along with that from 2005) and additional information about MRSA and the Oregon ABCs program can be found at *www.oregon.gov/DHS/ph/acd/abc.shtml*.

REFERENCE

1. McCaig LF, McDonald LC, Mandal S, Jernigan DB. *Staphylococcus aureus*-associated skin and soft tissue infections in ambulatory care. Emerg Infect Dis. 2006;12:1715–23..