Methicillin-Resistant *Staphylococcus aureus* (MRSA) Surveillance Report 2005

Oregon Active Bacterial Core Surveillance (ABCs)
Office of Disease Prevention & Epidemiology
Oregon Department of Human Services
Updated: January 2007

Background

MRSA surveillance within the Centers for Disease Control and Prevention (CDC) Emerging Infections Program (EIP) first began in Minnesota, Georgia and Maryland in 2001 in response to increasing reports of severe MRSA infections among person without established risk factors. This surveillance demonstrated the importance of MRSA as a community-acquired pathogen in these locations and initiated the expansion of this surveillance to several additional EIP Active Core Bacterial surveillance (ABCs) sites in 2004, including Oregon's Portland tri-county area.

Active, on-going population-based surveillance of invasive MRSA began January 1st, 2004 in the Portland tri-county area, which includes Clackamas, Multnomah, and Washington counties: estimated population is 1,543,907 (42% of Oregon). 2005 was the second year in which Oregon's Emerging Infections Program (EIP) performed active surveillance for invasive MRSA infections in the Portland tri-county area. In addition to active surveillance, participating hospital laboratories in the surveillance region began submitting invasive MRSA isolates to the Oregon State Public Health Laboratory (OSPHL) in 2005. Lab-confirmed isolates are sent on to CDC for PFGE typing on a monthly basis.

This report summarizes invasive MRSA surveillance methods and results for 2005 in the Portland tri-county area, as well as some comparison data from 2004.

Methods

There are 8 participating laboratories in the surveillance area that submit line lists of potential cases to the MRSA project coordinator for Oregon's Emerging Infections Program. These reports are received on a regular basis, ranging from individual case reports to quarterly reports depending on laboratory. Two trained nurse reviewers examine the medical records of all potential cases and complete standardized case report forms on all confirmed cases. The information that is obtained includes demographics; hospital information; location of culture collection; patient outcome; sterile and non-sterile sites from which MRSA was isolated; types of MRSA infections associated with cultures; underlying medical conditions; presence of healthcare-associated risk factors; antibiotic susceptibilities; and antibiotic prescriptions received prior to and after initial cultures.

An invasive MRSA case is defined as the isolation of MRSA from a normally sterile site (for example: blood; cerebrospinal fluid; joint/synovial fluid; pleural fluid; peritoneal fluid; bone, etc) in a resident of Multnomah, Clackamas or Washington County. Cases are classified as healthcare-associated (HA-MRSA) if the medical chart indicates that one or more of the following risk factors are present: 1) previous MRSA colonization or infection; 2) presence of an invasive device or catheter at the time of admission or evaluation; 3) culture collection >48 hours after hospital admission; or 4) hospitalization, surgery, dialysis, or resident of a long-term care facility (LTCF) within the year preceding the index culture date. Cases with none of these risk factors are classified as community-associated (CA-MRSA).

Surveillance Results

In 2005, we identified 353 cases for an overall incidence of 23/100,000 person-years [1]. 68 of these cases (19% or 4/100,000 person-years) were classified as CA-MRSA and 285 cases (81% or 18/100,000) were classified as HA-MRSA. Table 1 shows the number and incidence rates for CA-MRSA and HA-MRSA cases for 2004 and 2005.

Table 1. Number of cases and incidence (per 100,000 person-years) of CA- and HA-MRSA, 2004-2005

	2004	2005
	N (Inc.)	N (Inc.)
CA-MRSA	76 (5)	68 (4)
HA-MRSA	329 (22)	285 (19)
Overall	405 (27)	353 (23)

Twenty-four cases in 2005 had a previous invasive MRSA infection that was detected by our surveillance in 2004. Two of these cases developed subsequent infections in 2005. Of the remaining cases (327), 21 cases that were first identified by our surveillance programs in 2005 had recurrent infections in 2005. Three of these patients, in fact, had two recurrent infections in 2005 (for a total of 3 infections in 2005). To summarize, 353 infections identified in 2005 occurred among 328 patients in 2005 and 50 (14%) cases in 2005 were recurrent cases.

The demographic characteristics for all 2005 cases, stratified by MRSA classification type are presented in Table 2. Overall, males are more likely than females to have invasive MRSA ($p=0.043$), and the average age is significantly younger for CA-MRSA than for HA-MRSA ($p<0.001$). Race and ethnicity information was often unavailable and therefore no statistical analysis was performed.

Table 2: Demographic characteristics of invasive MRSA cases from 2005

Demographic Characteristic	CA-MRSA N=68 No. (%)	HA-MRSA N=285 No. (%)	Total N=353 No. (%)
Age (mean)	48	63	60
Gender			
Male	45 (66)	151 (53)	196 (56)
Female	23 (34)	134 (47)	157 (45)
Race			
White	28 (41)	154 (54.	182 (52)
Black	1 (2)	15 (5)	16 (45)
American Indian or Alaskan Native	1 (2)	5 (2)	6 (2)
Asian	1 (2)	7 (3)	8 (2)
Native Hawaiian or Pacific Islander	0	2 (1)	2 (1)
Unknown	37 (54)	102 (36)	139 (39)
Ethnicity			
Hispanic or Latino	1 (2)	4 (1)	5 (1)
Not Hispanic or Latino	17 (25)	92 (32)	109 (31)
Unknown	50 (74)	189 (66)	239 (68)

[1] Oregon has three remaining MRSA cases from 2005 that require confirmation.

Incidence Rate by County

Table 3 presents incidence data (per 100,000 person-years) for 2005 by county of residence and MRSA classification type. As seen in the table, incidence for both HA- and CA-MRSA is highest in Multnomah County and lowest in Washington County.

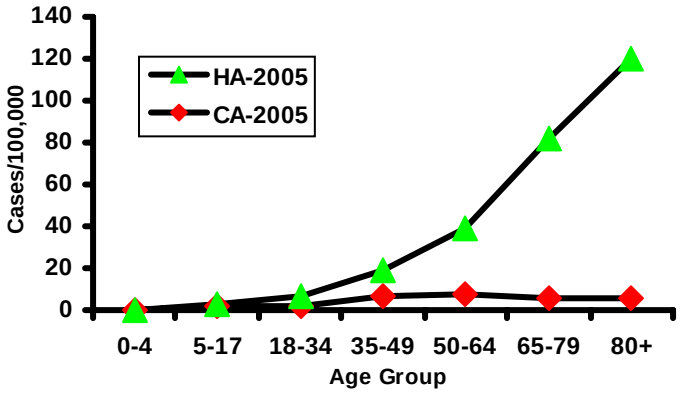
Table 3: Number of cases and incidence (per 100,000 person-years) of MRSA by County of Residence for 2005

	Clackamas No. (Inc.)	Multnomah No. (Inc.)	Washington No. (Inc.)
CA-MRSA	11 (3)	56 (8)	9 (2)
HA-MRSA	55 (15)	218 (32)	56 (11)
Overall	66 (18)	274 (40)	65 (13)

Incidence by Age, and MRSA Type

Incidence (per 100,000 person-years) by age classification is presented in Figure 1. Incidence rates generally increase with age HA-MRSA as well as with CA-MRSA, although the incidence of CA-MRSA appears to plateau in the older age range (65+ years).

Figure 1. Incidence (Cases per 100,000 Person-Years), by Age Group and MRSA Classification, 2005.



Hospital Stay and Mortality

We examined mortality rates by age group for both 2004 and 2005. As seen in Figure 2, there have been no deaths in cases <18 years of age for the past two years; but mortality increases steadily with age for the subsequent age groups.

Overall, 313 (89%) of the invasive MRSA cases from 2005 were admitted to a hospital. Fifty-two (77%) of the CA-MRSA cases and 261 (92%) of the HA-MRSA cases were admitted. As seen in Table 4, the median length of stay and mortality rate did not differ by MRSA classification type.

Figure 2. MRSA Mortality Rate by Age Group, 2004 and 2005

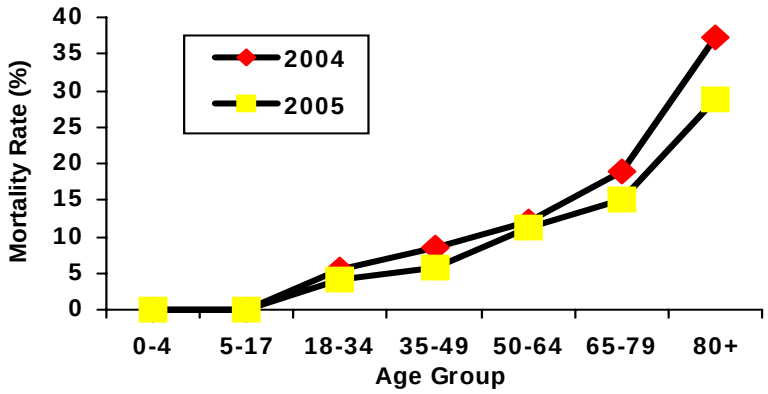


Table 4: Severity indicators, culture sites, infection types, underlying conditions, and antibiotic sensitivities of CA- and HA-MRSA cases from 2005.

	CA-MRSA N=68 No. (%)	HA-MRSA N=285 No. (%)	Total N=353 No. (%)
Severity Indicator			
Mortality	8 (12)	39 (14)	47 (13)
Length of stay (median days)	9	9	9
Culture site			
Blood	46 (68)	243 (85)	289 (82)
Joint/Synovial Fluid	12 (18)	23 (8)	35 (10)
Bone	2 (3)	8 (3)	10 (3)
CSF	0	2 (1)	2 (1)
Pleural Fluid	4 (6)	4 (1)	8 (2)
Peritoneal Fluid	0	1 (0.4)	1 (0.3)
Pericardial Fluid	0	1 (0.4)	1 (0.3)
Other sterile site	7 (10)	5 (2)	12 (3)
Infection types			
Bacteremia	47 (69)	246 (86)	293 (83)
Pneumonia	12 (18)	39 (14)	51 (14)
Internal abscess	12 (18)	24 (8)	36 (10)
Cellulitis	14 (21)	26 (9)	40 (11)
Endocarditis	10 (15)	16 (6)	26 (7)
Osteomyelitis	7 (10)	22 (8)	29 (8)
Underlying conditions			
Diabetes	13 (19)	102 (36)	115 (33)
Current smoker	30 (44)	81 (28)	111 (31)
Atherosclerotic cardiovascular disease	3 (4)	70 (25)	73 (21)
Chronic renal insufficiency	1 (2)	73 (26)	74 (21)
Congestive heart failure	4 (6)	69 (24)	73 (21)
Emphysema/COPD	4 (6)	45 (16)	49 (14)
IV drug use	19 (28)	35 (12)	54 (15)
Immunosuppressive therapy	3 (4)	56 (20)	59 (17)
Abscess/boil	7 (10)	9 (3)	16 (5)
HIV	1 (2)	4 (1)	5 (1)
Antibiotic sensitivity			
Clindamycin	52 (78)	112 (41)	164 (48)
Erythromycin	2 (3)	15 (5)	17 (5)
Rifampin	48 (100)	216 (98)	264 (99)
Tetracycline	40 (89)	202 (94)	242(93)
Trimethoprim-sulfamethoxazole	65 (100)	264 (98)	329 (98)
Vancomycin	67 (100)	284 (100)	351 (100)

Culture Site

Blood cultures continue to be by far the most common culture for invasive MRSA infections (82%) followed by joint/synovial fluid (10%), bone (3%), cerebralspinal fluid (CSF; 1%), and pleural fluid (3%). However, as shown in Table 4, the proportion of cases cultured at these sites differed by MRSA classification type; specifically, blood cultures were significantly more common for HA-MRSA cases (p=0.001) whereas joint/synovial fluid cultures were significantly more common for CA-MRSA cases (p=0.018).

Infection Types

Bacteremia was the most common type of invasive MRSA infection (82%) followed by pneumonia (14%), cellulitis (11%), internal abscess (10%), osteomyelitis (8%) and endocarditis (7%). HA-MRSA cases were significantly more likely to be bacteremic (p=0.001), whereas CA-MRSA cases were significantly more likely to have internal abscesses (p=0.024), cellulitis (0.007), and endocarditis (0.010).

Underlying Conditions

The most common underlying conditions for invasive MRSA cases from 2005 included diabetes (33%), smoking (31%), atherosclerotic cardiovascular disease (21%), chronic renal insufficiency (21%), and congestive heart failure (21%). When stratified by MRSA classification, HA-MRSA cases were significantly more likely to have chronic conditions such as diabetes (p=0.008), atherosclerotic cardiovascular disease (p<0.001), chronic renal insufficiency (p<0.001), congestive heart failure (p=0.001), emphysema or chronic obstructive pulmonary disease (COPD) (p=0.034), or be undergoing immunosuppressive therapy (p=0.002). CA-MRSA cases were more likely to have behavior-related conditions such as smoking (p=0.012) and intravenous drug use (p=0.001).

Antibiotic Sensitivities

HA- and CA-MRSA clinical specimens were resistant to erythromycin but susceptible to rifampin, tetracycline, trimethoprim-sulfamethoxazole, and vancomycin. However, there was a difference in resistance among HA- and CA-MRSA specimens in reference to clindamycin susceptibility; specifically, 78% of CA-MRSA cases were susceptible to clindamycin where as only 41% of CA-MRSA cases were susceptible (p<0.001).

HA-MRSA Risk Factors

The risk factors used to classify MRSA cases as either HA- or CA-MRSA include: 1) previous MRSA colonization or infection; 2) presence of an invasive device or catheter at time of admission or evaluation; 3) culture collection >48 hours after hospital admission; or 4) hospitalization, surgery, dialysis, or residence in a long term care facility (LTCF) within the year preceding the index culture date. The distribution of HA-MRSA cases by risk factor is provided in Table 5. As seen in the table, a majority of HA-MRSA cases had been hospitalized or had surgery in the year preceding the index culture date.

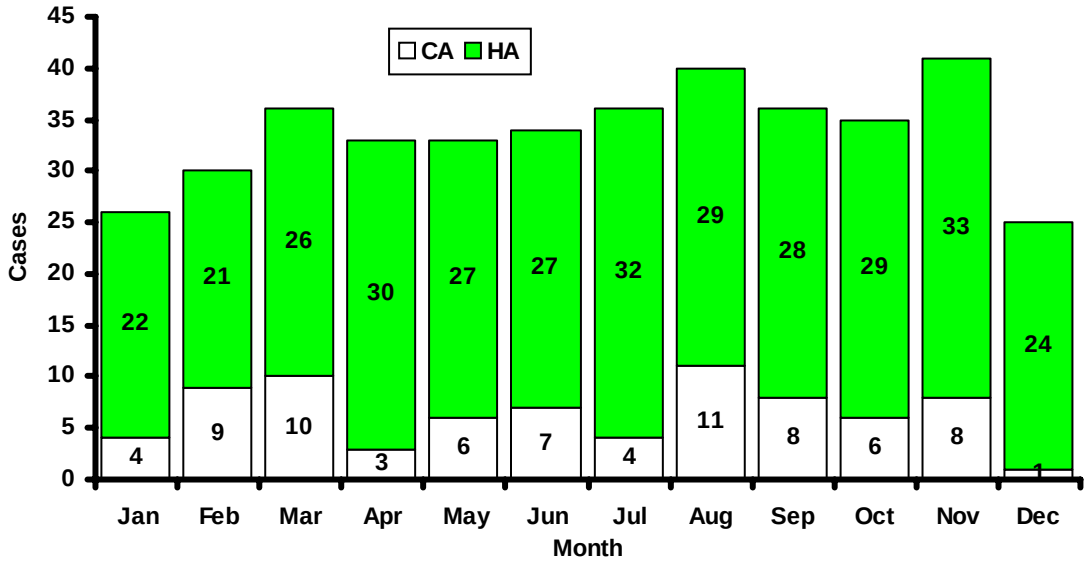
Table 5: Number and Percentage of HA-MRSA Cases by Risk Factor, 2005.

Risk Factor	HA-MRSA N=285 No. (%)
Hospitalized in past year	208 (73)
Surgery in past year	161 (57)
Long-term care facility resident in past year	118 (41)
Nursing home	76 (27)
Rehabilitation facility	17 (6)
Other	23 (8)
Unknown	2 (1)
Invasive device present at time of evaluation	114 (40)
Previous MRSA colonization or infection	94 (33)
Culture > 48 hours after admission	59 (21)
Dialysis in past year	55 (19)

Seasonality

Figure 3 shows the number of cases by month of culture. The greatest number of cases occurred in August and November; there does not appear to be any seasonal variation in incidence.

Figure 3. Number of HA- and CA-MRSA cases by month, 2005



Special Populations

Children. There were only 8 cases of invasive MRSA in children (<18 years of age) in the surveillance are for 2005. Of these 8 cases, the youngest was 8 years old. Five of these cases were classified as CA-MRSA and only three children classified as HA-MRSA. The types of infections that occurred among these 8 cases included bacteremia (50%), osteomyelitis (50%), internal abscesses (50%), empyema (25%), pneumonia (13%), cellulitis (13%), and line infection (13%). The median length of stay for children was 5.5 days (min. 3, max.7), which is less than the median length of stay for adults (9 days) and also less than the reported length of stay for children last year (8.5 days). There were no deaths in this age group.

Injection Drug Users. In 2005, there were 54 cases (15%) of invasive MRSA that had injection drug use as an underlying condition. Nineteen (35%) of these cases were classified as CA-MRSA and the remaining 35 (65%) were classified as HA-MRSA. The most common risk factors for this subset of HA-MRSA cases included being hospitalized in the past year (27 cases, 77%) or prior MRSA colonization or infection (24 cases, 69%). The majority of cases with injection drug use as an underlying condition resided in Multnomah County (43 cases, 80%). In addition, eight (15%) cases resided in Washington County and 3 cases (6%) were from Clackamas County. The median age (42 years), gender (59% male), racial classification (44% white, 44% unknown) and ethnicity (2%) of injection drug use cases were similar to the demographic characteristics of all 353 cases. The median length of stay in hospital for injection drug use cases was 9 days and 6 cases died (11%). With respect to concurrent underlying conditions, 46 (85%) were also current smokers, 13 (24%) abused alcohol, 6 (11%) had asthma, 3 (6%) had HIV/AIDS and 4 (7%) had diabetes. Forty-seven (87%) injection drug users had bacteremia, 20 (37%) had endocarditis, 11 (20%) had internal abscesses, 7 (13%) had cellulitis and only 3 (6%) had pneumonia.

People with diabetes. There were 115 (33%) cases of invasive MRSA in 2005 that had diabetes; 102 (89%) were classified as HA-MRSA while the remaining 13 (11%) were classified as CA-MRSA. Not surprisingly, the average age of invasive cases with diabetes was significantly higher than the average age of cases without diabetes (65 vs. 57 years old, respectively; $p<0.001$). Diabetic cases were more likely than non-diabetic cases to have chronic underlying conditions such as peripheral vascular disease (19% vs. 6%, $p<0.001$), atherosclerotic cardiovascular disease (35% vs. 14%, $p<0.001$), congestive heart failure (33% vs. 15%, $p<0.001$), stroke (17% vs. 9%, $p=0.045$), and chronic renal insufficiency (36% vs. 14%, $p<0.001$). Diabetic cases were less likely than non-diabetic cases to engage in injection drug use (4% vs. 21%, $p<0.001$); smoking status did not significantly differ among diabetics and non-diabetics for 2005. Fourteen (12%) diabetic patients with invasive MRSA in 2005 died; mortality rate did not differ from non-diabetic cases.

People on dialysis in the past year. There were 55 (16%) cases that had been on dialysis in the year prior to the index culture date; because this is an established risk factor for HA-MRSA, by definition all of these cases are classified as HA-MRSA. The average age of dialysis cases was older than non-dialysis cases (63 vs. 59 years, respectively), however for the 2005 dataset, this difference was not statistically significant. As expected, 96% of dialysis cases had bacteremia compared to 82% for the remaining cases ($p=0.004$); however, dialysis cases were less likely than non-dialysis cases to have pneumonia (6% vs. 16%, $p=0.039$), internal abscesses (0% vs. 12%, $p=0.007$), and cellulitis (2% vs. 13%, $p=0.015$). The mortality rate for dialysis cases (13 %) did not differ significantly from non-dialysis cases.