Group A Streptococcus Surveillance Report 2011

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 2011 estimated population of 1,656,775.* 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 2011, 65 IGAS cases were reported in the tri-county Portland area, for an incidence rate of 3.9/100,000 persons (Figure 1). This is similar to the 2010 national projection of invasive disease (4.0/100,000) and 18 percent higher than the average annual incidence rate in the Portland area from 2006–2010 (3.3/100,000).[1] Of these cases, there were seven deaths, for an annual mortality rate due to IGAS disease of 0.42/100,000 (Figure 1). This rate is similar to the figures reported from 2006-2010 in the Portland area (0.43/100,000) and the most recent national projections (0.40/100,000).[1]

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

The 2011 case fatality rate for IGAS in the Portland area was 11 percent, compared with 12 percent for the Portland area from 2006–2010 and 10 percent for the entire ABCs network in 2010.[1]

The mean and median ages of IGAS cases were 49 and 53 years, respectively (range: 2–90). Fifty-one percent of cases were male; of 41 cases where race was known, 40 (98%) were white. Twenty-nine percent of the 39 cases with known ethnicity were Hispanic. These data should be interpreted with caution, however, given that race and ethnicity were not obtained on a majority of the cases.

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

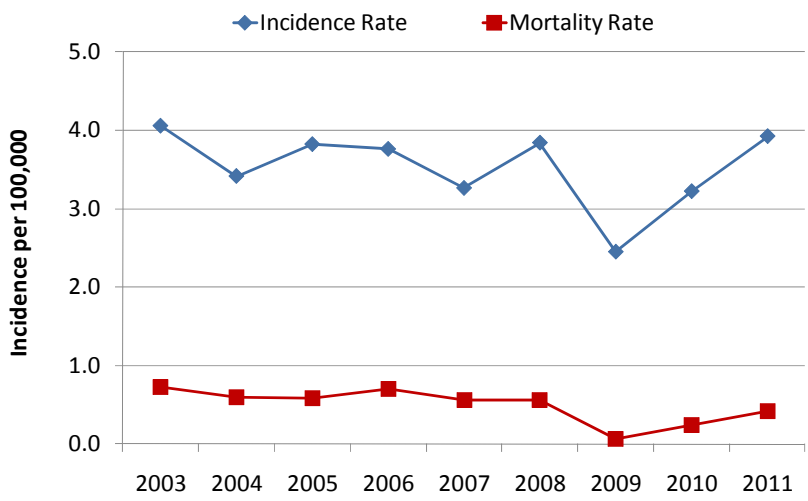
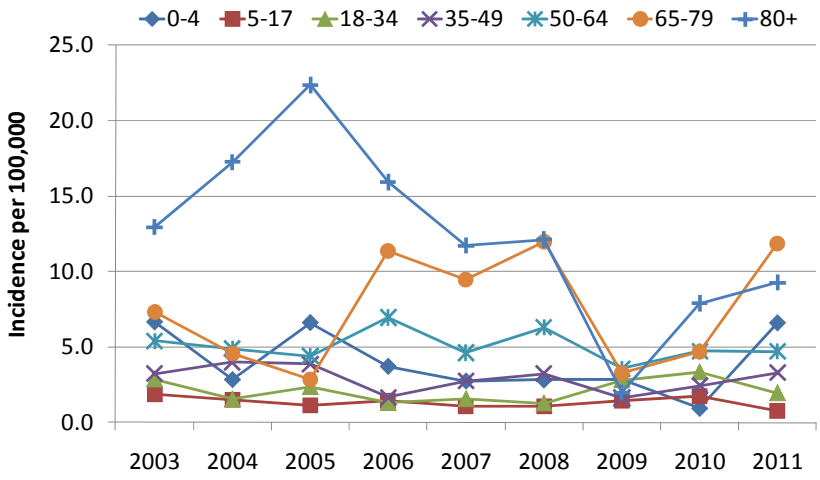


Figure 2: Incidence of IGAS Cases Tri-county Area by Age



The 2011 incidence of IGAS was equivalent in Clackamas, Multnomah, and Washington counties (3.9/100,000). Compared with the previous five-year average, the 2011 incidence was 45 percent higher in Clackamas, 12 percent lower in Multnomah, and 84 percent higher in Washington counties.

The burden of disease was highest in those 65-79 years of age (16 cases; 11.9/100,000 persons), followed by those ≥80 years of age (5 cases; 9.3/100,000) and those 0-4 years of age (7 cases; 6.6/100,000) (Figure 2). The incidence among the other age groups has remained relatively stable, within annual variation, over the past eight years.

Clinical Manifestations

With the exception of streptococcal toxic shock syndrome (STSS) (p=0.0036) and pneumonia (p=0.0294), the clinical profile of IGAS in 2011 was not significantly different compared with the previous 5-year average (Table 1). In 2011, five cases of necrotizing fasciitis and one case of toxic shock syndrome were reported, with one presenting with both syndromes. All five of these cases were hospitalized, and there was one fatal outcome. Three reported at least one underlying condition. Among cases reported since 2006, the only clinical syndromes that significantly varied by age were cellulitis and STSS (p=0.0132 and p=0.0280, respectively). After adjusting for age, fatal outcome was significantly associated with bacteremia, cellulitis, and necrotizing fasciitis (p=0.0060, p=0.0027, and p=0.0049, respectively).

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

Syndrome	2011			2006-2010		
	<18 years (n=9)	18-64 years (n=35)	65+ years (n=21)	<18 years (n=33)	18-64 years (n=162)	65+ years (n=71)
Abscess	0	6	0	3	6	6
Bacteremia	56	26	24	15	22	30
Cellulitis	0	31	62	21	40	32
Meningitis	0	3	0	9	2	3
Necrotizing Fasciitis	0	12	5	0	9	6
Pneumonia	22	6	10	33	12	28
Septic Arthritis	11	6	5	9	19	4
Streptococcal Toxic Shock	0	3	0	15	9	4

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

Underlying Conditions

In 2011, one child (11%) carried a diagnosis of asthma and two children (22%) suffered blunt trauma, while the remainder had no underlying conditions listed in their medical record. Among adults, the profile of underlying conditions reported in 2011 was similar to that reported from 2006-2010, with the exception of diabetes, dialysis and nephrotic syndrome (p=0.0231, p=0.0025 and p=0.0270, respectively). Younger adults were more likely to report asthma, intravenous drug use (IDU) or no underlying conditions, while older adults were more likely to have cardiovascular disease or COPD (Table 2).

Table 2: Underlying Conditions Reported Among Adult IGAS Cases by Age Group, 2006-2011

Underlying Condition	18-64 years (n=239) n (%)	65+ years (n=92) n (%)
Asthma	28 (12)	4 (4)
Blunt trauma	28 (12)	13 (14)
Burns	12 (5)	2 (2)
Cardiovascular disease*	17 (7)	36 (39)
COPD*	7 (3)	23 (25)
Diabetes	47 (20)	27 (29)

Underlying Condition	18-64 years (n=239) n (%)	65+ years (n=92) n (%)
Dialysis	7 (3)	2 (2)
Immunosuppression	28 (12)	15 (16)
Intravenous drug use (IDU)	16 (7)	1 (1)
Nephrotic syndrome*	10 (4)	9 (10)
Obesity	36 (15)	14 (15)
Penetrating trauma	29 (12)	10 (11)
Surgical wound	9 (4)	5 (5)
None	51 (21)	8 (9)

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

After adjusting for age, immunosuppression was the only underlying condition associated with fatal outcome (p=0.0056). In terms of clinical manifestation, after adjusting for age, pneumonia was associated with COPD (OR 2.9, CI 1.2, 7.3) and necrotizing fasciitis was associated with blunt trauma (OR 4.5, CI 1.8, 11.4).

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 2011, 10 *emm* types were determined for isolates from 35 cases (54%). The most frequent *emm* types reported in 2011 were 1 (22%), 12 (6%), and 28 (6%).

Since 2006, 38 *emm* types were determined for 331 isolates. The most frequent *emm* types seen over this time are presented in Table 3.

Table 3: Selected Demographic and Clinical Attributes of IGAS Disease by *emm* Type, 2006-2011

emm Type	Total (n=331) n (%)	Fatal outcome (n=41) n (%)	65+ years (n=92) n (%)	Necrotizing fasciitis (n=23) n (%)	Pneumonia (n=56) n (%)
1	88 (27)	16 (39)	28 (30)	10 (44)	26 (46)
03	15 (5)	2 (5)	5 (5)	0 (0)	3 (5)
12	26 (8)	4 (10)	8 (9)	3 (13)	4 (7)
28	24 (7)	2 (5)	8 (9)	2 (9)	3 (5)
89	14 (4)	0 (0)	3 (3)	0 (0)	0 (0)

* Percentages are number of isolates with displayed *emm* type out of the total number of isolates in that category.

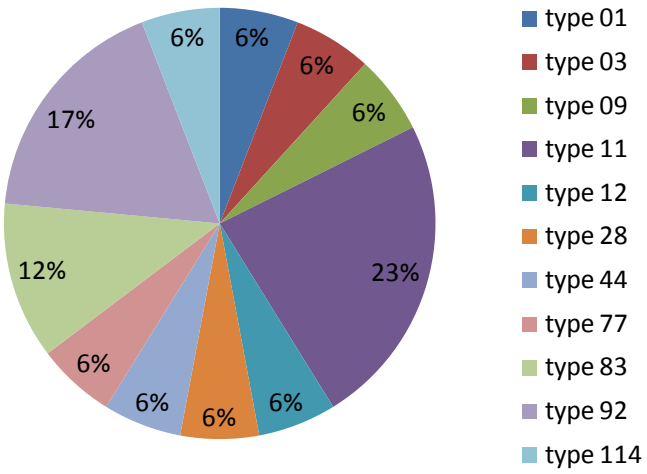
Emm type 89 is positively associated with cellulitis (OR 6.4, CI 1.7, 23.8). Other associations between *emm* types and clinical syndromes were not statistically significant.

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 249 isolates obtained from 2007-2011. Of these, 100 percent were susceptible to penicillin, ampicillin, cefotaxime, and vancomycin. Twenty-four isolates (10%) exhibited some level of antibiotic resistance: three displayed intermediate resistance and 13 displayed full resistance to erythromycin alone; eight were resistant to erythromycin and clindamycin. Erythromycin-resistance is not associated with any particular clinical manifestation of invasive GAS disease or with a fatal outcome.

Figure 3 shows the percentage of erythromycin-resistant isolates by *emm* type. Since 2007, *emm* types 11, 83, and 92 have accounted for the largest percentage (55%) of the erythromycin-resistant isolates.

Figure 3: Percentage of Erythromycin-Resistant Isolates by emm Type 2007-2011 (N=17)



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 or no reported underlying condition. 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. 2012. Active Bacterial Core Surveillance Report, Emerging Infections Program Network, Group A *Streptococcus*, 2010. Available via the Internet: http://www.cdc.gov/abcs/reports-findings/survreports/gas10.pdf. Accessed 17 Jul 2012.
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.