Group A Streptococcus Surveillance Report 2014

Oregon Active Bacterial Core Surveillance (ABCs)

Center for Public Health Practice

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Background

The Active Bacterial Core surveillance (ABCs) program is a core component of the Emerging Infections Program (EIP) Network sponsored by the Centers for Disease Control and Prevention (CDC). The purpose of the ABCs program is to determine the incidence and epidemiologic characteristics of invasive disease due to *Haemophilus influenzae*, *Neisseria meningitidis*, group A streptococcus (GAS), group B streptococcus (GBS), *Streptococcus pneumoniae*, and methicillin-resistant *Staphylococcus aureus* (MRSA). The entire EIP Network for invasive GAS disease represents 32 million persons in 10 surveillance areas around the United States. More information on the EIP/ABCs Network is found at: http://www.cdc.gov/abcs/index.html.

In Oregon, the surveillance area for invasive GAS (*Streptococcus pyogenes*) disease comprises the tri-county (Clackamas, Multnomah, and Washington) Portland metropolitan area, with a 2013 estimated population of 1,693,600.* More information on the Oregon ABCs program is found at: http://public.health.oregon.gov/DiseasesConditions/CommunicableDisease/EmergingInfections/Pages/ActiveBacterialCoreSurveillance.aspx.

Methods

Invasive GAS disease (IGAS) is defined as the isolation of GAS from a normally sterile body site or fluid, or from a wound accompanied by necrotizing fasciitis or toxic shock syndrome in a tri-county resident. Tri-county hospital laboratories submit GAS isolates to the Oregon State Public Health Laboratory, which forwards them to CDC for typing. Additional cases are identified through regular laboratory record reviews. Health record reviews of each case allow standardized reports of demographic characteristics, clinical syndrome manifestations, underlying illnesses or conditions, and illness outcome.

Surveillance Results

Descriptive Epidemiology

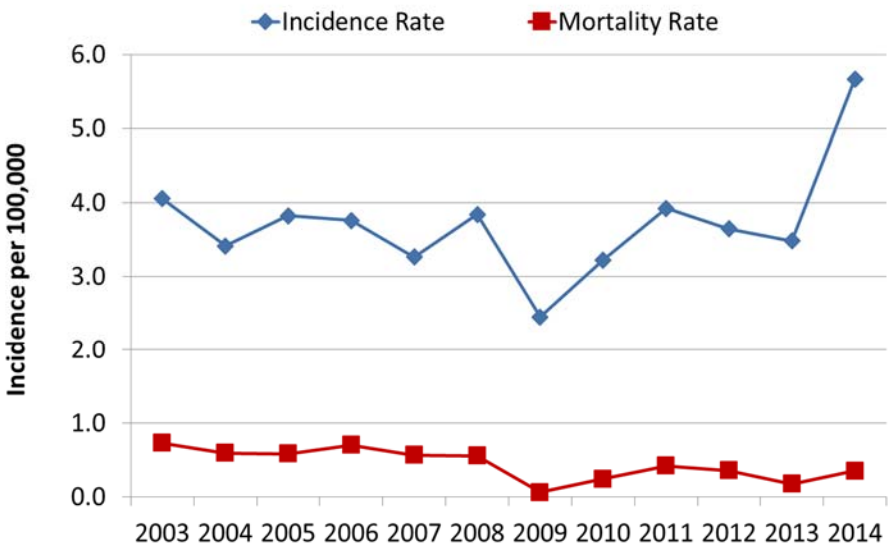
In 2014, 96 IGAS cases were reported in the tri-county Portland area, for an incidence rate of 5.7/100,000 persons (Figure 1). This is 53% higher than the 2013 national projection of invasive disease (3.7/100,000) and 52 percent higher than the average annual incidence rate in the Portland area from 2009-2013 (3.7/100,000).[1] Of these cases, there were four deaths, for an annual mortality rate due to IGAS disease of 0.35/100,000 (Figure 1). This rate is 31% higher than the figures reported from 2009-2013 in the Portland area

* Source: Portland State University Population Research Center (http://www.pdx.edu/prc/)

(0.27/100,000) but four percent lower than the most recent national projections (0.37/100,000).[1]

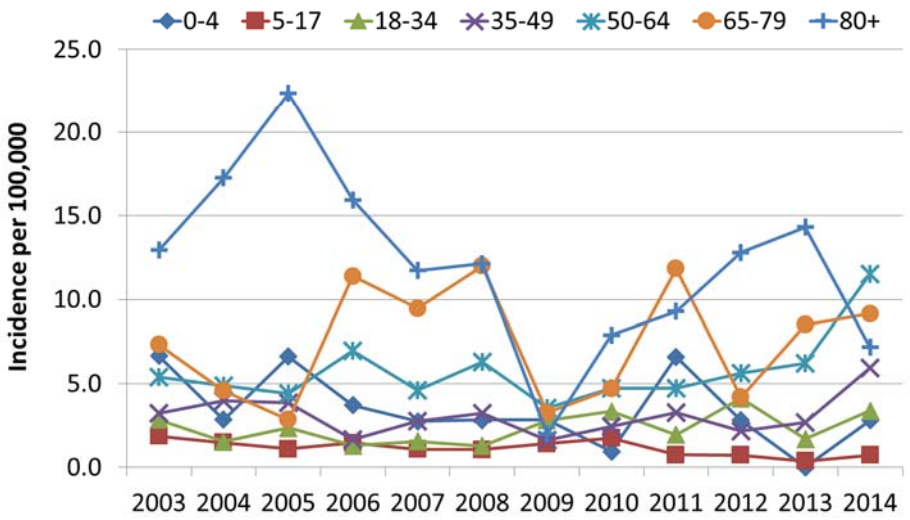
The 2014 case fatality rate for IGAS in the Portland area was 6 percent, which is the similar for the Portland area rate reported for 2009-2013, and 38 percent lower than projected rates for the entire ABCs network in 2013.[1]

Figure 1: Incidence and Mortality Rates of IGAS Cases in Tri-county Area



The mean and median ages of IGAS cases
Were 50 and 53 years, respectively (range: 1–94). Fifty-nine percent of cases were male. Race and ethnicity were obtained for 76% and 82% of cases, respectively; of 73 cases where race was known, 68 (93%) were white. Nine percent of the 79 cases with known ethnicity were Hispanic.

Figure 2: Incidence of IGAS Cases Tri-county Area by Age



The 2014 incidence of IGAS was lowest in Washington county (3.09/100,000), followed by Clackamas county (4.66/100,000) and highest in Multnomah county 7.93/100,000). Compared with the previous five-year average, the 2014 incidence was 68 percent higher in Clackamas, 82 percent higher in Multnomah, and 32 percent higher in Washington counties. The burden of disease was highest in those 50-64 years of age (37 cases; 11/100,000 persons), followed by those 65-79 years of age (14 cases; 9.1/100,000) and those ≥80 years of age (4 cases; 7.2/100,000) (Figure 2). The incidence among the other age groups, compared to the previous 5 year average, have fluctuated from a 22% decrease (5-17 year olds) to a 95% increase (35-49 year olds).

Clinical Manifestations

The clinical profile of IGAS in 2014 was not significantly different compared with the previous 5-year average (Table 1). In 2014, three cases of necrotizing fasciitis and one case of toxic shock syndrome were reported. All four of these cases were hospitalized, and there were no fatal outcomes. Among cases reported since 2009, the only clinical syndromes that significantly varied by age were cellulitis, arthritis and STSS (p=0.0015, p=.05, and p=0.005, respectively), which are both more common in adults than children. After adjusting for age, fatal outcome was significantly associated with bacteremia, cellulitis, and necrotizing fasciitis (p=0.03, p=0.03, and p=0.04, respectively).

Table 1: Percent of IGAS Cases† Reporting Common Clinical Syndromes by Age Group

Syndrome	2014			2009-2013		
	<18 years (n=5)	18-64 years (n=73)	65+ years (n=18)	<18 years (n=28)	18-64 years (n=180)	65+ years (n=70)
Abscess	0	7	6	0	8	3
Bacteremia	60	38	33	25	27	37
Cellulitis	20	38	18	7	33	43
Meningitis	0	0	0	0	1	1
Necrotizing Fasciitis	0	3	0	0	9	1
Pneumonia	0	3	17	36	7	16
Septic Arthritis	20	7	0	7	13	1
Streptococcal Toxic Shock	0	1	0	18	6	0

† Some cases report more than one syndrome. Not all syndromes reported are shown here.

Underlying Conditions and Behavioral Risk Factors

In 2014, one child (20%) carried a diagnosis of varicella and the remainder had no underlying conditions listed in their medical record. Among adults, the profile of underlying conditions reported in 2014 was similar to that reported from 2009-2013. Younger adults were more likely to report intravenous drug use (IDU) or no underlying conditions, while older adults were more likely to have blunt trauma, diabetes, obesity, cardiovascular disease or COPD (Table 2).

Table 2: Underlying Conditions and Behavioral Risk Factors Reported Among Adult IGAS Cases by Age Group, 2009-2014

Underlying Condition	18-64 years (n=286) n (%)	65+ years (n=88) n (%)
Asthma	24 (8)	6 (7)
Blunt trauma*	20 (7)	15 (17)
Burns	7 (2)	0
Cardiovascular disease*	27 (9)	37 (42)
COPD*	11 (4)	25 (28)
Diabetes*	58 (20)	35 (40)
Dialysis	5 (2)	3 (3)
Immunosuppression	21 (7)	6 (7)
Intravenous drug use (IDU)*	42 (15)	0
Nephrotic syndrome	5 (2)	3 (3)
Obesity*	34 (12)	20 (23)
Penetrating trauma	26 (9)	4 (5)
Surgical wound	12 (4)	3 (3)
None	65 (23)	8 (9)

* Significant difference by age group ($p<0.05$).

After adjusting for age, no underlying conditions were associated with fatal outcome. In terms of clinical manifestation, after adjusting for age, pneumonia was associated with COPD (OR 3.9, CI 1.4, 11) and cardiovascular disease (OR 3.2, CI 1.3,8.2), septic arthritis was associated with blunt trauma (OR 3.6, CI 1.4, 9.3), abscess was associated with IDU (OR 4.7, CI 1.8, 12), and cellulitis was associated with penetrating trauma (OR 2.2, CI 1.03, 4.8) and IDU (OR 3.5, CI 1.8, 6.9.

emm Type Analysis

The surface M protein – a known virulence factor for disease – has been the basis for GAS strain typing for decades. Since 1995, CDC has determined the M protein type through sequencing the DNA of the corresponding gene (*emm*), providing an *emm* type.[2] In 2014, 14 *emm* types were determined for isolates from 58 cases (60%)[§]. The most frequent *emm* types reported in 2014 were 59 (11%), 01 (10), and 79 (6%).

Since 2006, 46 *emm* types were determined for 363 isolates. The most frequent *emm* types seen over this time are presented in Table 3.

[§]Lab data for Jan-Nov, 2014

Table 3: Selected Demographic and Clinical Attributes of IGAS Disease by *emm* Type, 2008-2014

emm Type	Total (n=363) n (%)	Fatal outcome (n=30) n (%)	65+ years (n=88) n (%)	Necrotizing fasciitis (n=20) n (%)	Pneumonia (n=39) n (%)
1	116 (21)	4 (14)	18 (20)	5 (25)	15 (38)
89	45 (8)	2 (7)	10 (11)	4 (20)	2 (5)
12	37 (7)	1 (3)	6 (7)	2 (10)	1 (3)
28	37 (7)	3 (10)	8 (9)	1 (5)	2 (5)
92	28 (5)	2 (7)	6 (7)	2 (10)	0

* Percentages are number of isolates with displayed *emm* type out of the total number of isolates in that category. Since only the top 5 *emm* types are shown in this table, the numbers in each column do not sum to the total at the top of each column.

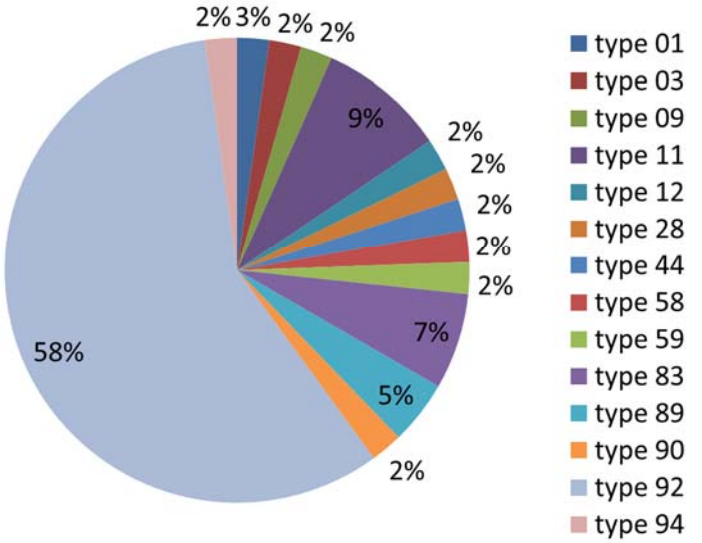
Emm type 1 is positively associated with pneumonia (OR 2.8, CI 1.4, 6). Other associations between *emm* types and clinical syndromes were not statistically significant. No significant associations were seen between *emm* types and fatal outcome.

Antibiotic Susceptibility

The antibiotic susceptibility profile of invasive GAS strains has been assessed at several points since the beginning of ABCs. Antibiotic susceptibility results are available for 330 isolates obtained from 2009-2014. Of these, 100 percent were susceptible to penicillin, ampicillin, cefotaxime, and vancomycin. Fifty-seven isolates (17%) exhibited some level of antibiotic resistance: two displayed intermediate resistance and 35 displayed full resistance to erythromycin alone; ten were resistant to erythromycin and clindamycin; ten were resistant to clindamycin. Erythromycin- resistance was associated with cellulitis (p=0.04) and bacteremia (p=0.04), but was not associated with a fatal outcome.

Figure 3 shows the percentage of erythromycin-resistant isolates by *emm* type. Since 2008, *emm* types 11, 83, and 92 have accounted for the largest percentage (73%) of the erythromycin-resistant isolates.

Figure 3: Percentage of Erythromycin-Resistant Isolates by emm Type 2009-2014 (N=45)



Discussion

Generally, IGAS disproportionably affects the elderly in Oregon, who are more likely to have systemic disease associated with chronic underlying conditions that may affect immune function. Among young adults, invasive disease is more likely to be associated with injection drug use. Although it is not possible to assess risk factors for disease through surveillance alone, the association with injection drug use in young adults and chronic disease in persons over 45 years of age has been well documented.[3] Monitoring trends in necrotizing fasciitis and toxic shock syndrome as well as potentially-preventable nosocomial infections (such as surgical wound infections) have also been objectives of IGAS surveillance through the ABCs network. In general, most clinical manifestations have remained relatively stable over the past few years. Trends will continue to be monitored by the Oregon ABCs surveillance program.

References

1. Centers for Disease Control and Prevention. 2013. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, Group A *Streptococcus*, 2013. Available via the Internet: http://www.cdc.gov/abcs/reports-findings/survreports/gas13.pdf. Accessed 30 Jul 2014.
2. Beall B, Facklam RR, Thompson T. Sequencing *emm*-specific PCR products for routine and accurate typing of group A streptococci. *J Clin Microbiol* 1996;34:953-8.
3. Factor SH, Levine OS, Schwartz B, et al. Invasive Group A Streptococcal Disease: Risk Factors for Adults. *Emerg Infect Dis* 2003;8:970–7.