

Acute Communicable Disease Control Program

Special Studies Report

2008



Los Angeles County
Department of Public Health



Public Health

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ACDC SPECIAL STUDIES REPORT 2008

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CLUSTER OF ENTEROVIRUS INFECTIONS AMONG DAY CARE ATTENDEES

Lauren A. Burwell, M.D.

INTRODUCTION

On November 6, 2007, the Los Angeles County Department of Public Health Acute Communicable Disease Control Program (ACDC) was notified by the infection preventionist at a local children's hospital of a previously healthy 3-month-old male found unresponsive in his crib. One day prior to his death, he had been febrile to 101°F, but no other symptoms were documented. The infant and his mother lived in a residential facility A for young mothers located on the same campus as the day care center that he attended. Eight days after the first report, ACDC was notified of the death of a 4-month-old female also found unresponsive in bed at home by her mother. The second infant and her mother lived in the community and received day care services at facility A.

METHODS AND RESULTS

ACDC immediately began its investigation and performed a site visit to facility A. ACDC staff noted that while the two infants received day care in the same classroom, they were in separate small groups of three infants each with separate dedicated caretakers. Facility A staff reported that several staff members and children at the day care had recent illnesses with symptoms consistent with upper respiratory infections. ACDC recommended that the facility exclude ill children and staff, emphasize handwashing, and encourage appropriate respiratory hygiene/cough etiquette.

At the time of the investigation, six staff members and 25 children were evaluated by their physicians for symptoms that included irritability, cough, congestion, and rhinorrhea. ACDC staff reviewed laboratory testing performed on the ill staff and children. One of the symptomatic children was the 14-month-old brother of the second case. He also attended day care at facility A and was seen in a local ER on November 15, 2007. Serum PCR was positive for enterovirus. Another ill child had a viral throat culture that grew adenovirus. No other respiratory viruses were identified on testing of ill children or staff.

ACDC staff reviewed medical records and laboratory results of the deceased infants. Post-mortem testing of the first case identified *Enterobacter cloacae* and *Acinetobacter calcoaceticus/baumannii* complex in blood culture and nasopharyngeal wash grew *Staphylococcus aureus* and *Acinetobacter calcoaceticus/baumannii* complex. Viral respiratory testing, including influenza, was negative. Post-mortem microbiological testing of the second case was negative for influenza A and B and no organisms were identified on blood cultures.

Final autopsy results on the second case were available in February 2008, and revealed focal myocarditis and focal brainstem encephalitis. The final autopsy report on the first case was available in May 2008, and revealed meningoencephalitis. Upon review of the autopsy findings, specimens were sent to the Viral and Rickettsial Disease Laboratory (VRDL) for additional testing. Real time PCR identified the presence of enterovirus nucleic acid in lung and brain tissue from the first case and from brain tissue from the second case. Serotype assessment is being attempted by VRDL from fixed tissues.

CONCLUSION

There may have been more than one respiratory virus circulating concomitantly in facility A at the time of this investigation. ACDC identified three confirmed cases of enterovirus, one confirmed case of adenovirus, and multiple staff members and children who exhibited symptoms of upper respiratory illness but either did not have viral respiratory testing performed or from whom virus was not identified from the submitted specimen. The two deceased infants were clustered in time and place, but a common etiology of death was not confirmed until additional laboratory testing was performed at VRDL and identified enterovirus. While adenovirus and enterovirus infections may manifest with similar respiratory symptoms, the deceased cases had evidence of encephalitis on autopsy. These cases are similar to the previously described neonatal cases due to Coxsackievirus B1 as seen in Los Angeles County and other sites in the United States (MMWR May 23, 2008).





NOROVIRUS OUTBREAK AT A LARGE SOUTHERN CALIFORNIA UNIVERSITY

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BACKGROUND

On Friday evening, October 3, 2008, the Los Angeles County Department of Public Health (LAC DPH) Acute Communicable Disease Control Program (ACDC) received notification from the student health center (SHC) at a large university of more than 20 students presenting with gastroenteritis symptoms, some of whom had been seen in a local emergency room and admitted to the school's contracted hospital for dehydration. In conjunction with the LAC DPH Environmental Health and Community Health Services, ACDC initiated an epidemiological investigation on Sunday, October 5, 2008, to determine the etiology of the outbreak, risk factors for the disease, and steps needed to prevent further infections.

METHODS

Case Investigation: An outbreak-associated case was defined as an individual who was ill between September 24, and October 13, 2008 with: (1) vomiting and diarrhea or (2) vomiting or diarrhea with two or more of the following symptoms: stomach cramps, nausea, fever, body aches, headache or fatigue or (3) laboratory confirmation of norovirus via RT-PCR. Frequency and distribution of symptoms among cases were calculated. ACDC toured the campus to inspect food venues and interview ill students at the SHC on Sunday, October 5, 2008. A standardized questionnaire was created to interview patients at the SHC and also for phone interviews. Later a web-based questionnaire was created and administered to all students on October 10, 2008. For both questionnaires, students answered questions regarding illness history, eating places and sports or other social events attended from October 1-3, 2008.

Case Risk Analysis: A case-control analysis was performed to identify a possible eating place on campus or sports or social event responsible for the illnesses. Chi-square and Fisher exact tests were used to compare exposures of interest for cases and controls via SAS 9.1 software.

Laboratory Testing: Stool samples were collected from ill students and analyzed in the Public Health Laboratory for enteric bacteria and norovirus using RT-PCR testing methods.

Outbreak Monitoring: ACDC monitored the progress of hospitalized students by receiving updates from the hospital's infection preventionist. ACDC also maintained frequent contact with the SHC, school administration and sports coaching staff to monitor the outbreak and assure containment.

Dining Hall Inspections: The LAC DPH Environmental Health Food and Milk Program (F&M) inspected two major campus dining halls on October 4, 2008 and again on October 10, 2008, to identify any possible food handling violations or ill food handlers.

Sporting Event Surveillance and Prevention Efforts: F&M also conducted investigations of vendors and restrooms at a home football game on October 4, 2008 and again on October 11, 2008 at the university. The LAC DPH Environmental Health, Housing and Institutions Program inspected selected student dormitories on October 4, 2008. The LAC DPH Community Health Services performed an in-service providing health education to fraternity presidents on October 18, 2008.

RESULTS

There were ten sites identified where students could obtain food on campus. ACDC toured three of the larger dining facilities on campus. One of the largest dining facilities is all self-serve style dining where there are many food stations with many food items. ACDC also visited a coffee and packaged snacks facility, and a food court which has several different name-brand vendors. ACDC interviewed 17 students who were discharged from the SHC with acute gastroenteritis on Sunday, October 5, 2008. Symptoms,



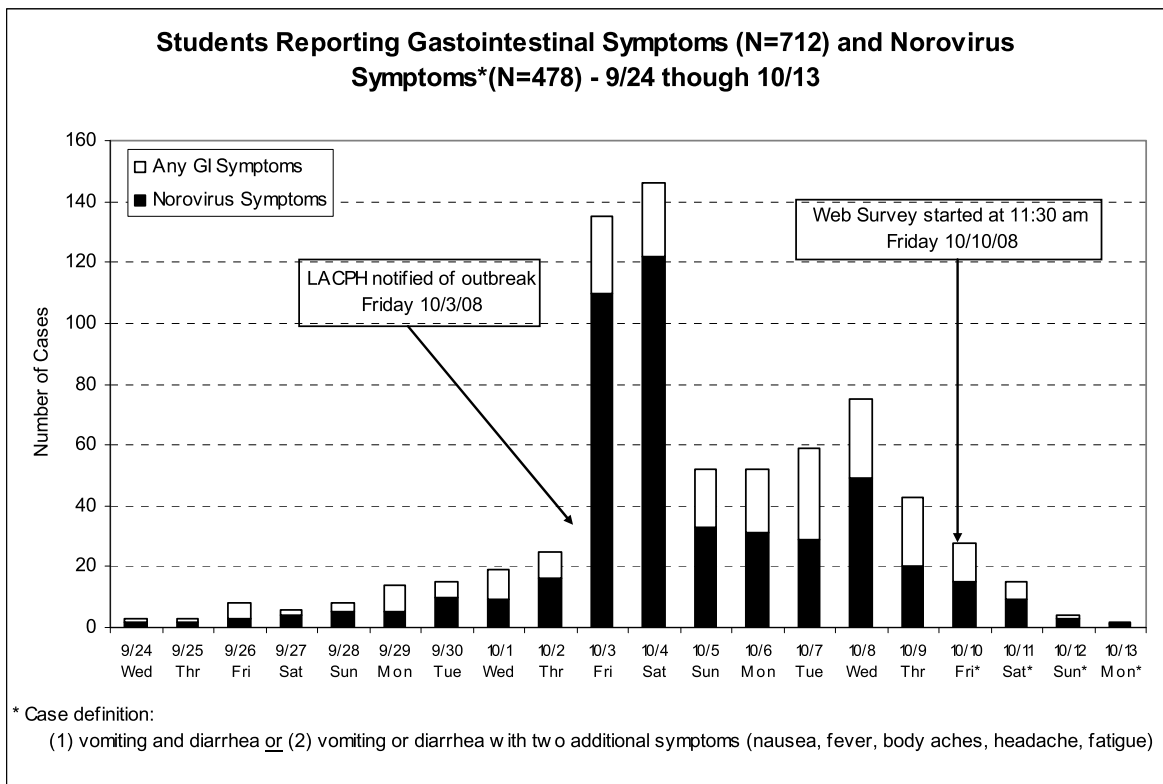
onset times, and possible exposures such as eating places and social events were assessed. The SHC provided ACDC with a list of students ill with gastrointestinal (GI) symptoms in the last week. The SHC was instructed to send stool specimens from several patients to the Public Health Laboratory for viral and bacterial testing. A total of 43 interviews were performed by ACDC; 17 interviews were performed at the SHC with ill students that had visited the SHC and 26 interviews were performed over the telephone using the contact list provided by the SHC.

Thirty-eight ill students fit the case definition. A majority of the cases occurred on October 3, 2008 and October 4, 2008 (n=30), but cases did occur as early as September 26, 2008 and as late as October 8, 2008. Most students reported living on campus (71%) with many residing in one particular dormitory (34%). However, other cases reported living in eight other campus dormitories, indicating that the outbreak was widespread.

Web-Based Case Investigation: Because of the scope of the outbreak, and because most students have access to computers and are familiar with the web, ACDC designed and administered a web-based survey which was sent to all students (N=32,418) inquiring about symptoms and illness history for those reporting illness. The survey was administered on October 12, 2008, and information was collected over five days. Of these students, 5,227 students completed the survey (16%). Students completing the web survey were slightly more likely to be female than the general student population (female 63% versus 49%) and were more likely to be undergraduates (70% versus 49%, $p < 0.01$), but similar in age (mean age 23.1 versus 24.7 years). The demographics of web-based cases (n=440) were very similar to those cases interviewed by ACDC from the SHC (n=38); mean age was 20.4 versus 19.3 years and both groups were 64% female.

Combined Case Investigation: The web-based questionnaires were combined with the earlier questionnaires assessed by phone and in person. In total, there were 712 students reporting GI illness, 478 meeting the case definition, and 4,756 healthy controls identified. Students reported illness onsets from September 24, 2008 through October 13, 2008 (Figure 1). The epidemiological curve indicated a sharp increase in the number of cases on Friday, October 13, 2008, but also indicated a gradual increase in cases in the nine days prior.

Figure 1





A majority of cases were female (64%) and the average age of a case was 20.4 years (Table 1). Cases were just as likely to be an undergraduate student as graduate student (49% versus 51%) and 45% of cases reported living on campus. Cases were identified from almost every dormitory on campus. Cases that occurred prior to October 3, 2008 were slightly older than the students ill on October 3, 2008 (mean age 22.7 versus 19.0), more likely to be an undergraduate student (62% versus 56%) and to reside on campus (48% versus 38%).

Symptoms of cases included nausea (87%), fatigue (83%), vomiting (78%), stomach cramps (73%), diarrhea (70%), headaches (61%), body aches (55%), and subjective fevers (47%) (data not shown). Fourteen percent of cases reported that they were still ill at the time of the interview. The average duration was 2.4 days (range: 1-6 days) with median duration of 2.0 days. One hundred eighty-five students sought medical care, 35 students visited an emergency room, and 10 students were hospitalized. No students died.

Case Risk Analysis: The epidemiological curve of cases reveals an apparent increase in the number of cases that occurred on Friday, October 3, 2008, indicating a possible point source exposed to norovirus during a social event, eating event, or in a restroom (Figure 1). Cases after October 3rd may have also been exposed to the same place or event, but ACDC would expect many person-to-person secondary cases after

October 3rd that would complicate the analysis of the exposures. For this reason ACDC restricted the exposure analysis to cases with illness onset occurring only on Friday, October 3, 2008 (N=94). Because symptoms of norovirus illness typically begin about 24 to 48 hours after ingestion of the virus [1], ACDC limited the analysis of exposures to the previous day October 2, 2008. Controls were selected from healthy students completing the survey (N=4,756).

Cases were just as likely to have eaten at a campus facility as controls (45% versus 50%, p=0.305) (Table 2). Sites where less than 3% of cases reported eating were dropped from the analysis, leaving three of ten sites for the analysis. None of these sites sustained a high attack rate. The analysis of dining place by eating time (breakfast, lunch, dinner) was also performed, but did not revealed any more significant information in regards to a source for this outbreak (data not shown).

Students were asked about any social and sporting events that they attended or participated in from October 1–3, 2008. For the reasons stated previously, only exposures on October 2, 2008 were analyzed among cases ill on October 3, 2008. Sporting events included swimming, football, soccer, softball, tennis, volleyball and marching band. Students were also asked about any fraternity or sorority events attended on these days. None of the events represented more than 4% of the cases (data not shown). The small number of responses may be due the fact that these questions were asked at the end of the survey and students may have not completed the information as requested. In addition to ill students, there were about 70 staff members who were reported ill from the school administration over the outbreak period.

Table 1 - Case Demographics

Demographic	All Cases	Cases ill	Early Cases
	(N=478)	10/3/08	ill 9/24/08 - 10/2/08
	n (%)	n (%)	n (%)
Gender			
Female	304 (64)	78 (71)	38 (76)
Male	171 (36)	31(28)	17 (34)
missing	3(0)	1 (1)	0 (0)
Age			
17	16 (3)	9 (8)	8 (16)
18	206 (43)	70 (64)	9 (18)
19	91 (19)	16 (15)	25 (50)
20-24	108 (23)	10 (9)	7 (14)
25-39	51(11)	3 (3)	6 (12)
40-49	4 (1)	1 (1)	1 (2)
missing	2	1 (1)	0 (0)
	Mean	Mean	Mean
	(95% CL)	(95% CL)	(95% CL)
Mean Age	20.4	19.0	22.7
	(20.0-20.8)	(18.3-19.8)	(21.4-24.6)
Student Level			
	n (%)	n (%)	n (%)
Freshmen	61 (14)	9 (8)	7 (14)
Sophomore	54 (12)	16 (15)	10 (20)
Junior	51 (12)	10 (9)	7 (14)
Senior	57 (13)	11 (10)	7 (14)
Graduate Student	213 (49)	48 (44)	19 (38)
missing	42 (9)	16 (15)	5 (5)
Residents			
Main Campus	199 (45)	42 (38)	24 (48)



Table 2 - Eating Places On Thursday (10/2/08) For Cases with Illness Onset on Friday (10/3/08) and Controls

Meal Eaten From	Attack Rate	Cases (N=94)		Controls (N=4756)		Chi-Square	p-value*
		n	%	n	%		
Fraternity or Sorority House	3%	8	9%	238	5%	1.7	0.12
Any Campus Site (10)	2%	42	45%	2355	50%	1.5	0.35
Site #1	3%	7	7%	215	5%	1.6	0.17
Site #2	3%	20	21%	754	16%	1.6	0.15
Site #3	4%	5	5%	137	3%	1.2	0.16
Other 7 Sites	2%	9	10%	473	10%	0.0	0.92

*Chi-Square testing performed for cell sizes >5, otherwise a Fisher Exact test was used

Laboratory Testing: A total of 14 stool samples were submitted to the Public Health Laboratory for testing. Eight of 14 stools tested positive for norovirus using RT-PCR techniques and were forwarded to California Department of Public Health Viral Rickettsial Disease laboratory for sequence analysis. The eight isolates matched genetically and were assigned to Genogroup 2, cluster 6 (GII.6 Seacroft), a genotype that had not been found previously in California. The earliest laboratory confirmed case had onset on October 3, 2008.

Outbreak Monitoring: Throughout the outbreak ACDC maintained communication with the school administration, SHC and local hospitals. The school administration continually assembled a list of new SHC visits for gastroenteritis, admissions to the contracted hospital, and calls of illness received from students or parents (intelecure) and calls from dormitory staff (residential case). ACDC received frequent list updates and any new reports of illness were graphed by the date the school was notified. Onset dates and symptom details were not reported on these lists, and illness notification dates were not available for 33% of the 492 illness reports received by ACDC. From October 3-10, 2008, the university was notified of 314 reports of GI illness. The first reports occurred on Friday, October 3, 2008, with a majority of reports occurring on Saturday, October 4, 2008 (N=93).

Dinning Hall Inspections: F & M conducted an inspection of the major food facilities on campus on October 4, 2008. These food facilities serve about 1,800 students per day. The food service operation appeared to be well run at the time of inspection. The attendance policy and the time cards of food employees who called in sick or left early due to sickness for the previous week were reviewed. No employees ill with GI illness were identified. The senior managers also stated that they assess (verbal questioning) the employees' health condition prior to their returning to work after an illness. The hand washing facilities were maintained clean, dishwashers in good repair, and open food at buffet was protected from consumers. The "Recommendations for Restaurants with an Outbreak of Norovirus" was reviewed with senior managers on site. Facilities were instructed to use chlorine solutions to sanitize all the surfaces to eliminate norovirus. Canisters of chlorine wipes and hand sanitizers were observed at customer service areas (dormitory lobbies), classrooms, restrooms, and under a tented area where any students could take some free of charge with student identification.

Sporting Event Surveillance and Prevention Efforts: LAC DPH Environmental Health Services (EHS) made a visible presence prior to and during a football game on 10/4/08 at the Los Angeles Coliseum to ensure that all employees at food concession stands were adhering to good personal hygiene practice and all restrooms were maintained clean and sanitary. Los Angeles Coliseum staff were informed of the norovirus outbreak and were advised to pay special attention to any report of GI illness. The coliseum manager stated that he did not receive any calls regarding GI illnesses or unsanitary conditions due to vomit/diarrhea in restrooms and public areas for this event on October 4, 2008. EHS returned to observe a football game on the following week, October 11, 2008. One ill person was identified with GI symptoms at the game and was held in the paramedics room. Vomit was also identified outside of two different restrooms and the janitorial staff were directed to clean and sanitize the affected area.



CONCLUSION

A GI illness outbreak occurred on a large university campus in LAC, with 478 students reporting symptoms and durations consistent with a norovirus infection between September 24, 2008 and October 13, 2008. A majority of cases were confined to a nine-day period (October 3 through October 11, 2008). Stool specimens from ill students tested at the Public Health Laboratory confirmed the outbreak etiology as norovirus. The Centers for Disease Control and Prevention (CDC) confirmed the norovirus strain as Genogroup 2, cluster 6 (GI.6 Seacroft), the first detection of this strain in California. The first lab confirmed case had symptoms onset on October 3, 2008. A majority of the cases were reported on Friday, October 3, 2008 and Saturday, October 4, 2008, indicating that some highly frequented place (restroom, study lounge), event (eating, sports or social), or contact surface may have served as a point of distribution for the virus from a few ill students to a large number of students on Thursday, October 2, 2008. Norovirus has a human reservoir and can be found in the stool or vomitus of infected individuals. Transmission occurs from ingestion of the virus, either by direct person-to-person contact, or via food or vomite contamination. The case-control analysis of student eating locations and events attended on Thursday, October 2, 2008, did not identify a particular risk factor for illness in this outbreak. ACDC could not rule out a possible foodborne source, but the outbreak was most likely due to the person-to-person spread of norovirus on a campus setting originating from the community. Intervention and education efforts by ACDC, Environmental Health, Community Health Services and the school administration were successful in containing the outbreak to nine days, and preventing the spread of this very contagious illness to a large university population.

LIMITATIONS

The results of food analyses are limited by the large number of possible eating venues and eating times for cases. Students answered questions about exposures that occurred one week earlier, which may have introduced some recall bias. As the web survey was anonymous, duplicate submissions could not be excluded from the analysis.

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SALMONELLA JAVIANA OUTBREAK AT A MULTI-SITE PRESCHOOL PROGRAM

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BACKGROUND

Acute Communicable Disease Control Program (ACDC) of Los Angeles County (LAC) Department of Public Health (DPH) was notified on October 16, 2008 by the Infection Preventionist (IP) at a local hospital of a cluster of ill persons admitted with gastrointestinal (GI) symptoms. A second call was received from the same IP of additional persons ill on October 17, 2008 and all ill persons had contact with multi-site preschool program centers. ACDC discovered by October 17, 2008 that five centers had staff with illness (N=23) and four centers had children with an undiagnosed GI illness. ACDC concluded that this was an outbreak in need of further investigation, as it involved a large number of ill persons connected in time at multiple operating sites of this organization, and furthermore may be deemed a critical incident as it involved young children. ACDC became the lead investigator and notified LAC DPH administration. On October 17, 2008 it was discovered that LAC DPH Community Health Services (CHS) had already been working with one of the sites as a community outbreak and efforts were coordinated.

METHODS

Case Definition: An outbreak-associated case was defined as an individual employed by, attending, or with contact to a person associated with the multi-site preschool program who was ill between October 13, 2008 and November 4, 2008 with: (1) fever and diarrhea; or (2) fever or diarrhea with two or more of the following symptoms: nausea, vomiting, body aches, headache or fatigue; or (3) laboratory confirmation of *Salmonella* Javiana.

Case Investigation: ACDC made a site visit to view the central kitchen and interview all staff at the kitchen on October 17, 2008. A standardized questionnaire was created to interview the ill kitchen staff; those not available in person were interviewed by telephone. All kitchen staff were required to submit stool specimens for culture. For surveillance at the preschool program sites, line lists were created to collect summary data on ill persons first by the program site and then a line list was created for individuals at each site. CHS Public Health Nurses conducted the site-specific surveillance. ACDC heightened surveillance by contacting local hospitals in affected areas asking them to report cases of salmonellosis immediately by phone. Frequency and distribution of symptoms among cases were calculated.

Case Control Study: A case-control study was performed only of staff and volunteers (excluding food workers), since adults are capable of providing their food history. A questionnaire on food history, symptoms and onset dates was developed, lists of all staff and volunteers at each preschool program site were obtained and interviews were conducted by phone. Data was analyzed using SAS 9.1 software.

Public Health Laboratory Testing: *Salmonella* isolates from private laboratories were submitted to the LAC Public Health Laboratory (PHL) for confirmation and serotyping. The testing scheme instituted required stool testing in the PHL of all employees from the central kitchen (including administrative staff), preschool teachers, aides, and volunteers at all preschool program sites regardless of symptoms. Symptomatic children were tested by PHL only if someone in their household was noted to be working in a sensitive occupation or situation (SOS). Food from the implicated meal on October 14, 2008 was sought for culture. Rodent feces collected from the central kitchen and nearby exterior sites were collected for culture.

Outbreak Monitoring: ACDC monitored the outbreak progress by receiving daily updates from the affected LAC Service Planning Areas (SPA). ACDC maintained frequent contact with the preschool program administration and LAC SPA staff to monitor case ascertainment and assure outbreak containment. Asymptomatic children and those who had recovered who did not have SOS in the



household, were allowed to attend preschool. Children with SOS in the household had to undergo stool clearance as per the usual protocol.

EH Inspections: The LAC Environmental Health Food and Milk Program (F&M) inspected the preschool program central kitchen on October 17, 2008, and on several subsequent dates for food handling violations or ill food handlers, to provide education, and make recommendations. Meal preparation was reviewed and food source records were obtained.

The Vector Management Program from the LAC Environmental Health also conducted a rodent inspection because of evidence of rodents inside and outside of the central kitchen building. Rodent dropping samples were submitted for culture at the LAC PHL.

RESULTS

Case Investigation: This outbreak of *Salmonella* Javiana affected 28 preschool sites. One site made a report of illness on October 15, 2008. On the same day, multiple preschool sites were queried and numerous students and staff were reported ill. A comprehensive survey of the 28 sites identified cases of gastroenteritis in all but one location.

All food is prepared at a central kitchen and delivered in bulk to the preschools where site staff serve breakfast, lunch and snack in a family style. The breakfast is a cold meal delivered the day before and refrigerated. Lunch is prepared starting the afternoon before and usually is a hot entrée served shortly after delivery. The food is measured out in bulk, packaged for transport at the central kitchen and delivered to each site, where it is served family style by the teachers for each student.

There were 594 people that met the case definition, including 438 children, 144 staff and volunteers, and 12 kitchen employees (Figure 1). Cases presented with diarrhea, fever, nausea, cramps, vomiting, headache, chills and body aches (Table 1). Demographics of cases are presented in Table 2. There were 308 cases confirmed to have *Salmonella* Javiana; the remaining 286 were presumptive cases (Table 3). There were ten secondary cases included in the above totals. A total of 30 cases were hospitalized, four adults and 26 children; there was one case of bacteremia and no deaths.

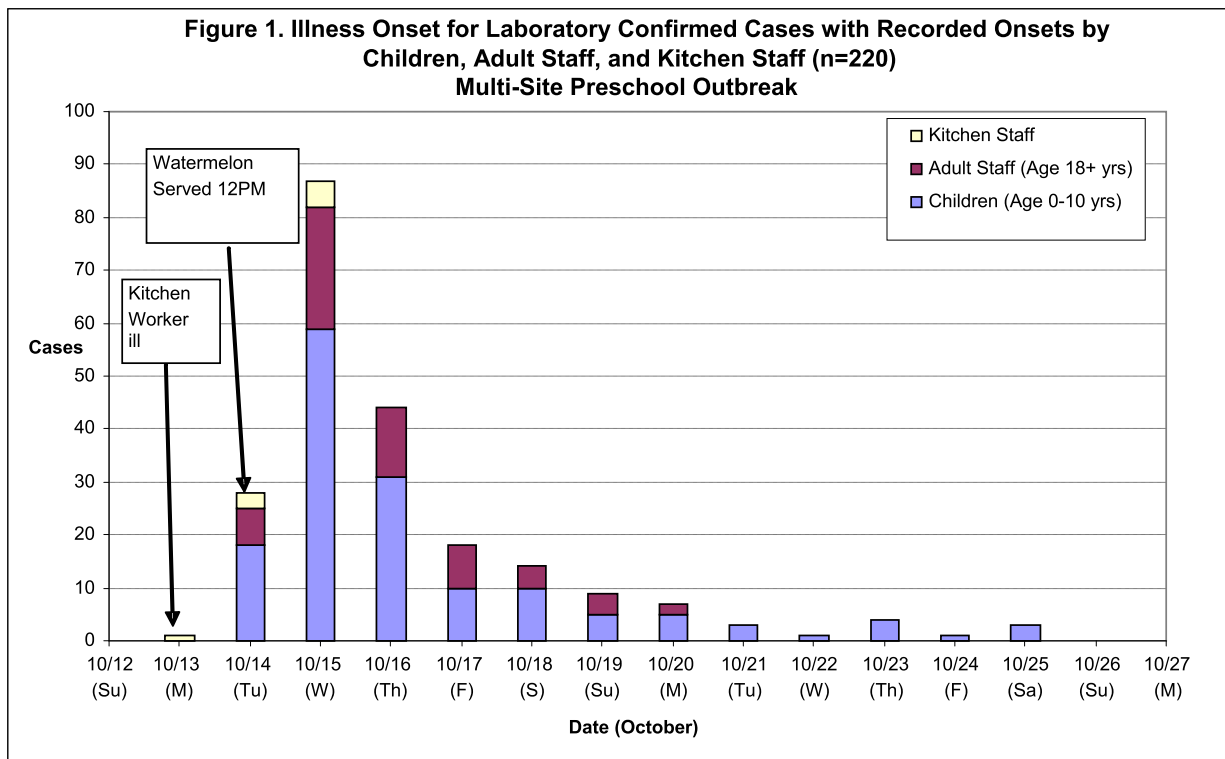




Table 1. Symptoms of Children and Staff (N=454)						
Multi-site Preschool S. Javiana outbreak						
	Children		Adults		Total	
	n	Percent	n	Percent	n	Percent
Total reporting symptoms	386	100%	66	100%	454	100%
Symptoms						
Diarrhea*	380	98%	66	100%	446	98%
Fever	347	90%	39	59%	386	85%
Cramps	315	82%	60	91%	375	83%
Vomiting	265	69%	34	52%	299	66%
Nausea	232	60%	48	73%	280	62%
Chills	226	59%	37	56%	263	58%
Symptoms duration**					Mean	Range
Duration (days)					5.0	1-18 days

*6 lab conf child cases with GI or fever symptoms excluding diarrhea (2% of total)

** Children only (n=332)

Table 2. Demographics of Cases (N=594)		
Multi-site Preschool S. Javiana Outbreak		
Age (years)	n	Percent
1-2	4	1%
3-4	420	71%
5-9	13	2%
10-19	5	1%
20-39	77	13%
40-59	69	12%
60+	6	1%
Gender		
Male	219	37%
Female	375	63%

Thirteen central kitchen staff were positive by stool culture for *S. Javiana*. Interviews revealed that an ill food handler came to work on Monday, October 13, 2008. This person cut up watermelon that day to be served the next day. One employee from an office adjoining the kitchen was not a food worker and did not eat food from the central kitchen but did assist this ill food worker by holding her hands and steadying her as she was leaving the toilet on October 13, 2008; she became a case on October 14, 2008. Some of the other kitchen staff who became ill later during the week continued to work despite having paid sick leave.



Children confirmed	177
Children presumptive	261
Adults confirmed	120
Adults presumptive	24
Kitchen staff confirmed	12
Kitchen staff presumptive	0
TOTAL	594

Environmental Health Investigation: On October 17, 2008, the central kitchen was inspected and closed for evidence of rodents. Three follow-up inspections were conducted to ensure that recommendations and mitigation measures were being followed. All preschool sites also voluntarily closed for cleaning on October 17 to 21, 2008. The central kitchen reopened after remediation which included disinfection and thorough cleaning with bleach and rodent control. Kitchen staff also received written, personal and group education on salmonellosis, good hygiene and food safety.

Case Control Analysis: A case control study of preschool staff (excluding food workers) was conducted. There were 255 employees that answered the case-control study questionnaire. Questions included basic demographics, symptoms, work location, days worked and food, meals and days eaten. In all there were 66 employees that complained of symptoms that were consistent with salmonellosis. There were 102 employees who were laboratory confirmed. The cohort was 95% female (n=239) with an average age of 40 years (Table 4). The study compared cases (employees with laboratory confirmed *Salmonella* Javiana) to controls (employees with no symptoms and no laboratory test or negative laboratory test for *S. Javiana*). This analysis revealed that those who ate on Tuesday had a statistically significant risk of being a case ($p=0.04$) and had an attack rate of 82%. Ninety percent of the cases ate on Tuesday, but no specific meal eaten on Tuesday reached statistical significance ($\alpha=0.05$), although eating breakfast had borderline statistical significance ($p=0.0502$). In addition, no individual food item reached statistical significance, although milk came close ($p=0.0563$).

	Total	Confirmed Cases
Total (%)	255 (100)	89 (100)
Male	15 (6)	2 (1)
Female	239 (95)	87 (99)
Mean Age (year) (SD)	40 (12)	40 (11)

Community Health Services: All preschool sites were visited multiple times by public health nurses who offered education, collected data, and collected stool specimens for screening and sensitive occupation clearance activities (stool cultures) for all staff including teachers, volunteers, food workers and selected children who had sensitive occupation in the household.

Public Health Laboratory: There were 308 cases confirmed to have *S. Javiana*. The PFGE profile of the isolate was compared to other *S. Javiana* isolates in Los Angeles and the national PulseNet database, and was found to be unique. There were no other clusters of this PFGE pattern in the US at the time of the outbreak. Rodent feces collected by Vector Management inside and outside the premises of the central kitchen were negative on culture for *salmonella*.



LIMITATIONS

There may have been recall bias since adult staff and volunteers were interviewed two to three weeks after the outbreak. ACDC was unable to interview most children's families to confirm onset dates and symptoms; since small children are unable to give an accurate food history, they were not included in the case-control study. Language and cultural differences between interviewers and cases may have created barriers, as most children were from poor Hispanic families that were only Spanish-speaking. Kitchen staff were hesitant to disclose their symptoms when interviewed prior to stool specimen collection.

DISCUSSION

A very large salmonellosis outbreak caused by *Salmonella* serotype Javiana occurred in LAC during October 2008 at a multi-site preschool program. There were 594 cases, including 437 children, with most cases occurring between October 14 and 18, 2008. The first laboratory-confirmed case had onset of symptoms on October 14, 2008 and the last case on November 4, 2008 (a secondary case). A case-control study of staff indicated that the most likely source was a meal served on Tuesday, October 14th. The lunch meal on Tuesday included fresh watermelon that was cut up Monday afternoon by a food worker who was working while ill with diarrhea. Other kitchen staff became ill later in the week, presumably from consuming contaminated food themselves. Since many of them continued to work with food, additional contamination may have occurred on other days. It was disconcerting that ill food workers stayed on the job despite having a benefits package that includes sick leave.

Salmonella can survive and propagate on cut fruit, especially if it is not promptly cooled and kept cold. This particular serotype, Javiana, is an unusual serotype and it had a unique PFGE pattern not found before in the US. This outbreak appeared to have a prolonged incubation period for some cases. It is possible that some of the children included as part of the initial outbreak were actually secondary cases. However, in other outbreaks where a low dose of *salmonella* is in the source product, incubation may be as long as 18 days. It is plausible that some individuals were exposed to high doses with a short incubation, while others ate a lower dose, and thus took longer to develop symptoms.

Numerous control measures were taken including closing the kitchen and the preschool sites for terminal cleaning, removal of ill food handlers until cleared of infection, and recommendations for better hand hygiene were made. Considering the large number of cases, control measures appear to have been very effective in preventing further spread of salmonellosis, as only ten secondary cases were discovered after October 23, 2008.

State regulations require specific follow-up for cases with sensitive situation (California Code of Regulation, Title 17, Section 2612). Preschool is considered to be a sensitive situation. ACDC was able to conduct clearance on all those who prepared or served food to the children, including all teachers and aides. Because of the very large number of children (1639 enrolled at the time of the outbreak), clearance procedure for the children was modified. Clearance was required for those who had been symptomatic and had SOS in the household. This action was discussed and approved by California DPH. There were no apparent secondary cases from the preschool, and ten persons became ill from contact within the household to cases.

PREVENTION

A number of actions were taken by Public Health in order to prevent further transmission, even at the time when the cause of the outbreak had not been determined. These included:

1. Closure of preschool classes at all locations for environmental cleaning of the facilities.
2. Closure of the central kitchen by DPH Environmental Health for cleaning, health education and rodent abatement.
3. Stool culture screening with removal of infected staff, especially kitchen staff.
4. Removal of ill children from classes until recovered from diarrheal symptoms (note that most ill children were not culture confirmed unless their households included someone involved in a sensitive occupation or situation).



5. Exclusion from work and culture clearance of anyone working in a sensitive occupation or situation residing in case households.
6. Provision of a draft letter to be used to inform parents, plus additional technical information to help answer parents' questions.
7. Distribution of information about the control of norovirus and salmonellosis to the directors of all the multi-site preschool program centers, including brochures and letters with specific recommendations.
8. Presentations by LAC DPH Community Health Services staff to provide health education to staff at each site prior to reopening on October 21, 2008.

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SEVERE ENTEROVIRUS INFECTION – LOS ANGELES COUNTY, 2007 AND 2008

Kanta Sircar, PhD, MPH and Laurene Mascola, MD, MPH

INTRODUCTION

Enteroviruses generally cause mild disease, however, neonates are at higher risk for severe illness because of the immaturity of their immune systems. The Los Angeles County (LAC) Department of Public Health (DPH) began an investigation of three cases of neonatal enteroviral infection with associated myocarditis during the months of July and August, 2007. All infants were diagnosed while in the neonatal intensive care unit. Two infants died. Two infants were confirmed to have Coxsackievirus B1 (CVB1) in their cerebral spinal fluid (CSF). The third infant was enterovirus positive by PCR, but the specimen was not saved for additional subtyping. In all three cases, the mothers were febrile at the time of birth. There are no known epidemiological associations among the three cases.

The states of Alaska and Illinois also reported temporally similar findings of severe enteroviral infections [1]. These deaths were the first due to (CVB1) reported to the National Enterovirus Surveillance System (NESS). It was also the most prevalent enterovirus reported that year to the NESS.

In 2008, LAC DPH initiated a surveillance project to understand the scope of severe enterovirus related disease in LAC. Its purpose was to describe the conditions and serotype of children who are admitted and found to be enterovirus positive. To accomplish this objective, the demographic, clinical and epidemiologic characteristics of all enteroviral cases aged <18 years who sought medical attention in 2007 and 2008 and were hospitalized or deceased, were identified. Their serotypes were described.

METHODS

In 2007, initial cases were identified by physician notification during June through December 2007, which was followed by active case finding for patients aged <18 years. Hospitals were asked to report cases. Cases where patients were hospitalized with severe disease (e.g., myocarditis, or required care in a pediatric/neonatal ICU, or died and had positive enterovirus laboratory results). Hospitals reporting the cases completed a reporting form.

In 2008, a health alert notification (HAN) was sent to all hospitals requesting them to report cases aged less than 18 years old, who died, had severe disease or admitted to the pediatric/neonatal ICU and had positive enterovirus laboratory results. Hospitals with cases completed a reporting form, submitted relevant medical record information and submitted specimen or isolates to the LAC public health laboratory (PHL).

Medical records were collected and abstracted. Death certificates were reviewed. Cases were reported in electronic disease reporting system—Visual Confidential Morbidity Reporting (VCMR) system. Access was used to manage the data and SAS was used to analyze the data.

RESULTS

In 2007, eight hospitals reported 46 cases from June through December 2007. Thirty-nine cases met the case definition for that year. In 2008, 12 hospitals and the coroner's office reported 68 cases during 2008. Four enterovirus positive cases were not included because they were over the age of 18 years. Thirty-seven patients were not admitted to the pediatric/neonatal ICU. For example, 18 patients were admitted in hospitals that do not have pediatric/neonatal ICUs. Therefore, only 27 patients met the case definition in 2008.

Table 1 describes the characteristics of cases from 2007 and 2008. Both years, viral meningitis was the most common diagnosis. In 2008, three cases were diagnosed with fever and enteroviral infection and two cases died. Both death cases were older than seven days old. There were also no cases diagnosed



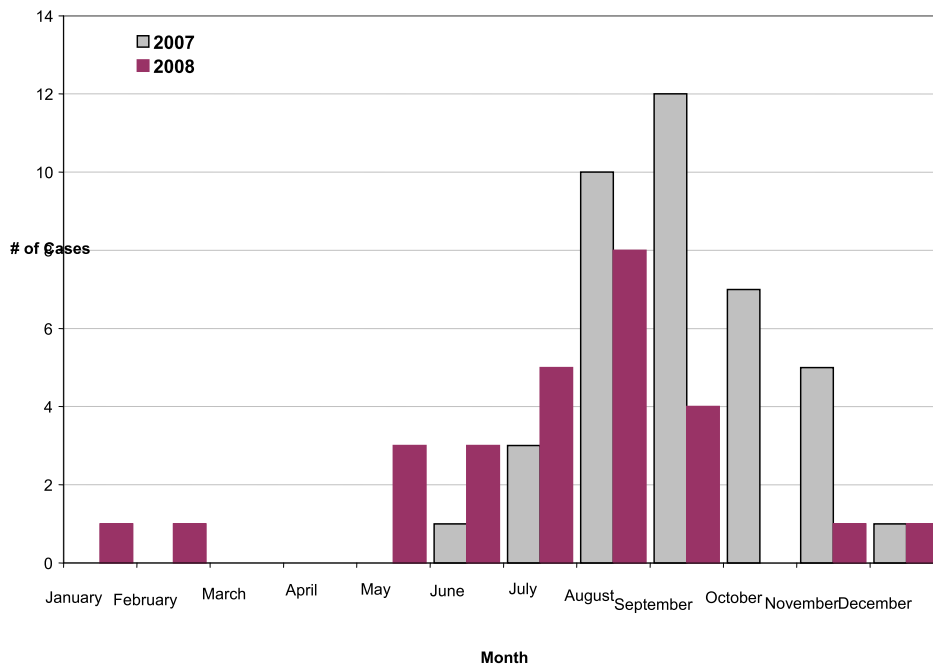
with myocarditis. In 2007, there were more deaths and there were cases with myocarditis. As the epidemiologic curve (Figure 1) demonstrates, most cases were diagnosed in August, with cases occurring throughout the year.

Table 1: Comparison of Characteristics of Reported Cases of Enteroviral Infections 2007 and 2008

	2007	2008
Reporting Period	June to December 2007	January to December 2008
N	39	27
Female N (%)	24 (62%)	11 (41%)
White N (%)	28 (90%)	10 (37%)*
Age (median, range)	24 days (1 day-14 years)	27 days (1 day -15 year)
Perinatal cases (aged < 7 days)	10 (26%)	15 (56%)
Death	4 (10%)	2 (7%)
Myocarditis	11 (28%)	0 (0%)
Meningitis	30 (77%)	22 (82%)
Febrile illness only	5 (13%)	3 (11%)

*37% of cases have unknown race.

Figure 1: Epidemiologic Curve of Enteroviral Infection Cases in 2007 and 2008



Compared to 2007, there were less cases than in 2008. In 2008, cases were more likely to be male. In 2008, cases were also older—average age of four years compared with average age of 24 days in 2007.



Race is difficult to compare because in 2008, 37% of the cases did not have a race listed or it was categorized as unknown.

Specimens: 17 specimens that were positive for enterovirus by PCR were typed by the LAC PHL. The most prevalent type was Echovirus 4 (n=12), followed by Echovirus 9 (n=2). There were one specimen each of Coxsackievirus B4, Coxsackievirus B6 and Echovirus 30. The two cases that died were enterovirus positive by PCR but they were not able to be typed.

DISCUSSION

In 2007 and 2008, LAC conducted surveillance projects to understand the scope of a cluster of pediatric severe neonatal enteroviral cases discovered in LAC in 2007. As enteroviruses are not reportable in LAC, there is no background rate for comparison. As the epidemiologic curve demonstrates, summer is when the number of cases peak. Therefore, in 2007, the majority of cases for that year are considered to be captured although the surveillance did not begin until June.

There were more cases in 2007 compared to 2008. Cases in 2007 had more deaths and were diagnosed with severe conditions such as myocarditis. CVB1 which was associated with deaths in neonates in 2007 was not identified in any case specimens in 2008. One reason for the difference in severity from 2007 to 2008 may be the presence of this enterovirus. However, CVB1 may have been present but not detected, as cases were confirmed by PCR only, and few were subtyped.

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ANALYSIS OF GIARDIASIS TRENDS IN GLENDALE HEALTH DISTRICT, 2005-2007

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BACKGROUND

Giardia lamblia is a flagellated protozoan parasite that colonizes the small intestine and causes giardiasis. Infection begins when a cyst is ingested by a host; subsequent exposure to acids in the stomach leads to the excystation into trophozoites in the small intestine, where they can cause diarrhea [1]. Exposure to biliary fluid causes some of the trophozoites to form cysts which are excreted in feces, and if poor hand hygiene practices exist can then infect others. Travel to foreign countries, contact with diapered/incontinent children and adults, and outdoor exposure constitute some of the main risk factors for infection with giardiasis [2]. In Los Angeles County (LAC), giardiasis is a reportable disease that is investigated by public health nurses in the 23 health districts within the county.

Prior to 2005, the number of giardiasis case reports was in a steady decline in LAC. With a peak incidence of 8.6 cases per 100,000 persons in 1997, incidence decreased to 3.4 cases per 100,000 persons by 2004. However, beginning in 2005, giardiasis incidence increased by 40% from 3.27 per 100,000 in 2005 to 4.55 per 100,000 in 2007. While giardiasis is endemic to LAC, this increase in reports warranted further investigation. Of all the 23 health districts in LAC, a greater proportion of cases were reported from residents within the Glendale Health District (GHD). In 2007, 87 (20%) cases were reported from the GHD, compared to 23 cases (8%) in 2005. An investigation was initiated to determine the reasons for a three-fold increase in reported giardiasis cases during this three-year period and why cases were localized to GHD. In addition, a review of the Refugee Health Assessment Program (RHAP) parasitic disease screening practices was done in conjunction. The review was done to explore the role of immigration in giardiasis trends.

METHODS

Case Definition: a confirmed giardiasis case was defined as having positive laboratory criteria with the detection of the *Giardia* cysts or trophozoites by light microscopy in a stool specimen and a completed case investigation form.

Los Angeles County Department of Public Health Acute Communicable Disease Control Program (ACDC) reviewed all giardiasis case reports from GHD reported between 2005 and 2007. Additionally, a random sample of 75 giardiasis cases who had residence throughout LAC (excluding GHD) and were reported in 2007, were reviewed as a comparison group. Demographic, clinical and epidemiologic variables were taken from the Parasitic Epidemiology Case History form (T-102) and entered into an Access database. ACDC compared the demographic data for all cases from GHD by year of report. ACDC also compared various epidemiologic and clinical risk factors for 2007 cases from GHD versus 2007 cases from the random county sample.

Data Analysis: Chi-square analysis and the Wilcoxon rank-sum test were used to determine differences. Analysis was performed using SAS 9.1 software.

Refugee Health Assessment Program (RHAP) Site Visit: As part of the investigation into the increase in giardiasis cases within the GHD, ACDC made a site visit to the Hollywood-Wilshire RHAP to gain a better understanding of the parasitic disease and health screening process, specifically what refugee populations are served and what communicable disease protocols are used.

The screening protocols for all refugees was reviewed, including all screening tests performed for chronic and acute communicable diseases, as well as lifestyle and mental well-being assessments.



RESULTS

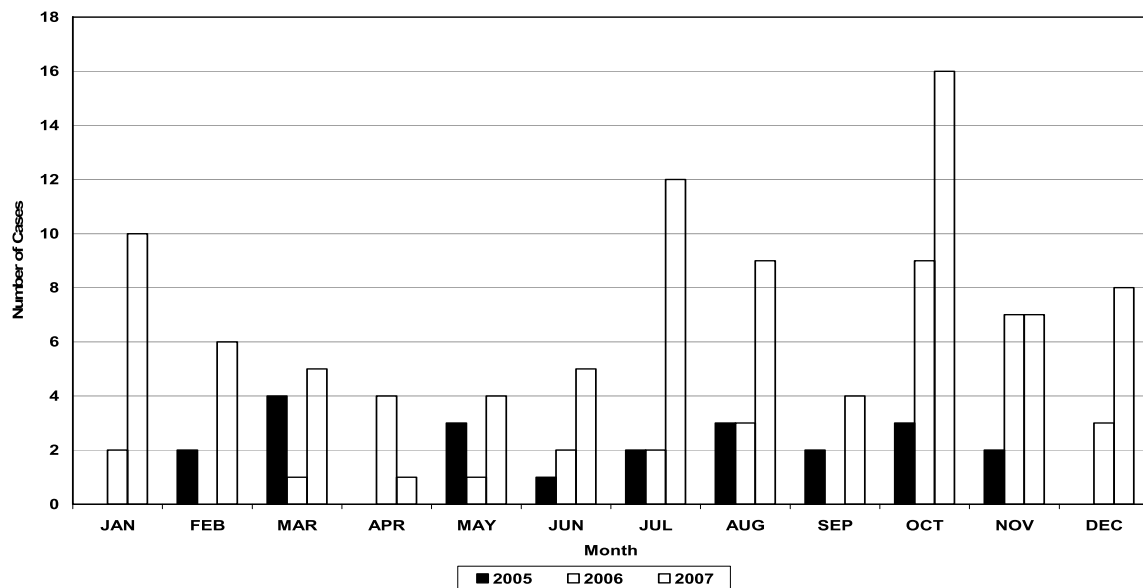
Demographics in total 143 giardiasis cases were identified from 2005-2007—23 occurred in 2005, 34 in 2006 and 87 in 2007. Most cases were male, comprising 57% of cases in 2005, 65% in 2006 and 74% in 2007. White cases made up 87-90% from 2005-2007. The median age of cases increased during the 3-year period from 21 (range: <1-73) in 2005 to 28 years of age (range: <1-80) in 2007 (Table 1). Stratifying by age group, in 2005, the 5-14 year-old group had the largest proportion of cases, 33%, whereas in 2006 and 2007, the 15-34 year-old age group had the largest proportion of cases, 30% and 45%, respectively.

	2005 n=23 (%)	2006 n=34 (%)	2007 n=87 (%)
White (non-Hispanic)	18 (87)	30 (88)	78 (90)
Hispanic	2 (10)	3 (9)	5 (6)
Black	-	-	1 (1)
Asian	1 (5)	-	2 (2)
Median age (years)	21	33	28
Age range (years)	<1 – 73	4 – 72	<1 – 80
Male	12 (57)	22 (65)	64 (74)

Seasonal Trends

Peak seasonality of GHD cases was consistent with the usual distribution seen in LAC with peak reports noted from late summer to early fall. A departure from the trend is noted in 2005 when a number of cases reported peaked in March, with 18% of cases. Cases reported from GHD in 2006 and 2007 (Figure 1) had a consistent peak in the number of cases in October, with 26% and 19%, respectively.

Figure 1. 2005-2007 Glendale Health District Giardiasis Cases





Clinical Presentation of Cases

Over 50% of Glendale cases reported no symptoms with the proportion of asymptomatic cases ranging from 11 (52%) in 2005 to 49 (57%) in 2007. In 2007, the most frequently reported symptoms were abdominal cramping (16, 40%), bloating (16, 40%), gas (22, 55%) and fatigue (20, 50%). The median numbers of symptoms reported during 2005-2007 were 2, 0.5, and 2 respectively, reflective of the few cases that reported experiencing any symptoms.

Refuge Health Assessment Program (RHAP)

As part the assessment, each refugee is required to submit three stool samples for ova and parasite screening within three months of entering the country as part of their visa requirements, even if they are clinically asymptomatic. Of note, many refugees enter the US via a resident country, which is not their country of origin, where they can live for up to a year waiting for visa paperwork to process [3]. The majority of refugees in the GHD are from Iran; Austria is the most frequently reported resident country.

Risk Factors

Risk factors reported by Glendale cases over the three year period changed significantly from 2005 as compared to 2006 and 2007. Examining immigration as a risk factor found that over the course of three years, proportions of immigrant cases ranged from 68% in 2005 to 92% in 2007 ($p=0.003$). In 2005 contact with animals accounted for 18% of reported exposures, the most frequently reported by all cases excluding immigrant status (Table 2). However, in 2006 and 2007 the most frequently reported exposure was travel to another country.

After excluding cases that did not meet the definition of travel exposure from analysis, travel still emerged as the most commonly reported exposure for 2006 (35%) and 2007 (41%). Other exposures that were consistently found to be reported included: contact with animals and outdoor activity such as hiking and swimming. While contact with animals stayed relatively consistent over the 3 year period, outdoor exposure increased from 14% of cases in 2005 to 29% and 27% in 2006 and 2007, respectively.

Table 2. Most Frequently Reported Risk Factors, Glendale 2005 - 2007				
	2005 n=22 (%)	2006 n=34 (%)	2007 n=87 (%)	p-value
Travel	3 (14)	10 (29)	27 (31)	< 0.001
Outdoors	3 (14)	10 (29)	23 (27)	0.61
Contact with Animals	4 (18)	6 (18)	18 (21)	0.75
Immigrant	15 (68)	25 (74)	79 (92)	0.003

Random Sample Comparison

Comparing the 2007 GHD cases to a random sample of LAC cases from 2007, there were no significant differences in the median age and proportion of male cases. However, the race/ethnicity differed compared to the LAC sample with 36% Hispanic cases in the LAC sample and 6% in the Glendale cases (Table 3). Although there was no significant difference between the median ages among GHD cases and the random sample, the age of Glendale cases were more evenly dispersed over all age groups while a large proportion of GHD were in the 15-34 year-old age group; 44 %, compared to 22 % in the sample.



	Glendale n=87 (%)	Random n=75 (%)	p-value
White (non-Hispanic)	78 (90)	35 (47)	< 0.001
Hispanic	5 (6)	27 (36)	< 0.001
Black	1 (1)	3 (4)	0.2
Asian	2 (2)	4 (5)	0.4
Median Age (years)	28	31	0.31
Age Range	<1 – 80	1 – 78	-
Male	64 (74)	48 (65)	0.23

GHD cases had significantly fewer clinical symptoms associated with giardiasis compared to the random sample. The 2007 countywide sample had 19% reporting asymptomatic infection, whereas cases from GHD had 58%. Abdominal cramping ($p<0.001$), acute diarrhea ($p<0.01$), chronic diarrhea ($p=0.02$), fever ($p=0.01$) and weight loss ($p<0.01$) were more frequently indicated as symptoms among countywide cases than among Glendale cases. The median number of symptoms reported by the 2007 countywide and Glendale cases was also very different. Countywide cases reported a median of 3 symptoms, compared to the 2007 Glendale cases that reported a median of 1 ($p<0.001$).

Cases from Glendale had a significantly higher proportion of immigrants, 79 cases (92%) compared to 21 (29%) cases in the random sample ($p<0.001$). Most immigrants in the random sample were from Mexico (33%) whereas cases from GHD were from Iran (68%). A greater proportion of immigrants from GHD were refugee/asylees who had immigrated to the US within the six months prior to their diagnosis, compared to the immigrants in the LAC sample that had been in the county longer. Travel was a frequently reported risk factor among both groups, with 40% of cases from GHD and 22% of the LAC sample reporting this exposure ($p=0.02$.)

GHD cases reported a smaller proportion of animal contact as a risk factor compared to the random sample of LAC cases, 21% versus 36 % cases, ($p=0.04$). The majority of animal contact reported was with domesticated animals at home. The proportions of cases reporting an outdoor exposure such as hiking, drinking untreated stream water and fishing were not statistically significantly different among the two populations (Table 4).

	Glendale n=87 (%)	Random n=75 (%)	p-value
Immigrant	79 (92)	21 (29)	< 0.001
Travel	34 (40)	16 (22)	0.02
Outdoors	23 (27)	17 (23)	0.62
Animals	18 (21)	26 (36)	0.04



DISCUSSION

From 2006-2007, a large increase in giardiasis cases was observed compared to 2005 with the majority of cases being reported by individuals who resided in the GHD. ACDC found the increase was most likely due to increasing numbers of immigrants to this particular HD from countries where giardiasis is endemic. Furthermore, the RHAP's policy of conducting ova and parasite screening on all refugee entrants to the LAC would have contributed to this increase noted in GHD. Testing for the parasite in all refugees would detect large numbers of asymptomatic infections that would not have otherwise been diagnosed.

A major limitation of this investigation was data quality. Incomplete and blank T-102 forms were submitted for many cases from GHD and throughout LAC, missing clinical symptoms and/or exposure information. Language could have been a barrier to conducting complete interviews. Another limitation was a misunderstanding of risk factors among the Public Health Nurses who were completing the epidemiologic case history form; the same errors were seen frequently in the case history forms from the GHD. A recurrent error was the reporting of travel as a risk factor for refugee immigrant cases, when in fact the case had entered the US from a resident country. The evaluation of case history forms submitted from GHD revealed that the staff completing the T-102 form had incorrectly marked travel as a risk factor when actually immigrant status was the true risk factor.

CONCLUSION

After analysis of risk factor information revealed issues with many areas of the form, ACDC determined a revision in the case history form was warranted. The travel risk factor was a major source of misunderstanding for the nurses completing the forms for the immigrant/refugee cases. These individuals had traveled in the previous six months, however it was to enter the US, and not recreational travel from the US to another country as it is currently defined. After the completion of this investigation, the following was done by ACDC:

1. The definition was revised to make clear to the person completing the epidemiologic case history form that it was to capture information on individuals currently residing in the US that travel to another country.
2. Due to the risk factors associated with different immigrant, refugee and asylee immigration categories, a revision was also completed on the immigrant risk factor to obtain additional risk factor information. It was expanded to include a designation for refugee and asylee, as well as what resident country they lived in before immigrating to the US.

In conclusion, this study demonstrated that the increase in cases reported from the GHD is due to the RHAP's active screening process. As a result of this screening, many individuals with asymptomatic *Giardia* infections are being treated unnecessarily. Screening with ova and parasite should be limited to refugees who are clinically symptomatic, or have certain laboratory features warranting further work-up for parasites such as iron deficient anemia or abnormal liver enzymes or have immigrated or spent time in refugee camps with intestinal parasites that are a known public health threat.

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ANTIBIOTIC RESISTANT TYPHOID FEVER ASSOCIATED WITH TRAVEL TO INDIA LOS ANGELES COUNTY, 2000-2004

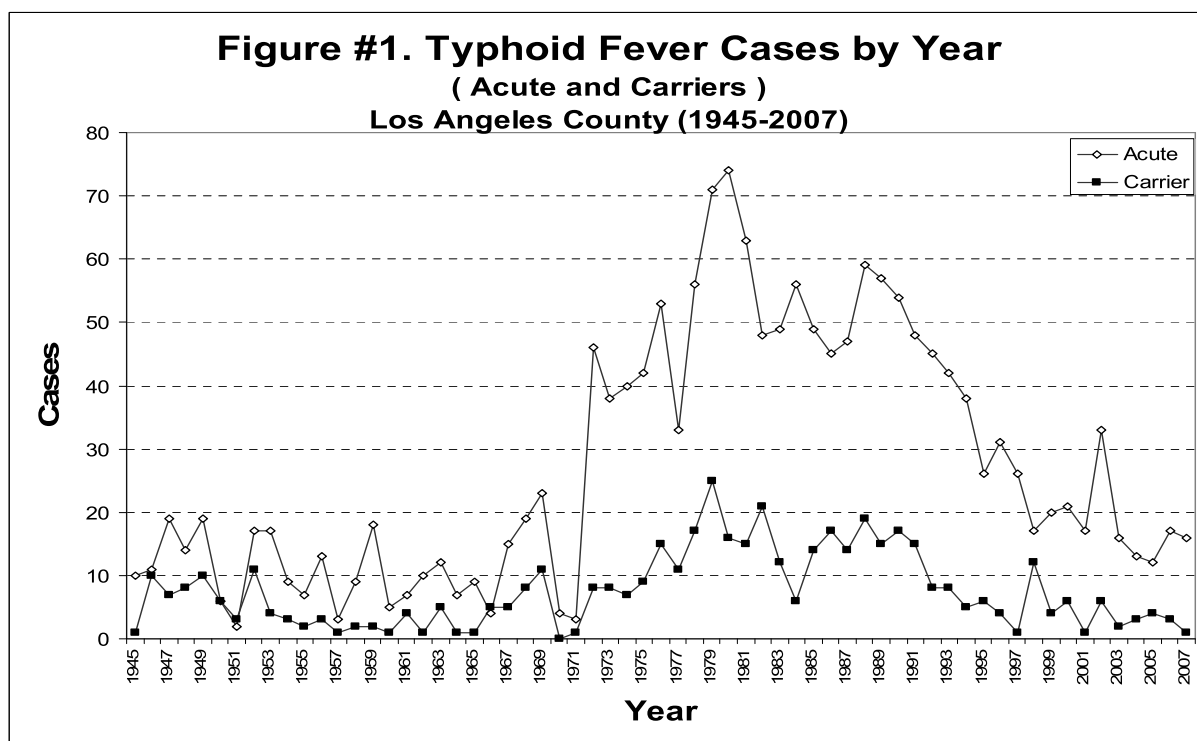
Curtis Croker, MPH; Roshan Reporter, MD, MPH; Leticia Martinez, RN, MPA, PHN;
Rita Bagby, RN, MSN, PHN

BACKGROUND

Typhoid fever is an acute systemic infectious disease caused by the bacteria *Salmonella typhi*. This species of salmonella has no known animal reservoir, and survives in the environment only by fecal oral person-to-person transmission. Three to five percent of cases who recovered from typhoid fever are estimated to become typhoid carriers [1]. Globally, it is estimated that 17 million new typhoid fever infections occur and about 600,000 persons die from the disease annually [2].

The impact of the disease in the United States (US) has been greatly reduced in the first half of the 20th century with the advent of municipal water chlorination and solid waste disposal, as well as personal hygiene and overall public awareness. Reduced disease burden in the later half of the century was accomplished with the introduction of antibiotics to treat carriers and the availability of vaccines to prevent illness in travelers. In 1900 the mortality incidence for typhoid fever was 25 per 100,000, but today mortality from typhoid fever is very rare. Currently about 400 cases of illness are reported annually in the US, with mortality occurring in less than 1% of cases [3]. Antibiotics such as chloramphenicol were used historically to treat typhoid fever cases. Newer treatments include the quinolones ciprofloxacin and ofloxacin) for adults and the cephalosporin cefoxitin for children [1].

In contrast to the years prior to 1960 when the disease was acquired domestically, more US cases now are acquired while traveling overseas to typhoid endemic countries. Increases in the number of cases reported in the late 1960s through the 1970s have been associated with the combination of increased foreign travel of US residents and increased population growth (Figure 1). A study of cases reported in the US from 1996-97 (N=293) found that 81% were travel associated [4], This study found no resistance to ciprofloxacin or ofloxacin, however 7% of isolates were resistant to the quinolone naladixic acid, and 24% of isolates were resistant to other antibiotics. Cases traveling to South Asia (India, Pakistan, Bangladesh) were at higher risk of having multi-drug resistant typhoid (MDRST). Other studies of US cases have documented typhoid resistance to ciprofloxacin, with the first case documented in 1992 [5].





Typhoid fever is a reportable disease in California. The Los Angeles County Department of Public Health (LAC DPH) follows up all reported cases to ensure treatment and minimize continued public health risk. Since 1980, the number of annual reported cases in the county has dropped dramatically from 70 cases to about 18 cases annually. However, with the rise in travel related antibiotic cases, research is needed to track the extent of the antibiotic resistance and related travel regions and to ensure that the current suggested treatment regimen is still effective for LAC cases.

METHODS

LAC DPH Acute Communicable Disease Control Program (ACDC) reviewed acute typhoid fever cases reported in LAC from 2000 to 2004. Epidemiological case history forms were reviewed for demographics and travel history. Antibiotic resistance was reviewed by matching LAC cases to NARMS – the National Antimicrobial Resistance Monitoring System for enteric bacteria. Case isolates were analyzed by NARMS for susceptibility to 18 different antibiotics, covering 7 classes of antibiotics: phenicole (1), quinalone (3), penicillin (3), aminoglycoside (4), tetracycline (2), sulfonamide (2), and cephalosporin (3). Because the NARMS data base is de-identified, matching was performed by using laboratory accession number first, if available, then by using combinations of the laboratory collection date with age, gender and/or race information. For cases where there were multiple isolate susceptibility results, the earliest result was used. Demographics and travel regions of cases were analyzed by antibiotic resistance using Chi-squared statistics and SAS 9.1 software.

RESULTS

Acute typhoid fever in LAC is a rare disease; just 101 cases of typhoid fever were reported to the LAC DPH from 2000 to 2004, with an annual average of 20 cases and incidence of 0.18 per 100,000. Cases were primarily young (mean age 25 years), Hispanic (43%) or Asian (47%), and just as likely to be male or female (F:M=1:1) (Table 1). A majority of cases (69%) reported recent foreign travel, with many traveling to Asia (46%, n=68) and Central America (17%, n=25). Vaccine usage was reported in only 2 travel related cases (3%), one oral and one injection. Several cases with no travel history (10%, n=13) were traced back to a previously undiagnosed carrier through public health investigations. Twenty-one percent of cases were considered to be locally acquired. Infection was successfully treated in almost all cases (93%, n=127) that remained in the county for LAC DPH follow up (n=136). Cases leaving LAC after diagnosis were reported to their new jurisdictions for follow up (n=11). One case expired after returning from India (1%).

Antibiotic resistance profiles were matched to 88 cases from 2000-2004 (88%); 60% of cases were matched using accession number and an additional 28% were matched using a combination of collection date with age, gender and/or race information. The remaining cases (n=13) could not be matched to NARMS results. Antibiotic resistance was found in 16% (n=14) of isolates tested, with 7% (n=6) of isolates having resistance to multiple antibiotic classes (MDRST) (Table 2). Antibiotic resistant cases were more likely to be Asian (71% vs. 34%, $p<0.05$), to have traveled internationally recently (86% vs. 69%, $p<0.01$), and to have traveled to Asia (86% vs. 34%, $p<0.01$), especially to India (64% vs. 8% $p<0.01$), than antibiotic susceptible cases. In contrast, no antibiotic resistance was found among persons acquiring infection in Central or South America. Two antibiotic resistant cases did not report any foreign travel.

Antibiotic resistance was found against each of the seven antibiotic compounds tested. Resistance to the quinalone class was most commonly identified, with 13% resistant to naladixic acid; however no resistance was found to the quinalone ciprofloxacin, the currently suggested for typhoid treatment. Antibiotic resistance to the traditional phenicole drug chloramphenicol was 7%.



Table 1. Demographics and Travel Location of Acute Typhoid Fever Cases by Antibiotic (Abx) Resistance, Los Angeles County, 2000-2004

	All		Abx Susceptible		Abx Resistant*		Difference p-value
	n	%	n	%	n	%	
Typhoid Cases	101	100%	73	100%	14	100%	
Race/ Ethnicity							
Asian	45	44%	25	34%	10	71%	<0.01
Latino	42	41%	36	49%	2	14%	0.02
Caucasian	8	8%	7	10%	2	14%	0.29
African American	3	3%	2	3%	0	0%	NA
Gender							
Male	49	48%	34	47%	8	57%	0.18
Female	52	51%	38	52%	6	43%	0.18
Age Group							
0-19	46	45%	35	48%	7	50%	0.22
20-39	36	35%	23	32%	5	36%	0.23
40-59	15	15%	10	14%	2	14%	0.31
60+	4	4%	4	5%	0	0%	NA
Foreign Travel							
Recent Travel	69	68%	52	71%	12	86%	<0.01
Asia	44	44%	25	34%	12	86%	<0.01
India	19	19%	6	8%	9	64%	<0.01
Central America	12	12%	10	14%	0	0%	NA
South America	12	12%	11	15%	0	0%	NA
Africa	1	1%	1	1%	0	0%	NA
Europe	0	0%	0	0%	0	0%	NA

* 87 cases tested for Abx susceptibility. Group not tested (n=14) did not differ from the total group by age, race or sex.

Table 2. Abx Resistant Typhoid Fever Cases Los Angeles County, 2000-2004

Antibiotic Resistance	n	%
Any Resistance	14	100%
Resistant to 1 Abx	8	57%
Resistant to 2-6 Abx (MDRST)	3	21%
Resistant to 7Abx (MDRST)	3	21%
Abx Resistance Type		
Quinalone ^a	13	93%
Phenicoles ^b	6	43%
Sulfonamides	6	43%
Aminoglycoside	5	36%
Penicillins	5	36%
Tetracyclines	4	29%
Cephalosporin	1	7%
a. 13 cases resistant to nalidixic acid, all sensitive to ciprofloxacin, ofloxacin not tested		
b. Traditional treatments (Chloramphenicol)		



DISCUSSION

As in an earlier national study [4], persons with acute typhoid fever resistant to antibiotics were more likely to have traveled to Asia than to other parts of the world. Available data could not distinguish whether these cases were non-US born and returning home to visit friends or family in Asia, or US born tourists traveling to Asia. The proportion of antibiotic resistant cases found in our study was lower than that found in the national study (16% versus 25%). This may indicate that antibiotic resistance in typhoid fever is not worsening; however, it also indicates that the problem still persists. As with the earlier study of reported US cases, no resistance was identified to quinalone ciprofloxacin or the cephalosporin ceftriaxone. The current suggested treatment for typhoid fever in LAC, ciprofloxacin, appears to still be an effective in treatment.

CONCLUSION

Our results suggest that antibiotic resistant typhoid fever is a problem among foreign travelers in LAC not receiving typhoid vaccine, especially among Asians and among travelers to Asian countries. Vaccine usage in these travelers should be promoted in order to prevent infections, including antibiotic resistant cases. Continued studies are needed to monitor the development of antibiotic resistant typhoid cases in the US.

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REVIEW OF BOTULISM CASE REPORTS LOS ANGELES COUNTY, 2000-2007

David Dassey, MD, MPH

BACKGROUND

Botulism is a rare but serious paralytic illness caused by nerve toxins produced by the anaerobic bacterium *Clostridium botulinum* and rarely other species. These toxins block motor nerves, leading to paralysis. Death ensues if the respiratory muscles become paralyzed and mechanical ventilation is delayed. All suspected botulism reports are medical emergencies. Botulism is also a public health emergency because a food item contaminated with botulism toxin endangers others who may consume it. In recent years it has also been postulated that botulinum toxin could be used as a bio-weapon due to the extremely small dose required for clinical illness. Therefore, prompt and complete investigation of all reports of suspected botulism is a public health priority.

There are seven known botulinum toxins, four of which – types A, B, E, and F – affect humans. Clostridial spores germinate anaerobically and may produce toxin in a food item, a wound, or the intestine. Toxin may also be given therapeutically for medical or cosmetic reasons and cause paralysis if administered incorrectly or at too high a dose. Theoretically botulinum toxins could also be aerosolized as a bio-weapon and intoxicate victims by the respiratory route.

The patient's history, the progression of neurological findings, and specialized diagnostic procedures are integral to the diagnosis of botulism. The laboratory investigation is important to confirm the disease. An inadequate investigation has the potential to delay diagnosis or misclassify the type of botulism, for example calling a case wound botulism when it actually is foodborne botulism, endangering others at risk of consuming a contaminated food item.

The Los Angeles County (LAC) Department of Public Health has had a longstanding agreement with the California Department of Public Health permitting LAC to investigate all reports of suspected botulism in persons over the age of infancy. Infant botulism suspects in California are investigated and treated by the California Infant Botulism Program without assistance from local health departments.

The LAC Public Health Laboratory (PHL) conducts a complete range of botulism microbiological testing. Specimens of serum, stool, gastric contents, and food obtained can be tested for botulism toxin or clostridium culture. Clostridium isolates from patients' wounds are submitted by hospital laboratories for species confirmation and toxin production.

The objectives of this report were to summarize clinical and diagnostic results for investigations of suspected botulism cases reported to LAC from 2000-2007; describe confirmed botulism cases; evaluate completeness of laboratory investigations conducted; and identify investigatory aspects needing improvement.

METHODS

All available records of botulism cases and suspects over 1 year of age were reviewed; these included the botulism suspect worksheet, epidemiologic case history form, medical records on file, and laboratory records from the treating hospital and the PHL. Since 2005, the botulism suspect worksheet has been used to guide investigators and organize documentation of all botulism investigations. The epidemiologic case history form is completed only for confirmed cases meeting the following case definitions; these forms are then submitted to the California Department of Public Health in compliance with the California Code of Regulations, Title 17, Section 2502.



Standardized CDC case definitions for each form of botulism (excluding infant botulism) are as follows:

- A case of foodborne botulism is a clinically compatible case that is laboratory confirmed or that occurs among persons who ate the same food as persons who have laboratory-confirmed botulism.
- A probable foodborne botulism case is clinically compatible with an epidemiologic link to a suspicious food item.
- A case of confirmed wound botulism is a clinically compatible case that is laboratory confirmed in a patient who has no suspected exposure to contaminated food and who has a history of a fresh, contaminated wound during the two weeks before onset of symptoms.
- If a patient aged greater than one year of age has no history of ingestion of suspect food and has no wounds, but botulinum toxin or organisms are detected in a clinical specimen, the disorder is described as botulism, other.
- For purposes of this review, a case of clinical botulism was defined as a patient whose illness is clinically compatible with botulism but for whom the laboratory tests necessary for confirmation were either non-supportive or not done, and there was no alternative diagnosis made by the treating physician.

A laboratory specimen instruction sheet has been distributed annually since 2005 to all hospital emergency departments and laboratories, neurologists, and infectious disease physicians. Investigations were conducted by medical epidemiologists in ACDC who rotate telephone duty and after-hours call for LAC DPH. The initial investigator was responsible for all follow-up and completion of required documentation. All decisions and documentation were reviewed and approved by a senior physician.

RESULTS

- A total of 54 suspected botulism cases were reported to LAC DPH during the eight-year period (Table 1); one third (18) were confirmed. The male to female case ratio was 3.5 to 1 for all suspects and for all confirmed cases. The ages of all suspects ranged from 10 to 82 years; the mean age of confirmed cases and unconfirmed suspects did not differ. Confirmed botulism cases were more likely to be injection drug users (IDU) than were unconfirmed suspects, 72% versus 56%. Sixty-nine percent of suspects received botulinum antitoxin treatment, including all 18 of the eventually confirmed cases. More than half of the unconfirmed cases (53%) were also treated with antitoxin.

	All Suspects n (%)	Confirmed Cases n (%)	Unconfirmed Suspects n (%)
Total	54 (100)	18 (33)	36 (67)
Male : Female	42 : 12	14 : 4	28 : 8
Mean age, years (range)	45.9 (10 – 82)	45.7 (17 – 82)	46.1 (10 – 55)
IDU	33 (61)	13 (72)	20 (56)
Got antitoxin	37 (69)	18 (100)	19 (53)



Figure 1 shows the confirmation status of the 54 suspected botulism cases by year of occurrence. The number of reports of suspected botulism ranged from 3 to 11 reports per year, while confirmed cases ranged from zero to eight cases annually. In 2000 and 2003, no botulism cases were confirmed.

Figure 1. Suspected Botulism Cases by Confirmation Status and year of Occurrence, Los Angeles County, 2000-2007

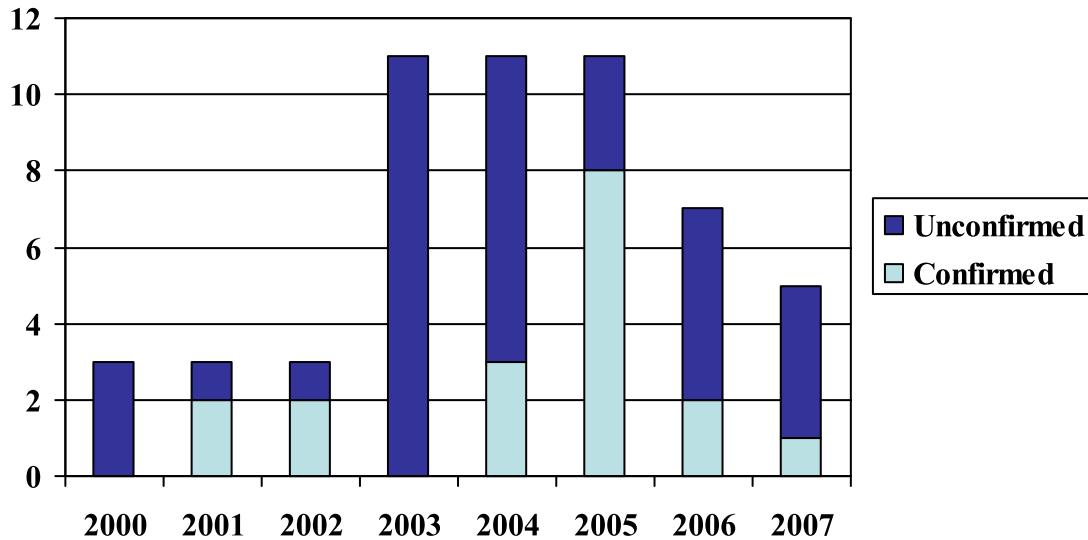


Table 2 breaks down the 18 confirmed botulism cases by year of occurrence, route of intoxication and toxin type. Fifteen of the 18 confirmed cases, 83%, were caused by botulinum toxin type A.

Year	Foodborne Botulism Cases – Type*	Wound Botulism Cases - Type*
2000	-	-
2001	2 - AF	-
2002	-	2 - AA
2003	-	-
2004	-	3 - AA, not B
2005	2 - AA	6 - AAAABU
2006	-	2 - AA
2007	-	1 - A
Total	4	14

* A, type A toxin; B, type B toxin; F, toxin type F; U, unknown toxin type



There were three episodes of foodborne botulism with four confirmed cases: two isolated cases and one outbreak of two cases in a family. Sera and stool samples from all four cases were collected and tested. Food specimens were obtained in only two of the three episodes. One 2001 case was fatal and involved a mentally ill man. The case-patient's home had dozens of unrefrigerated containers of food; none of the food was tested for toxin since the patient's serum had already tested positive. The other 2001 case was caused by type F toxin produced by *Clostridium barratii*; toxin was detected in the case's serum, and the organism was isolated in two food items retrieved from the garbage. In 2005, a foodborne outbreak caused by type A occurred with a grandfather (fatal) and his grandson; the offending food item was not identified because a site visit to the home was delayed because other family members were unavailable for two days. By the time an investigator got into the home, no foods found in the home were a compatible medium for botulism, and the garbage had been tossed and collected by the sanitation department.

There were 14 confirmed wound botulism cases, 11 (79%) were due to type A toxin. Sera were collected from all wound botulism cases, and 13 were positive. The only type B case was diagnosed in 2005 in a patient whose serum tested negative for toxin but whose wound culture grew *C. botulinum* type B. A wound specimen for cultured was obtained from eight of the fourteen suspects (57%), of which two were positive, including one case whose serum was toxin negative. For two cases there was insufficient serum to permit definitive toxin typing; these were reported as "not B" and "toxin present, type unknown." Collection of other specimens that would assist with ruling out foodborne botulism was rarely done; only three gastric specimens and one stool specimen were submitted; LAC DPH did not obtain any food items from these eventually confirmed wound botulism cases.

Disposition of Remaining Suspects

Of the remaining 36 suspects, 17 (47%) were considered to have clinical botulism that was not confirmed, including 14 cases of possible wound botulism, two cases of possible foodborne botulism, and one possible iatrogenic case. Because these cases failed to meet the formal case definitions, they were not reported to the California Department of Public Health.

For the 14 suspected botulism cases believed to have unconfirmed wound botulism, serum samples were obtained and tested for twelve (86%); the other two were a married couple, both IDU, who presented together with compatible signs and symptoms but left the emergency department against medical advice before specimens were obtained. Wound cultures were obtained from 6 of the 14 clinical wound botulism suspects (43%), none of which grew *C. botulinum*. Stool specimens were available from only 3 of the 14 suspects (21%), and no gastric aspirates or food samples were obtained.

Two unconfirmed clinical botulism cases were investigated in persons who were not injection drug users and who had no other recent wounds. Specimens of serum, stool and food were obtained in both investigations, but tests did not identify botulinum toxin or toxigenic organisms. These suspects were felt to have possible foodborne botulism based on the clinical presentation and lack of an alternative diagnosis.

A case of possible iatrogenic botulism was reported in a child with cerebral palsy who received quarterly injections of botulinum toxin to relieve muscle spasms. Because of development of antibodies against BoTox[®] (type A toxin) his treatment was changed to Myobloc[®] (type B toxin). Because these products are not bioequivalent, there is the potential for overdosing the patient if the Myobloc dosage is not adjusted downward. Serum obtained one month after the change to Myobloc did not contain measurable botulinum toxin, but the clinical presentation and its timing after treatment were consistent with iatrogenic botulism.

Eighteen patients originally reported as possible botulism cases eventually received another diagnosis. The most common diagnosis was Guillain-Barré syndrome in nine patients; interestingly two of these were stool culture positive for campylobacter, and another had a history of recent diarrheal illness. In addition, there were four patients with nonspecific inflammatory conditions of the central nervous system, two patients with strokes, two with a neoplasm, and one case of myasthenia gravis. The remaining case had no alternative diagnosis but was not compatible with botulism.



Variations in Investigation by IDU Status

This analysis showed that botulism suspects who are injection drug users are investigated differently from other suspects. There were 33 IDU suspects and 20 suspects without a history of IDU (one omitted for missing data). Among IDU botulism suspects, 85% had serum tested, but only 65% of non-IDU suspects had serum tested. Wound specimens were obtained from just 45% of the IDU suspects; only one non-IDU had a wound that was screened as a potential toxin source. Samples of stool, food and gastric contents were more likely to be collected from non-IDU suspects; but in only 50% of those investigations was a stool sample collected.

CONCLUSION

From 2000 to 2007, LAC evaluated 54 reports of possible botulism, of which 18 were confirmed. A near equal number (17) were felt to be botulism based on clinical criteria and absence of an alternative diagnosis, but these cases were not laboratory-confirmed and thus not officially reported in state and national statistics. There were 19 patients with other diagnoses. Sixty-two percent of reported suspects were IDU, including 14 confirmed botulism cases, 14 unconfirmed cases of clinical botulism, and four patients with other or unknown diagnoses.

It is the responsibility of treating physicians to obtain clinical specimens from the patients; despite use of a detailed collection guide, specimen collection was often incomplete. Among suspects who were IDU, serum collection was high, but a wound specimen was obtained from fewer than half of the suspects; understandably, not every patient has an obvious wound to be drained.

In a number of investigations, the report to LAC DPH was made prior to obtaining diagnostic tests that pointed to an alternative diagnosis. For example, tests such as the edrophonium (Tensilon[®]) challenge, EMG, lumbar puncture, or visualization studies of the head often are pending when the case is first reported. A positive finding from one of these tests may cancel the need for further botulism work-up. Nonetheless Public Health must improve compliance with published specimen submission guidelines. Once specimens are in the hands of Public Health, tests can be cancelled in the event another diagnosis is reached.

Public Health depends on the treating physicians to get the patient's history of risk factors, especially exposure to suspicious foods. For suspected foodborne botulism, Public Health is responsible for collecting potentially contaminated food items. Unfortunately, many patients are already placed on a ventilator and sedated by the time Public Health is notified, so historical information is limited. Many of these individuals have no next of kin or are homeless, further limiting our ability to conduct a full investigation.

Failure to work up all suspected botulism cases fully could mask a foodborne botulism case as a wound botulism case. Delay in identification of foodborne botulism may endanger others exposed to a contaminated product. Investigators can improve diagnostic work-ups by interviewing the patient or close contacts quickly, especially when foodborne botulism is suspected, so that suspicious food items are gathered quickly. Treating facilities should be encouraged to follow specimen guidelines more carefully.





LOS ANGELES COUNTY OUTBREAKS OF ACINETOBACTER BAUMANNII

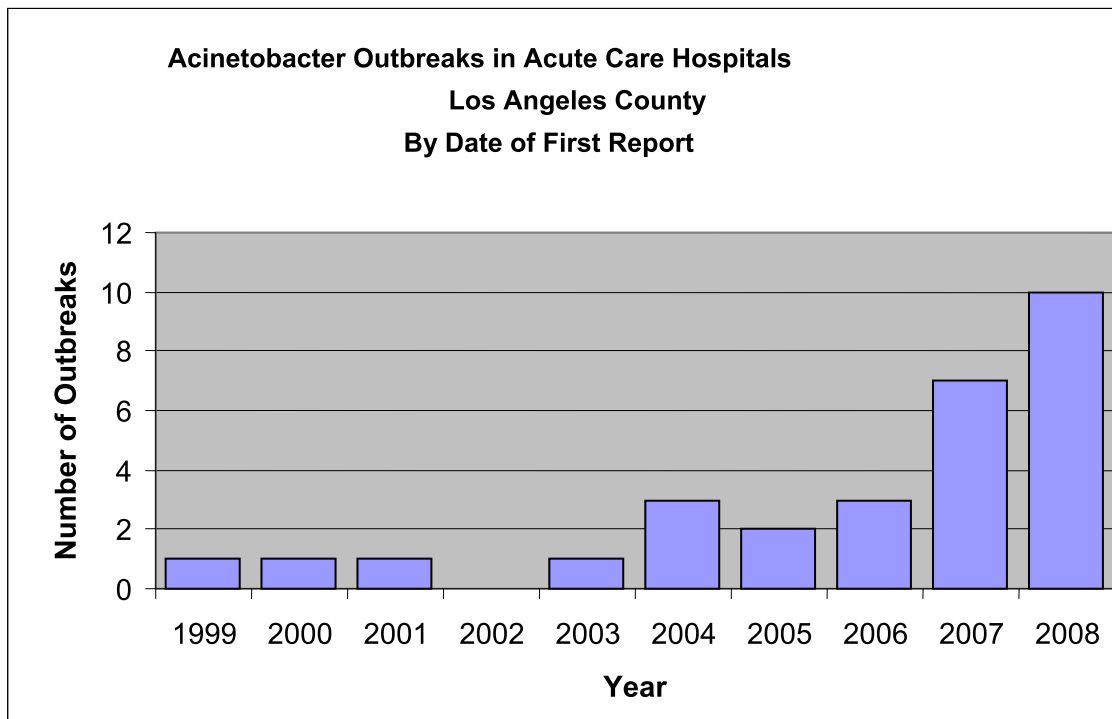
Dawn Terashita, MD, MPH and L'Tanya English, RN, MPH

BACKGROUND

Acinetobacter baumannii, also known as *Acinetobacter calcoaceticus-baumannii* complex, is an opportunistic pathogen emerging as an important cause of healthcare associated infections (HAI). It is a gram-negative coccobacillus commonly found in soil, water, and animals. The multi-drug resistant organism became an increasing problem among patients in intensive care units in the late 1980s. Of particular concern is the organism's propensity to accumulate mechanisms of antimicrobial resistance that lead to multi-or pan-drug resistance and may cause large HAI outbreaks. Reports of individual *Acinetobacter* outbreaks are found in the medical literature; though, there are far fewer *Acinetobacter* outbreaks documented than other gram negative organisms [1].

In Los Angeles County (LAC), prior to 2007, *Acinetobacter* outbreaks were either under-reported, under-recognized, or did not occur. Between 1999 through 2006, LAC averaged approximately one *Acinetobacter* outbreak reported per year (Figure 1). LAC Department of Public Health (DPH) investigated 10 outbreaks of *Acinetobacter baumannii* reported in 2008. The study includes characteristics of the affected patients, sources for the organism, efforts of infection control, and outcomes related to the control efforts. Further knowledge of these factors will help to increase understanding of this emerging healthcare associated organism and guide development and management of *Acinetobacter* infection surveillance, prevention, and control measures.

Figure 1



METHODS

This is a descriptive study of reported acute-care hospital *Acinetobacter* outbreaks in LAC in 2008. LAC DPH received reports of suspected outbreaks of any disease per Title 17, California Code of Regulations (CCR), Section §2500. Reports were telephoned to Acute Communicable Disease Control (ACDC)



program as well as DPH Health Facilities Inspection Licensing and Certification Division (HF) immediately after identification. HF determined their own outbreak definition. ACDC defined an outbreak as an increase in healthcare acquired *Acinetobacter* infection or colonization rates in patients above the baseline rate for the facility or a particular unit within the facility. Once an outbreak had been reported to public health staff, the investigation was initiated and the facility is contacted to collect data according to standard protocol.

Standard protocol during an outbreak investigation may have included but was not limited to the verification of the diagnosis and the occurrence of an outbreak, creating a line list of all patients involved with pertinent clinical information, case definition and additional case finding, chart review, additional clinical and/or environmental sampling, laboratory data including molecular typing of isolates with pulsed field electrophoresis (PFGE), site visit and inspection, staff interviews and surveys, data analysis, and recommendations of prevention and control measures.

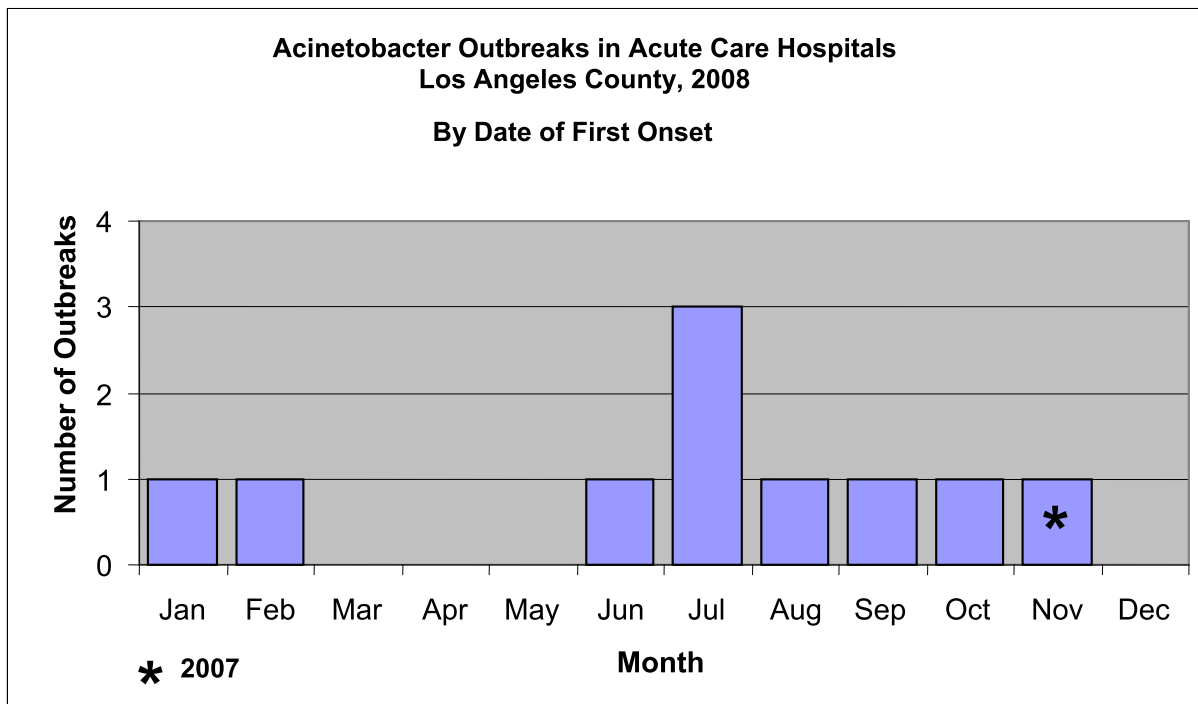
A case was defined as a patient who had a positive culture for *Acinetobacter baumannii* or *calcoaceticus-baumannii* complex from any site cultured more than 48 hours after admission with no signs or symptoms of infection on admission. Background and outbreak incidence rates of healthcare acquired *Acinetobacter* (cases per 1000 hospital days) were calculated for four hospitals reporting outbreaks.

RESULTS

General Outbreak Characteristics

There are 102 licensed acute-care hospitals in LAC. Between January 1, 2008 and December 31, 2008, ACDC received 10 confirmed outbreak reports from acute-care hospitals, representing 37% of the total outbreak reports received (N=27) in 2008. The onset of one outbreak was in November of 2007. All other outbreaks had onset in 2008. Three outbreaks were reported from the same hospital at separate times and on two separate units. July had the most number of reported outbreaks (n=3) with the other outbreaks spread through the summer, fall, and winter (Figure 2). Outbreaks lasted between 5 and 155 days, with the mean duration of 58.9 days.

Figure 2





A total of 117 cases occurred with the number of cases per outbreak ranging from 3 to 36. One case was asymptomatic; 116 cases were considered infected; 29 cases died for a 25% case fatality rate (Table 1). Nine outbreaks occurred among adults, and one occurred in a pediatric facility. The mean age of the adult cases was 58.4 years; the mean age of pediatric cases was 5.5 years. (Figure 3). There were more males (56%) than females. Background incidence rates ranged from 0 to 1.4 cases per 1000 patient days. Outbreak incidence rates ranged from 0.89 to 3.14 cases per 1000 patient days.

TABLE I

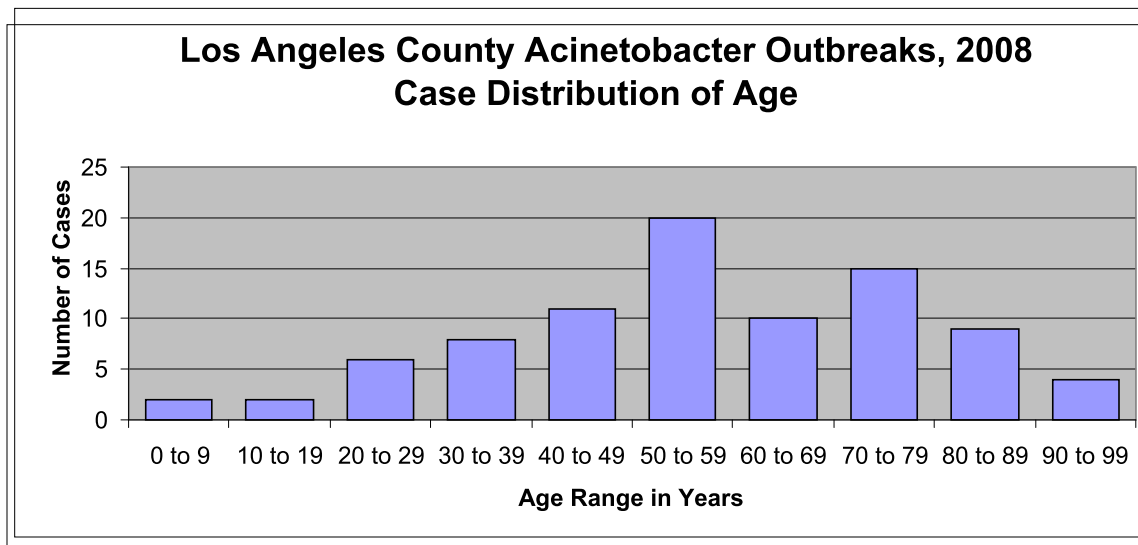
Outbreak No.	No. Cases	Mean Age (years)	Age Range (years)	Sex Male (%)	Onset date	Stop date	Duration of Outbreak (days)	Setting	Ventilator	Background Incidence Rate Per 1000 Patient Days	Outbreak Incidence Rate per 1000 Patient Days
1	6	37.3	27-52	5 (83%)	11/20/2007	12/29/2007	39	Burn ICU	4 (67%)	NA	NA
2	4	61.3	39-81	4 (100%)	2/1/2008	2/14/2008	13	ICU	2 (50%)	NA	NA
3	13	56.8	19-87	7 (54%)	1/7/2008	3/25/2008	78	ICU	10 (77%)	1.45	3.14
4	3	5.5	0.58-13	1 (33%)	7/3/2008	7/8/2008	5	Pediatrics	0	NA	NA
5	7	79.4	58-94	5 (71%)	7/13/2008	8/31/2008	48	ICU, Rehab	4 (57%)	NA	NA
6	4	48.0	36-57	4 (100%)	8/1/2008	8/14/2008	13	Burn ICU	4 (100%)	NA	NA
7*	21	67.2	48-90	8 (47%)	6/1/2008	11/6/2008	155	General Hospital	13 (62%)	0.75	0.89
8	7	56.6	29-82	4 (57%)	9/16/2008	10/20/2008	34	ICU	4 (57%)	0	1.65
9**	16	48.8	23-79	9 (60%)	10/1/2008	11/26/2008	55	MICU	8 (50%)	NA	NA
10***	36	65.0	35-90	14 (42%)	7/1/2008	11/30/2008	149	ICU	unknown	1.01	2.63
	117	56.8	0.58-94	61 (56%)			58.9		49 (60%)		

*3 ages and 4 sexes unknown

**1 sex unknown

***27 ages and 3 sexes unknown

Figure 3





Eight of the 10 outbreaks occurred in an intensive care unit (ICU). The other two outbreaks occurred throughout the hospital. In the nine outbreaks where ventilator data was collected, 49 (60%) of 81 cases were on a ventilator; this included *Acinetobacter* infections from all sites. Of 54 patients with positive respiratory specimens, 49 (90%) were on a ventilator at the time of diagnosis. Respiratory specimens were the most common site of positive *Acinetobacter* culture. Other common sites include blood, wound, and urine. Five patients were positive from multiple sites. (Figure 4, Table 2)

Figure 4

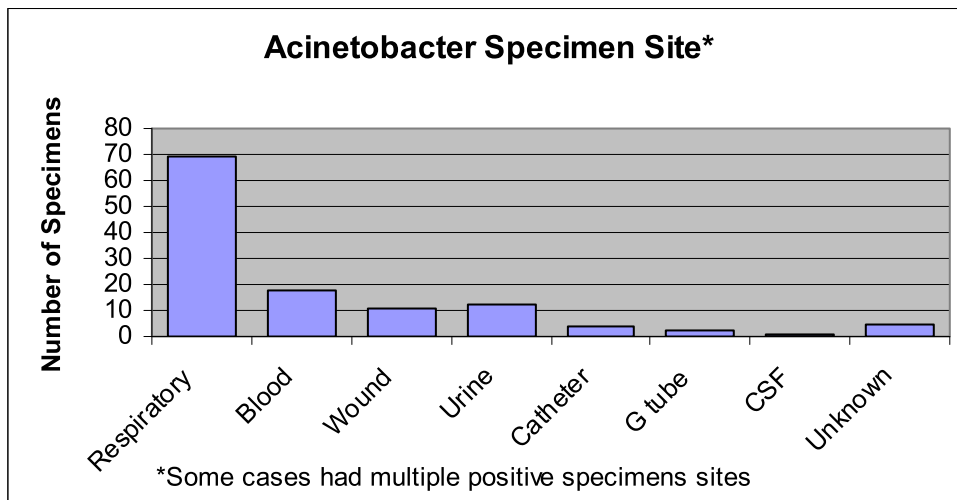


TABLE 2

Outbreak No.	Ill	Colonized	Died	Blood	Respiratory	Wound	Urine	Other
1	6	0	1	1	5	0	1	2
2	4	0	1	1	3	0	0	0
3	13	0	5	1	8	0	2	2
4	3	0	0	1	1	1	0	0
5	7	0	1	1	5	3	0	0
6	4	0	0	1	3	1	0	0
7	21	0	7	1	14	4	2	0
8	7	0	4	0	7	0	0	0
9	15	1	8	6	8	1	1	0
10	36	0	2	5	15	1	6	9
	116	1	29	18	69	11	12	13

Other than clustering in place and time, no commonalities or point sources were identified among the cases in each outbreak.



Laboratory Investigation

All outbreaks reported multi-drug resistant strains of the *Acinetobacter* isolates defined by resistance to one or more classes of antibiotics. PFGE was performed in three of the outbreaks with all results yielding no single predominant strain but multiple predominant strains.

Environmental surveillance cultures were performed in four of the outbreaks. *Acinetobacter* was cultured from multiple sites in three of these four outbreaks including the bed rails, sinks, and reusable suction tip stored at the patient's bedside.

Control Measures

Recommended control measures varied per facility and included: contact precautions; patient and staff cohorting; dedicated equipment; staff education; enhanced hospital-wide surveillance for *Acinetobacter* infections; open communication with ACDC; immediate reporting of new cases; increase environmental cleaning with particular attention to high-touch surfaces including thoroughness, frequency, and monitoring; observation and documentation of staff hand hygiene compliance as defined in the Joint Commission 2008 National Patient Safety Goals; increased infection control professional (ICP) to licensed acute care bed ratio; notifications to patient, visitors, staff, and physicians; limiting patient transfers as possible; discontinuance of multi-dose vials as possible; antibiotic stewardship; and observation of the CDC 2003 *Guidelines for Environmental Infection Control in Healthcare Facilities*, the 2002 *Guideline for Hand Hygiene in Health-Care Settings* and the *Management of Multidrug-Resistant Organisms in Healthcare Settings, 2006*.

Many of the control measures were implemented by the facility prior to ACDC notification. Public Health conducted site visits in four of the outbreaks. Inspections identified no obvious lapses in infection control. Point surveillance cultures were recommended in three outbreaks on a total of 32 patients; however, no additional colonized cases were identified. The units affected were closed voluntarily to new admissions in two outbreaks.

DISCUSSION

No point source was identified nor determined to be the cause of any of the ten outbreaks investigated. Three outbreaks had patterns characterized by periods of increased incidence within sustained and ongoing healthcare associated transmission of *Acinetobacter* infections; therefore, definition of a true outbreak was controversial and calculation of an outbreak duration was difficult. Often, these periods of increased incidence were flanked by periods of decreased incidence artificially giving the impression of a larger problem. Whatever the true nature of the outbreak, hospitals should aim to decrease healthcare associated infections of any cause to zero.

ACDC did not analyze the antimicrobial resistance patterns of the outbreak isolates as concurrence between genotyping and phenotyping (antibiotic susceptibilities) has not been demonstrated in *Acinetobacter* [2]. The significance of multiple distinct patterns by PFGE is unknown. One or more epidemic *Acinetobacter* clones have been demonstrated to coexist within endemic strains [3,4]. The finding supports the hypothesis that most of these outbreaks are not from a single source but represent endemic transmission as a result of general lapses in staff infection control practices. For example, ACDC identified inadequate environmental cleaning, improper hand washing, and lapses in or a lack of process bundles designed to prevent central line associated blood stream infections, surgical site infections, and ventilator associated pneumonia.

It is not certain that the infections were all due to transmission within the hospital especially without a known organism source. The definition of positive culture after 48 hours after admission used for hospital acquisition of the organism may not represent the patient with an incubating or low level of infection who subsequently develops a defined *Acinetobacter* infection. No admission active surveillance cultures were performed on the cases, so the colonization status of cases prior to infection is unknown. The risk of *Acinetobacter* colonization on developing subsequent infection has not been established. However, in



the three outbreaks where hospitals did point surveillance, no colonized patients were identified, suggesting a low rate of colonization.

CONCLUSION

Overall the number of reported *Acinetobacter* outbreaks has been increasing. Though a thorough review of antibiotic resistance patterns was not performed, in many of the outbreaks, the organism was considered to be pan-resistant, often resistant to all antibiotics tested. Control of this organism has been shown to require a combination of judicious use of antibiotics, enhanced environmental cleaning, improved education and use of proven infection control measures such as process bundles to decrease healthcare associated infections, and lastly improved hand hygiene.

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HEPATITIS B OUTBREAK IN A SKILLED NURSING FACILITY

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BACKGROUND

Hepatitis B is a viral disease transmitted by contact with blood. In 2006, there were an estimated 46,000 acute cases in the United States (U.S.) and an additional 1.25 million people living with chronic Hepatitis B infection [1]. Infection with Hepatitis B can lead to serious sequel: 1% die of acute infection and approximately 40% are hospitalized. A total of 2-6% of adults who acquire acute infection with the virus develops chronic disease which can lead to liver failure, liver cancer, or death. Cases in children are rarely seen because of school vaccine requirements and aggressive follow-up of pregnant mothers who have chronic disease to ensure that their infants are fully vaccinated. In the U.S., the main adult risk groups are people with multiple sex partners, men who have sex with men, and injection drug users. Cases in adults >50 years are rare.

Healthcare associated Hepatitis B Virus (HBV) has been increasingly reported in the past 10-20 years. Outbreaks have been identified in long-term care facilities, mainly associated with sharing of diabetic testing equipment. A recent review of Hepatitis B in long-term care facilities revealed that all involved diabetic residents were associated with breaks in infection control, including using single-patient finger stick devices on multiple patients [2]. Outbreaks of Hepatitis B have also been associated with shared syringes and contaminated multi-use vials of medication. Outbreaks have been reported in homes for the developmentally disabled though the mode of transmission has not been well described. Since Hepatitis B has a long incubation period of up to six months, it is often difficult to conclusively identify a source.

In September of 2008, the Acute Communicable Disease Control Program (ACDC) of the Los Angeles County Department of Public Health (DPH) was notified of a single patient with a laboratory test indicative of acute Hepatitis B in a resident of a long-term care facility (Facility A). In October, the facility reported that two additional cases of acute Hepatitis B had occurred in patients between June 2008 and August 2008. None of the patients were diabetic and all were over 50 years. An investigation was begun to determine the cause of the outbreak and to implement control measures. Once the investigation identified a more extensive outbreak, investigators from the Centers for Disease Control and Prevention (CDCP) performed more extensive chart review and sent laboratory specimens for further analysis. This report will focus on the work performed by ACDC/DPH personnel.

METHODS

For this investigation, case definition of acute Hepatitis B was a patient who resided at Facility A anytime between January 2008 and December 2008 and who had a positive test for Hepatitis B IgM+ or a new test for Hepatitis B sAg, in the absence of previously documented chronic HBV infection. Case definition of chronic Hepatitis B was a patient who resided at Facility A between January 2008 and December 2008 who had a positive test for Hepatitis B sAg and a history of chronic HBV. A susceptible patient was one who tested negative for all markers of Hepatitis B infection. An immune patient was one who had a positive test for Hepatitis B sAb or Hepatitis B Ig total.

Setting: A 120-bed skilled nursing facility focusing primarily on people with mental health diagnoses with other chronic medical conditions.

Serological screening: ACDC tested the blood of all current residents for markers of Hepatitis B including IgM, sAg, sAb, and total Ab.

Additional case finding: For those residents between January and December 2008 who were not available to have their blood drawn, ACDC cross-referenced names against the Visual Confidential Morbidity (vCMR) database of all Los Angeles County residents who have been reported with acute or chronic Hepatitis B, as they are reportable conditions in California.



ACDC also sent the list of names to the California Department of Public Health to see if the former residents had been previously diagnosed with Hepatitis B in another jurisdiction in California. ACDC obtained the medical records of patients who had been discharged to acute care hospitals to see if their admissions were compatible with a diagnosis of acute Hepatitis B.

Chart review: ACDC reviewed charts of all patients who tested positive for acute Hepatitis B and reviewed the charts of 20 other non-case patients. Demographic information, medications, dates of blood draw, dental and podiatry visits were abstracted.

Case Interviews: ACDC interviewed cases with a standardized interview form, used for routine case investigation for acute cases of Hepatitis B in Los Angeles County. Questions included exposures to medications, sexual history and drug use history.

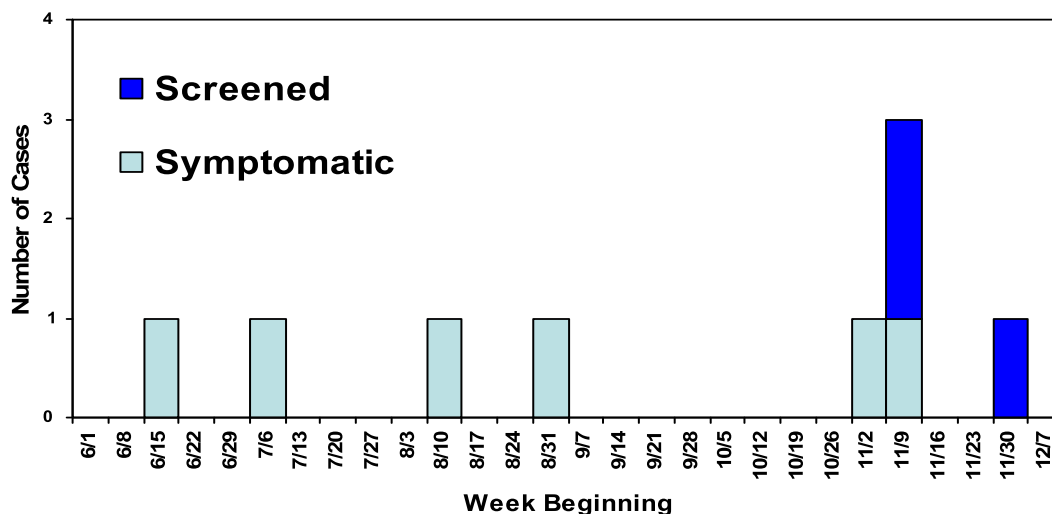
Infection Control Observation: Podiatry procedures were observed. Also inquired were finger stick, barbering, and nail cutting procedures. ACDC inspected the personal care cart used to hold shaving, cleaning, and nail cutting supplies.

Data and Statistics: All data were entered and managed in Microsoft Excel. Odds ratios and chi-square statistics were calculated using SAS v. 9.1, Cary NC and Epi Info 2000, Atl, GA.

RESULTS

A total of nine acute cases and five chronic cases were identified in current and former residents of Facility A. Five patients were symptomatic and tested positive for HBV IgM at Facility A. Review of the vCMR database revealed an additional patient with acute Hepatitis B who had been discharged over the summer. Upon serological screening of 120 residents, 9 (7.5%) patients tested positive for IgM, 5 of which had not symptoms; 3 (2.5%) patients were sAg+, 7 (6%) patients had evidence of immunity due to vaccination and 11 (9%) patients had evidence of prior HBV infection. The remaining 90 (75%) had no markers of Hepatitis B infection or vaccination. Two of the three current residents who tested positive for Hepatitis B sAg were in the local Hepatitis B registry. Review of vCMR database also identified an additional two discharged residents with previously reported chronic Hepatitis B. Review of the state Hepatitis B registry and of medical records for 21 of 37 former residents who had been discharged to acute care hospitals did not identify any other acute or chronic cases of Hepatitis B.

Figure: Acute Hepatitis B cases by means of detection and date of onset or diagnosis, Facility A, 2008





The onset of the symptomatic cases occurred between June-November 2008. The three asymptomatic cases were identified through serologic screening in November. Given an average onset of acute Hepatitis B from six weeks-six months, it appears that this may have been a point-source outbreak (Figure).

Chart Review: The acute cases were aged 49-72 years; six were male and three were female. Only one received finger sticks regularly to check blood glucose and four received injection medications during their incubation period but none of the medications or days of injections overlapped. Four had dentist appointments but none on the same day. None of the female cases had roommates with chronic or acute Hepatitis B. However, 5 of the male cases did have roommates with acute or chronic disease during their incubation periods.

Of the 5 chronic cases, 2 were female and 3 were male. Two of the chronic male cases were discharged early in the year and did not pose a risk of transmission for as long as the three other chronic residents, who resided in the facility from January to December 2008. One of the females received finger sticks regularly to check blood glucose levels. Two received injection medications and three had dentistry consults.

A cohort analysis revealed that male residents who were roommates of male residents who had chronic Hepatitis B or had acute Hepatitis B were more likely to be subsequently diagnosed with acute Hepatitis B. Of the six acutely infected male cases, five shared a room with a chronic case or a vermeil acute case. Males with a roommate who were acutely or chronically infected with Hepatitis were 14.6 times as likely to become acutely infected compared to males who did not have roommates ($p = 0.003$, 1.9-114.8, 95% CI). This increased risk was not found for the acute female cases all of whom had roommates who were neither acutely nor chronically infected.

Chart review revealed that five of the initial acute cases all had podiatry care on the same day in mid-March. On this day, one of the chronic cases (Patient A) also had podiatry care. The onset of these five cases occurred from mid June-mid November. Of the remaining four cases, one had podiatry care on the same day as Patient A in the beginning of October and had an onset of illness in mid-November, one had a reported sexual relationship with Patient A, one received finger sticks at the same time as Patient A, and one was a roommate of another acute patient who had podiatry care in March with Patient A.

One acute case had dentistry on the same day as a chronic case, but was unlikely the source of infection as the acute case was discharged two weeks later with acute Hepatitis B infection. There were no other overlapping risk factors between acute and chronic residents identified in the case chart review. All cases denied drug use or sexual contact with others at Facility A.

Infection Control Observations: ACDC observed the podiatrist perform routine procedures on residents at Facility A and identified breaches in infection control policies. There was a sink in the procedure room and hand washing protocols were generally followed. The procedure room was small and consequently, there was not sufficient counter space for the podiatrist (or dentist) to lay out their tools and separate contaminated tools from tools that had had no contact with patients. Furthermore, there was no dedicated sharps disposal container in the procedure room. After observing five patients receive procedures such as nail cutting and callous debridement, blood was visible on the skin of two of the patients. Used nail cutters, contaminated with blood, were placed in an open vinyl pouch on the counter next to the sterile nail cutters. Upon leaving Facility A, the podiatrist placed the open vinyl pouch into his medical tool box, potentially contaminating the surface of other medical equipment such as bandages, tape, and the sterile wrappers of the unused nail cutters.

ACDC also inspected the personal care cart which contained razors and personal use toe-nail clippers. Facility A does not allow patients to have individual razors; patients are issued individual disposable razors when they shave and these razors are thrown out after use. However, the nail clippers that patients use to clip their fingernails, or nurses use to clip patients' fingernails, are used repeatedly by multiple patients. The Facility says that it has a policy to wipe nail clippers with a disinfectant after each use. However, inspection of one of the nail clippers revealed nail clippings still caught in the clipper.



DISCUSSION

A total of nine acute Hepatitis B cases were identified in Facility A between September and December 2008. Additionally, five chronic Hepatitis B cases were also identified. The nature of the facility and residents in Facility A made this outbreak investigation unique from typical Hepatitis B outbreaks in skilled nursing facilities. Identifying a possible cause of the outbreak was difficult with a very mobile population that often interacts away from the watchful eye of staff members.

None of the traditional risk factors for Hepatitis B were identified as possible sources for the outbreak. Risk of infection through close household contacts was not a significant factor for this population, in part, because they are not confined to their rooms. Although assigned to the same rooms, residents wander throughout the facility and may interact with others more than their roommates. Routine distribution and disposal of individual razors and toothbrushes during grooming exercises also greatly decreased risk of infection via close contact.

The majority of acute cases received podiatry on March 19th, following Patient A. Podiatry has not previously been shown to pose a significant risk for transmission of Hepatitis B, especially in a skilled nursing facility. This outbreak highlighted how few infection control resources are available for podiatry care, especially for podiatry consultants. It also pointed out the importance of an appropriately designed procedure room in skilled nursing facilities to allow for ample space between designated clean and dirty areas to prevent the possibility of cross-contamination.

Infection control practices at Facility A, although adequate, still needed improvement. Since resident independence is promoted through grooming practices, it is vital that proper cleaning and disinfection of non-disposable grooming devices such as nail clippers be rigorously performed to prevent transmission of disease. It was also recommended that the facility follow the CDC's Recommended Infection Control and Safe Injection Practices to Prevent Patient-to-Patient Transmission of Bloodborne Pathogens for their diabetic patients.

CONCLUSIONS

ACDC conducted an investigation that included case identification, serological screening, additional case finding, chart review, patient interviews and an evaluation of infection control practices at the facility. A total of nine acute Hepatitis B cases were identified along with five chronic Hepatitis B cases. Previous investigations of acute Hepatitis B outbreaks in long-term care facilities have routinely involved diabetic patients and risk factors identified have been related to the care of the diabetic patient. In this investigation, these risk factors were not identified. Several breaks in infection control were observed including the mixing of dirty equipment with clean equipment during podiatry procedures and improper cleaning by the facility of non-disposable grooming devices such as nail clippers. It was found that the majority of acute cases received podiatry care on the same day as a resident who had chronic Hepatitis B. The findings of the investigation emphasize the need for long-term care facilities to establish an active, effective infection control program which includes observation of the infection control practices of consultants who deliver clinical services in the facility.

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MYCOBACTERIUM CHELONAE INFECTION FOLLOWING LIPOSUCTION

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INTRODUCTION

This report describes the investigation of a case of *Mycobacterium chelonae* infection following liposuction. Any known or suspected outbreaks of any disease are required to be immediately reported to public health¹. After notification of this case, the Acute Communicable Disease Control Program (ACDC) at the Los Angeles County Department of Public Health (LAC DPH) conducted a case investigation, case finding, medical record review, environmental investigation, and laboratory investigation to determine if there were other cases of post-surgical atypical mycobacterial infections after receiving liposuction.

METHODS AND RESULTS

Case investigation: On November 12, 2008 an infectious disease (ID) physician at a local area hospital reported to ACDC a patient who had abdominal liposuction on August 30, 2008 at an outpatient medical office and was found to have subcutaneous abscesses with drainage from the anterior abdominal wall. The patient noticed “hard” red areas at the incision sites four weeks post-procedure, and first noticed drainage from the incision sites 6 weeks post-procedure. The patient was treated initially as an outpatient by the physician who performed liposuction with oral ciprofloxacin and telithromycin and subsequently intravenous (IV) cephazolin as an outpatient without any improvement. The patient was admitted to the hospital on November 4, 2008 and an aspirated subcutaneous abdominal abscess specimen obtained by the ID physician on November 7, 2008 showed 3+ acid-fast bacilli (AFB) on smear and culture grew *Mycobacterium chelonae*. The patient, who was interviewed by ACDC, had stated that the wounds were kept clean post-liposuction and denied immersing the wounds in water after the procedure.

Setting: Liposuction was being performed by one physician (board-certified in Internal Medicine with a valid license from the California Medical Board) in a single outpatient medical office. The office had 1 procedure room that was used for liposuction, flexible sigmoidoscopy, and esophagogastroduodenoscopy. There were a total of six(6) staff consisting of three (3) medical assistants (MA), two (2) oriental medical doctors, and the physician. The office staff and physician did not recall any differences in cleaning/sterilization of equipment or liposuction procedure steps during time of the case-patient’s procedure compared to other patients who had liposuction.

Case finding: On November 13, 2008 a line list was obtained of all patients who had liposuction since May, 2008 when liposuction surgery first starting being performed by this physician at this outpatient office. Twenty-seven patients underwent 28 liposuction procedures from May 30, 2008 – November 15, 2008 (14 procedures done prior to the case-patient’s procedure date of August 30, 2008 and 14 were done since August 30, 2008; one patient had liposuction done twice at different anatomic sites on different dates).

Medical record review was conducted on November 19, 2008. There was no documentation in the medical records of which staff were present during the liposuction procedure but the physician stated that it is usually himself, plus one other MA who is “sterile” and then one or two other MAs who are “non-sterile” documenting fluid aspirate volumes and times. Review of the liposuction procedures performed from May 30, 2008 through November 15, 2008 showed that all 27 patients followed up after their liposuction procedure within 1 week for stitch removal. After the one week stitch removal followup, patient follow-up varied from one month to three months post-procedure. Six patients had at least three months follow-up evaluation documented in the medical records, there was no documentation of infection at the liposuction wound sites. Sixteen patients between May 30, 2008 and October 4, 2008 had less than three months follow-up documented in the medical records. Five patients had liposuction performed after October 4, 2008 and had not yet reached their 2 and 3 month follow-up visits. Only one other patient (excluding the case-patient) who had liposuction since May 2008 was treated with antibiotics post-procedure. This patient was treated with antibiotics 1 week post-procedure but had no signs of infection at one month post-procedure follow-up according to the medical record review; telephone interview was conducted by ACDC with this patient, who reported no current signs or symptoms of infection. Of note, medical charting and phone conversations written in the medical records by medical assistants were in a



foreign language. Post-liposuction wound care instructions (e.g. do not bathe, touch wound, swim, etc.) were given verbally to patients but no written instructions were handed out for the patients to take home after the procedure.

Follow-up telephone interviews were conducted by ACDC on December 2 and 3, 2008 with the 16 patients who had received liposuction from May 30, 2008 through October 4, 2008 and had less than three months post-procedure follow up evaluation. None of these patients reported signs or symptoms of wound infection (e.g. fever, redness, “bumps” or nodules, drainage) at their liposuction sites and none had seen another physician due to concerns about their liposuction wound sites.

Because positive AFB tests are reportable under California Code of Regulations Title 17, Section 2505 to the LAC DPH Tuberculosis Control Program (TBC), ACDC contacted TBC to look for any positive AFB results from surgical wound sites. TBC’s database was queried and did not show any other laboratory results of rapidly growing mycobacteria from surgical wound sites except for that of the initial case-patient.

Environmental Investigation: On November 19, 2008 ACDC conducted a site visit consisting of a walk-through and interviews with the physician and office staff regarding the liposuction procedure including equipment cleaning and sterilization. The procedure room where liposuction was being performed was clean and orderly. There was one sink in the procedure room. Areas for cleaning/disinfection of equipment were separate from sterile equipment storage and medication preparation. The medical office did not have ice machines or water baths.

There was 1 liposuction machine (VASER®) bought new since May 2008, 1 tabletop steam autoclave (Validator 8®- Pelton & Crane Co.) several years old which had not undergone any repairs or preventive maintenance checks. Skin markings for liposuction preparation were done using sterile, single use markers that were included in sterile one time use procedure packs. The liposuction procedure was performed under local anesthesia using the tumescent technique under local anesthesia where normal saline IV bags are mixed with epinephrine (single use aliquots), lidocaine (multidose vial), and bicarbonate (multidose vial). The tumescent infusion solution was disposed of after each patient use. An open date was written (November 3, 2008) on one opened multidose lidocaine vial and there were no other open medication vials.

Single-use, disposal liposuction equipment consisted of the suction tubing, infusion tubing, and vacuum canisters. Reusable liposuction equipment consisted of skin ports, infiltrator cannulas, ultrasonic probes, suction cannulas (Figure 1), handpiece for cannulas, connectors, and a wrench (used to connect the handpiece). Reusable liposuction equipment was cleaned with soap and tap water with a bristle brush, then disinfected in CIDEX Plus™ (3.4% alkaline glutaraldehyde) solution by soaking for 30 minutes, then air dried, and steam-pressure autoclaved.

Infection Control: Office MA staff were trained by the manufacturer on cleaning, disinfecting, and sterilizing the liposuction equipment in May 2008 when the machine was initially purchased. Cleaning, disinfection, and sterilization of liposuction equipment were usually done primarily by one MA. Office staff indicated that sterilized equipment not used within two weeks, is re-sterilized prior to use.

The office did not have any written infection control policies or hand hygiene policies. The office did not have the manufacture’s instructions for VASER® liposuction equipment cleaning, disinfection, and sterilization. There were no written procedures or logs for cleaning/disinfection of liposuction equipment and no written procedures or logs for autoclave sterilizing. The office did not have the manufacture’s instructions for the autoclave and had never used biological indicators (monitors the effectiveness of the steam sterilization process) to assure sterilization as recommended by the autoclave manufacture’s instructions (which were later obtained by ACDC). Indicator tape (adhesive tape used in autoclaving to indicate whether a specific temperature and pressure has been reached) was used on instrument bags and the physician and office staff were informed by ACDC that the indicator tape only showed that only a certain temperature was reached, not necessarily adequate sterilization.

The following was also noted: staff indicated they combine left over small 4 oz open bottles of povidone-iodine together, if needed, into larger containers; staff used cotton balls in small plastic containers moistened with alcohol for wiping tops of multidose vials instead of individual sterile alcohol wipes; MAs



describe assisting the physician in mixing and injecting intravenous cephazolin used for patients but it was unclear whether they had a direct role in administering any IV therapy; the physician indicated that during the liposuction procedure, he would insert the cannula into 70% isopropyl alcohol from an open bottle (non-sterile) and flush the suction cannula to dislodge tissue from ports then insert the cannula back into the patient for further suctioning.

Laboratory Investigation: The following environmental samples were taken for AFB testing: procedure room tap water, swabs from inside the faucet/aerator, autoclave reservoir water, autoclave distilled water, fresh CIDEX Plus™ disinfectant from an open container, opened containers of povidone-iodine gel, instrument cleaning brush rinse, and a container of cotton balls soaked in alcohol.

Procedure room tap water was AFB smear negative; culture grew *Mycobacterium gordonae*. The faucet and aerator swabs had 2+ AFB and 1+ AFB, respectively, and cultures for both grew *M. gordonae*. The remainder of the environmental specimens were AFB smear and culture negative.

DISCUSSION

Atypical mycobacterial infections have been associated with post-procedure skin and soft tissue infections including after cosmetic surgeries and outbreaks have been documented^{2,3,4,5,6,7,8}. Potential sources of contamination reported in the literature were inadequate sterilization and rinsing of liposuction equipment with tap water, contaminated methylene blue used to mark incisions for face lifts, and contamination of the quaternary ammonium solution used to disinfect liposuction instruments^{3,6,7,8}. *M. chelonae* can be found widely distributed in the environment in soil and water, including tap water. Facial procedures, abdominoplasty, liposuction, breast reduction or augmentation, mammoplasty, and nipple piercing have all been associated with cases of post-procedure infection with rapidly growing mycobacteria. Increased use of alternative medicine providers and increased numbers of procedures performed in freestanding surgical centers that are not routinely monitored by infection control committees or equivalent oversight bodies may be contributing factors².

Our investigation of this case of atypical mycobacterial wound infection following liposuction shows that it was likely an isolated occurrence as 100% case finding and AFB surveillance did not reveal any other infections. Although no other cases were found, proper cleaning, disinfection, and sterilization of liposuction equipment and other infection control issues at the office were of concern. The office did not have written procedures for processing reusable liposuction equipment, did not keep logs of using the autoclave for sterilization, and were not performing preventive maintenance checks or verification of sterility on the autoclave as recommended by the manufacturer.

In general, liposuction instruments by their nature (Figure 1) may be difficult to clean and proper sterilization steps need to be undertaken⁹. Decreasing lumen diameter and length are factors that affect the efficacy of sterilization and can impair sterilant penetration¹⁰; liposuction cannulas may retain unseen tissue posing sterilization difficulties⁹.

Risk factors causing or contributing to infectious disease outbreaks in the outpatient settings that have been identified include: inadequate cleaning, disinfection, sterilization, and storage of instruments and equipment; inappropriate use of barrier equipment such as gloves by healthcare personnel; inadequate hand-washing practices by healthcare workers; failure to use aseptic technique; and lack of familiarity with established infection control practices on the part of ambulatory care personnel. Also, in the outpatient setting, the responsibility for implementing an infection control program is usually not assigned to a specific individual¹¹. Following our site visit, our concerns regarding the absence of infection control procedures and the absence of equipment cleaning and sterilization procedures were discussed verbally with the physician. A letter was sent to the physician on December 8, 2008 summarizing the findings and making recommendations to improve his practice. These included developing an infection control policy; keeping written procedures and logs of cleaning, disinfecting, and sterilization procedures which are consistent with the manufacturer's recommendations; performing preventive maintenance on the autoclave according to the manufacturer's instructions; and using biologic indicators to assure sterilization.



Regarding antiseptics and sterilization, we recommended the following: utilize single-use alcohol prep pads for cleaning multidose vials instead of cotton balls soaking in alcohol containers; avoid mixing/combining antiseptic solutions unless it is according to the manufacturer's instructions; and while performing liposuction, to only use sterile solutions or irrigations (not non-sterile bottles of isopropyl alcohol) to flush ports on previously sterilized liposuction equipment.

We also recommended that the physician provide patients with written, take home post-liposuction wound care instructions in the patient's preferred primary language which include instructions on avoidance of bathing or soaking wounds in water for the instructed time period. Additionally, the physician was instructed to review the duties of medical assistants; MAs may not place the needle or start and disconnect the infusion tube for IV therapy as these procedures are considered invasive, and therefore, not within the medical assistant's scope of practice. Medical assistants are not allowed to administer medications or injections into the IV line¹².

Although there have been many cases of atypical mycobacterial infections reported in the medical literature due to contamination during liposuction or other cosmetic procedures, a thorough investigation did not reveal any other cases nor a source for *M. chelonae* associated with this office. It is possible that the case-patient acquired the infection through an environmental source outside this particular office. However, since there were several infection control issues of concern and because the incubation period for atypical mycobacterial infections can be prolonged (the range has been reported to be from 2 weeks to 20 weeks²), the physician was reminded to be vigilant for any further wound infections in patients post-liposuction and to notify ACDC of any patient with wound infection post-liposuction.

Plastic surgeons and dermatologists are the types of physicians who most often perform liposuction, but any licensed physician may perform the procedure. While some physicians' professional societies recommend standardized training for such procedures, there is no standardized training required for liposuction¹³. Outpatient medical offices are also not routinely monitored by oversight bodies or infection control committees as are hospitals and outpatient surgical centers¹⁴. Due to this and other factors^{2,15}, lapses in infection control specifically in these outpatient settings may result in outbreaks^{11,14,16}. Our findings during the investigation at this medical office further highlight the unaddressed infection control monitoring problems in outpatient settings.

Figure 1: Close up view of ports of reusable suction cannulas (with openings at the right end) and ultrasonic probes used for liposuction





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METHICILLIN-RESISTANT *STAPHYLOCOCCUS AUREUS* ACTIVE SURVEILLANCE PRACTICES IN ACUTE CARE HOSPITALS IN LOS ANGELES COUNTY, 2008

Ashley Peterson, MPH; Patricia Marquez, MPH; Dawn Terashita, MD, MPH

BACKGROUND

Since its emergence in health care facilities in the 1960s, methicillin-resistant *Staphylococcus aureus* (MRSA) has become a leading cause of healthcare-associated infections and is associated with significant morbidity, mortality and increased costs of care. In 2003, it was estimated over 60% of Intensive Care Unit (ICU) patients with *Staphylococcus aureus* have MRSA [1]. Additionally, colonization with the organism is a risk factor for developing infection in severely ill patients [2].

Prevention of MRSA transmission within acute care hospitals has become a focus of many infection control programs but has been complicated by an influx of patients with community-associated and hospital-associated colonization and infection. Laboratory-based active surveillance (AS) for MRSA has been proposed as a method to screen and identify these patients as an important first step in implementing appropriate control measures to reduce transmission and to prevent colonized patients from developing severe infections. Research on the efficacy and cost-effectiveness of MRSA AS remains divided [3,4]; however, several states have adopted legislation requiring the reporting of or screening for MRSA.

In light of pending California legislation mandating the screening of high risk patients for MRSA, Los Angeles County (LAC) Department of Public Health Acute Communicable Disease Control (ACDC) administered a survey to infection preventionists (IPs) in all acute care hospitals in LAC to assess the current status of MRSA AS. Since completion of this survey, California has enacted legislation, Senate Bill 1058 of 2008, now Chapter 296, Sections 1255.8 and 1288.55 in the Health and Safety Code.

METHODS

The internet based SurveyMonkey© software was used to create and distribute a 29-question survey to IPs at all 102 LAC acute care facilities via email. Using features of SurveyMonkey©, the questionnaire was designed with skip logic to alter questions observed by the respondent based on the respondent's previous answers. Respondents were given one month to complete the questionnaire, from March 24, 2008 to April 21, 2008. During this one month period, LAC Department of Public Health liaison public health nurses (LPHNs) contacted respondents to encourage completion of the survey. Three weeks after survey collection began, on April 14, 2008, non-responders were sent a notification email requesting they complete the survey.

Respondents were asked if their facility was performing any self-defined active surveillance. If not, respondents were taken directly to the end of the questionnaire and asked about plans to begin active surveillance. All other respondents were asked about the type of active surveillance being performed, targeted populations, laboratory testing methods and time to results. Respondents were also asked about the patient environment prior to and after test results are available. Information was requested regarding who is notified of active surveillance results and any subsequent education regarding care of MRSA positive patients including education of patients, family members and other receiving facilities. Presence of active surveillance evaluation plans was also determined. Definitions of AS, MRSA, common infection control terms, and laboratory terms were not provided. Finally, ACDC assessed other bacteria for which hospitals routinely perform AS.

Following review of completed questionnaires, verbal contact may have been made with individual respondents to clarify free response answers or to adjust inappropriately completed questionnaires.

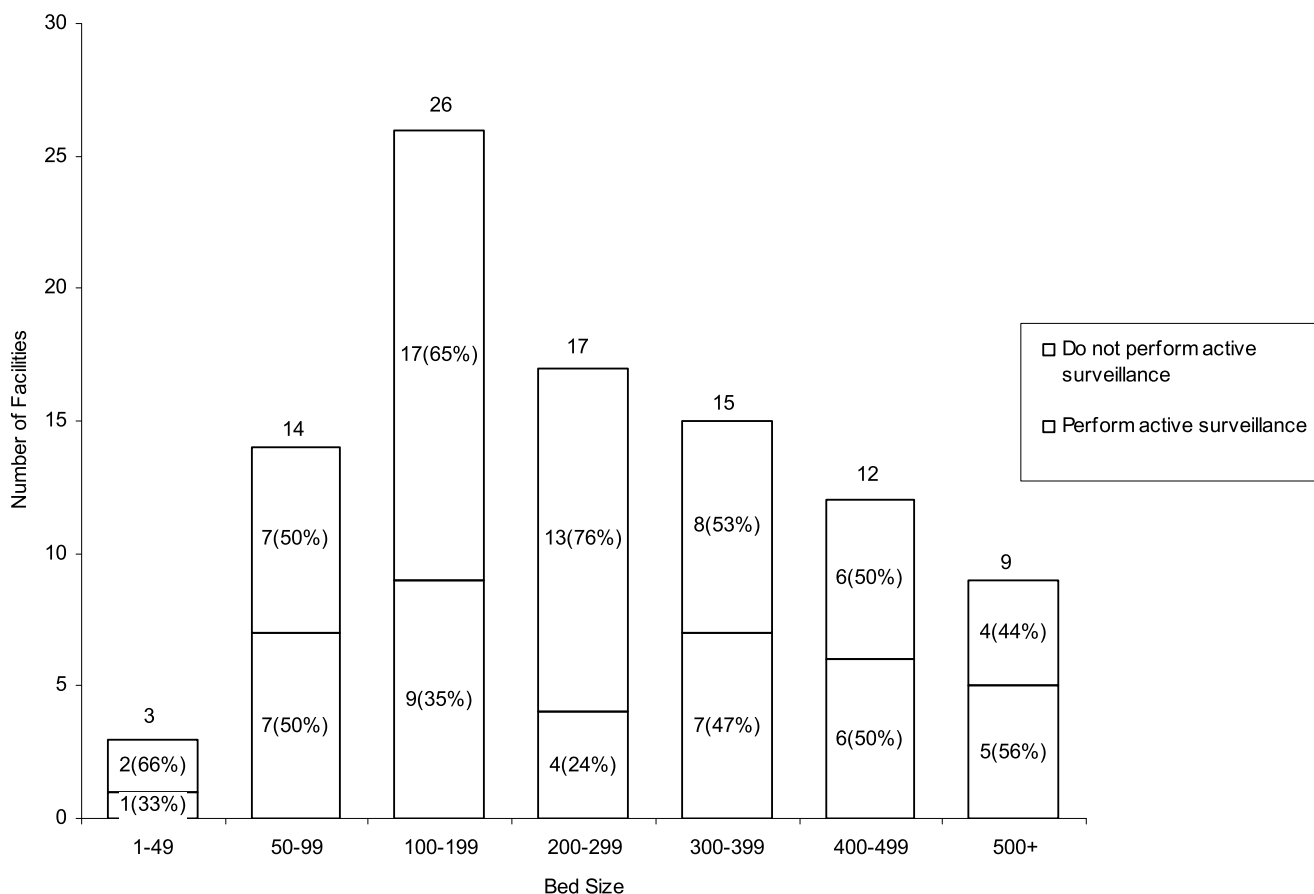
Data collected by SurveyMonkey© was downloaded into MS Access and imported into SAS version 9.1 for analysis. No incentive was provided to respondents.



RESULTS

Ninety-six acute care hospitals completed the survey yielding a 94% response rate (N=102). Thirty-nine (41%) hospitals were performing some kind of MRSA AS. Performance of MRSA AS was analyzed by bed-size category. No trend was observed between categories but ranged from 24-56% of hospitals in each category. The highest proportion of hospitals performing MRSA AS was seen in the 500+ bed-size hospitals, with 56% (Figure 1).

Figure 1: Los Angeles County acute care facilities active surveillance practices by facility bed size (n=96).



Among the 39 hospitals conducting MRSA AS, eight (21%) reported conducting universal surveillance in which they screen all patients. The remaining 31 (79%) hospitals were conducting targeted surveillance in which only select patient populations were screened. The most frequently indicated screening criteria listed included hospitalization in the ICU, history of colonization and/or infection, and presence of skin/wound infection. (Table 1)

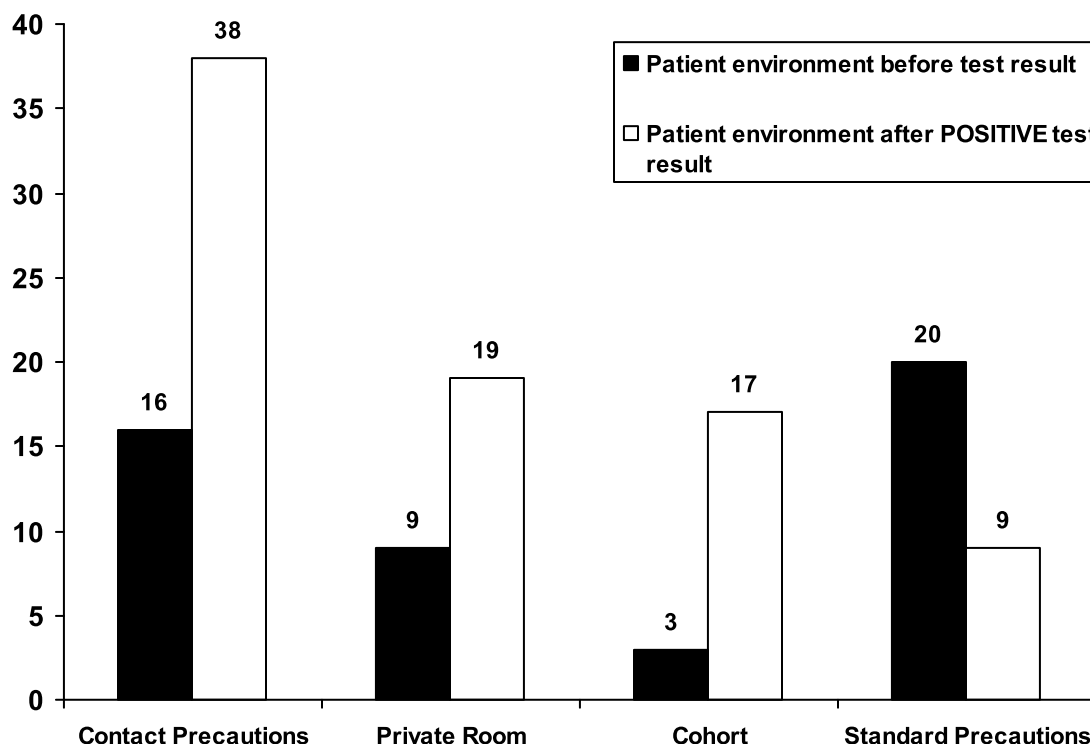
All 39 (100%) AS hospitals performed testing upon patient admission. Some hospitals also tested upon patient transfer to another unit within the facility (8, 21%), as well as at patient discharge (9, 23%). Testing methods vary but the majority (34, 87%) of hospitals used only culture methods to screen for MRSA. A small number of hospitals used only molecular methods directly on specimens (3, 8%), and 2 facilities (5%) used both culture and molecular methods. Of the 36 respondents using culture methods, chromogenic agar (e.g., CHROMagar™) was the most frequently reported medium used (14, 39%) with oxacillin resistance screening agar (ORSAB) the next most frequent (10, 28%). Of the five hospitals using molecular methods, four (80%) reported using PCR. For hospitals using culture methods, results were available within 24-48 hours compared with 2-24 hours reported for hospitals using molecular methods. Higher costs associated with molecular methods was often cited as the reason for use of culture methods for MRSA screening.



Criteria	Number of hospitals n (%)
Hospitalization in ICU	18 (46)
History of colonization/infection	14 (36)
Presence of skin/wound infection	12 (31)
Transfer from all long-term care hospitals	11 (28)
Transfer from other acute care facility	8 (21)
Other	6 (15)

Patients were placed in contact precautions in 16 (41%) AS hospitals prior to MRSA AS results becoming available and in 38 (97%) AS hospitals after positive MRSA results. Patients were placed in standard precautions in 20 (51%) AS hospitals prior to MRSA AS results becoming available and in 9 (23%) AS hospitals after positive MRSA results. Private room and cohort environments were also assessed. (Figure 2) The IP was the person responsible for taking action on MRSA AS results (reported 26 times), but in most instances a combination of the IP, the charge nurse and the patient’s physician determined the next courses of action (reported 33 times). In two hospitals, the infectious disease physician and an MRSA coordinator were indicated as the persons responsible for actions taken after MRSA AS results are available. These two facilities voluntarily reported having an MRSA coordinator separate from their IP(s) in the free-response portion of this question.

Figure 2. Patient environment before and after results of MRSA AS (n=39).





Assessment of decolonization practices revealed that 22 hospitals (56%) conducting MRSA AS did not decolonize patients identified as MRSA positive. Three hospitals (8%) always decolonize their patients and 14 (36%) decolonize based on patient characteristics (Table 2). Three hospitals indicated criteria to decolonize was decided by the patient's physician but did not disclose the criteria. The most frequently cited patient characteristic to call for decolonization was being a cardiac surgery patient. Of the 17 hospitals that decolonize their patients, a combination of methods was used. Intranasal mupirocin, chlorhexidine wash and use of oral/IV antibiotics were each listed seven times, the most common combination being intranasal mupirocin with chlorhexidine wash. Free responses to this question included one facility reporting use of topical antibiotics for wound infections only and another facility reporting use of Provon® body wash on all admissions.

Table 2. Patient characteristics determining decolonization upon positive MRSA testing

Patient Characteristics	Number of Hospitals
Cardiac Surgery Patient	4
Physician Discretion	3
Other*	3
Recent C-section	1
Solid Organ Transplant Patient	1
Bone-marrow Transplant Patient	1
Burn Patient	1

*Other – Presence of infected wound, patient acuity, and patients being discharged to home

The most common reasons hospitals performed AS were to prevent MRSA transmission (32, 92%), to reduce rates of MRSA in their hospitals (26, 67%), and to determine incidence and prevalence of hospital-acquired versus community-acquired MRSA infections (18, 46%). Also indicated, though not as frequently, were concerns regarding new federal Medicaid regulations that will block reimbursement of the facility for hospital acquired infection costs (10, 26%).

The most frequently reported organism for which hospitals routinely performed surveillance was vancomycin-resistant enterococcus (VRE) (22, 56%). Twelve (31%) hospitals also reported doing methicillin-sensitive *Staphylococcus aureus* surveillance. Other organisms being surveyed included *Clostridium difficile* (10, 26%), Acinetobacter spp. (9, 23%), and multi-drug resistant gram-negative rods (9, 23%).

Of the 55 hospitals not performing MRSA AS at the time of survey, 46 (84%) had had internal discussions on the matter. Twelve (26%) of the 46 hospitals planned to implement some form of AS in their facility within 1-12 months of the survey completion date. Twenty-seven (59%) facilities that had discussed MRSA AS did not have additional details. Seven (15%) hospitals stated they had no plans to implement active surveillance for MRSA. Reasons for this decision varied; however, most cited limited IP resources, no demonstrated cost-benefit of such surveillance, and cost of material resources as barriers to MRSA AS. One facility reported its cost estimate of implementing MRSA AS at upwards of \$250,000 to screen all admitted patients using a rapid method. Many respondents also felt that other organisms such as VRE and *Clostridium difficile* represent a greater problem in their facility. In addition, numerous hospitals reported having space constraints, limited staffing resources, and patient care concerns which could not support patient isolation practices pending MRSA AS results.



DISCUSSION

The response rate was very high (94%) due to the efforts of the liaison public health nurses with hospital IPs and the controversial nature of this topic and the pending legislation. The small number of non-respondents limits the effect of any response bias on the results.

A significant limitation of this survey was the lack of an accompanying dictionary of terminology. A definition of active surveillance was not provided and three hospital IPs indicated that their hospitals did not perform MRSA AS when, according to subsequent responses, they did. In addition, some respondents used the term universal surveillance when in practice they performed targeted surveillance. The method in which the survey was disseminated was another limitation. However, in follow-up conversations with hospital IPs, ACDC was able to correct any confusion the survey distribution method introduced.

Unfamiliarity with laboratory test names and other laboratory terminology also proved to be a significant limitation; the response 'check with lab' was given several times when asking which methods their laboratories used to screen for MRSA. However, this provided an opportunity for IPs to become familiar with laboratory procedures associated with MRSA AS.

What was initially an example of unfamiliar terminology actually became an interesting finding. In assessing the use of standard and contact precautions, three hospitals did not indicate use of either before MRSA AS results are available. In fact, national standard guidelines require the use of standard precautions on all patients in all situations. This finding was concerning as the first step in effective infection control is grasping the associated terminology.

What is evident from the survey is the variety of MRSA AS implementation methods in LAC hospitals. As with any methodology, differences in implementation will result in differences in limitations and in efficacy. It must recognize that facilities will have varying success rates at preventing hospital-associated MRSA infections given their method of MRSA AS.

Many IPs commented that organisms other than MRSA were of greater concern and were more of a problem in their facilities. Consequently, it is apparent that MRSA infections are only a part of a greater problem of multidrug-resistant organisms (MDRO). Addressing the issue of all MDROs requires focus on these other organisms as well as MRSA.

CONCLUSION

An on-line survey was administered to IPs of the 102 acute care hospitals in LAC. Forty-one percent of respondents were conducting MRSA AS at the time of the survey. Many hospitals not currently performing AS reported they had discussed surveillance of MRSA in their facility. Since completion of the survey and enactment of California legislation, all hospitals are now required to screen select patients for MRSA.

Despite the large number of hospitals performing AS, the benefit of AS is controversial. It is unknown if actively screening for MRSA will limit transmission in hospitals, reduce associated morbidity and mortality, or limit outbreaks of this organism. Further cost-benefit analysis is warranted to objectively assess whether the benefits of knowing a patient's infection/colonization status offset the demonstrated costs.

This survey has prompted much discussion regarding mandated AS. In the absence of literature supporting MRSA AS as an effective method of controlling MRSA transmission in hospitals, California's choice to adopt MRSA AS legislation is an example of policy driven healthcare as opposed to science driven healthcare. Patient safety is the primary concern of hospitals. Simultaneously adhering to this legislation and working to decrease healthcare-associated infections has been difficult as demonstrated by many of the answers to the survey. Public health departments can perform an important role during these difficult transitions by facilitating communication and interaction between hospitals in response to emerging Public Health concerns.



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RESPONSIVENESS OF PUBLIC HEALTH PHYSICIANS ON-CALL: ANALYSIS OF LOS ANGELES COUNTY CALL OPERATOR DATA FOR 2007

Ramon E. Guevara, Ph.D., MPH

INTRODUCTION

The Los Angeles County (LAC) Department of Public Health (DPH) processes emergency calls made after regular business hours through the LAC Call Operator, who attempts to reach the assigned physician on-call to respond to the emergency. Since the bioterrorism preparedness efforts after September 11, 2001, the national goal for response to emergency calls by local public health agencies has been 30 minutes or less [1]. Recently, LAC DPH Acute Communicable Disease Control Program (ACDC) has performed quality assurance by guising planned calls as emergency calls to measure the responsiveness of the department. This report emerges from an interest in exploring the LAC Call Operator data as an alternative method to measure the responsiveness of LAC DPH to emergency calls received outside of regular business hours. Furthermore, a description of how the data might be used for quality assurance and control purposes will be presented.

METHODS

The LAC Call Operator data is entered and stored in a computer database as emergency calls arrive and updates are made regarding the progress in the attempts to reach the physician on-call and the final resolution of the call. While the data exists electronically, it is not directly transferable to a standard database application such as Microsoft Access, Microsoft Excel, or SAS. As such, the LAC Call Operator provided their data for 2007 on a 20-page printout. Inquiries about missing data within records, such as when the resolution of the call was not indicated, were explained by the Call Operator as faults of the computer system database.

After a review of the data to determine measurement categorization and analysis, a Microsoft Access database was developed for data abstraction. Based on the available data, ACDC created the following fields: unique ID, page in the 20 pages, month of call, day in the week of call, date-time of call, date-time of operator connecting to the physician on-call, caller type, reason of call, physician recipient, and missing date-time of connection to the physician on-call. Categories for caller type were 1) hospital, 2) urgent care/emergency department, 3) sheriff/police of any jurisdiction, 4) medical professional, 5) other LAC agency (not sheriff/police), 6) public, and 7) other. Categories for reason of call were 1) report illness, 2) request for information/advice on current case, 3) advice for possible case/exposure, 4) report/request information/advice: possible OB (outbreak), 5) TB (tuberculosis) clearance, 6) advice/information on medicine/therapy, 7) other, and 8) not specified/unknown. Selection of categories for each entry were based only on available information in the data and performed by the same person for consistency. When the physician on-call was not listed in the call details, records of the same day or weekend were used to identify the physician on-call; otherwise, the physician on-call was categorized as "unknown/not specified."

SAS 9.1 was used for data analysis, particularly to look at the distribution of response time, which was defined as date-time the emergency call was received by Call Operator to the date-time the Call Operator connected to the physician on-call (not the pager or voicemail, but the actual person assigned as the physician on-call).

RESULTS

The Call Operator data had 235 entries for 2007. Of these records, 52 (22%) were missing information on when the Call Operator connected to the physician on-call. For 183 entries, the median time to connect to the physician-on-call was seven minutes (range of one to 292 minutes) (Figure 1). One-hundred sixty (87%) of these calls were connected to the physician on-call within 30 minutes. However, 23 (13%) calls took longer than 30 minutes to connect to the physician on-call (Table 1). The five longest times to



connect to the physician on-call were 292, 246, 194, 177, and 69 minutes. Table 1 presents how the data on calls with long response time might be used for quality control.

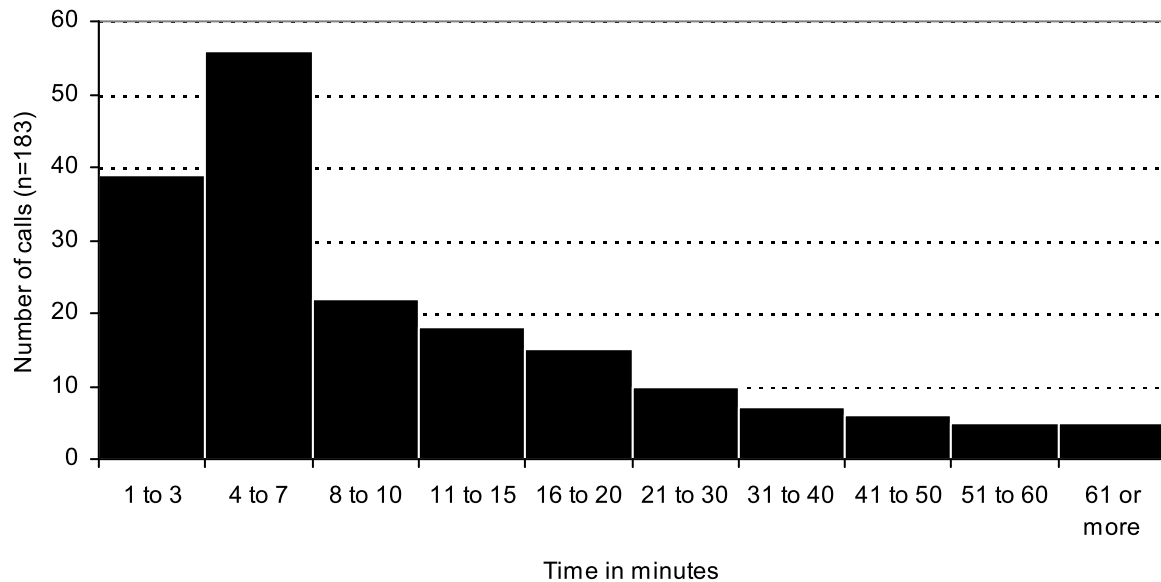


Figure 1. Minutes to connect emergency call to physicians on-call during non-office hours (during holidays, weekends, and weekdays 5pm - 8am), Los Angeles County Call Operator data for 2007. Median time was seven minutes (range one to 292 minutes).

Table 1. Details for the emergency calls (N=23) requiring more than 30 minutes for the Los Angeles County (LAC) Call Operator to connect to the physician on-call during non-office hours in 2007

Minutes to connect	Month	Day	Time	Caller type	Reason	Physician*
292	Jun	Sat	12pm - 5:59pm	Hospital	Info/advice on current case	0
246	May	Sun	12am - 5:59am	Sheriff/Police of any jurisdiction	Possible case/exposure	1
194	Jan	Sat	12pm - 5:59pm	Urgent Care/ ER	Report illness	2
177	Apr	Mon	12am - 5:59pm	Urgent Care/ ER	Possible outbreak	0
69	Aug	Sat	12pm - 5:59pm	Hospital	Tuberculosis clearance	2
58	Feb	Fri	12pm - 5:59pm	Other LAC agency (not police/sheriff)	Other	3
57	Feb	Mon	12pm - 5:59pm	Hospital	Tuberculosis clearance	3
57	Jun	Sun	12pm - 5:59pm	Hospital	Advice on medicine/therapy	4
55	Jan	Sun	6am - 11:59am	Med. professional	Report illness	5
52	Aug	Fri	12pm - 5:59pm	Hospital	TB clearance	0
48	Dec	Tue	6am - 11:59am	Hospital	Info/advice on current case	6
48	Aug	Sat	12pm - 5:59pm	Hospital	Info/advice on current case	0
47	Apr	Fri	6pm - 11:59pm	Hospital	Info/advice on current case	4
44	Dec	Sun	6am - 11:59am	Hospital	Info/advice on current case	6
44	Jan	Sat	12pm - 5:59pm	Med. professional	Possible case/exposure	4
44	Jan	Sat	12pm - 5:59pm	Hospital	Possible outbreak	2
40	Sep	Thr	12pm - 5:59pm	Hospital	Other	0
39	Oct	Sun	12pm - 5:59pm	Hospital	Tuberculosis clearance	3
36	Mar	Thr	6am - 11:59am	Public	Possible case/exposure	3
34	Jun	Fri	12am - 5:59am	Urgent Care/ ER	Possible case/exposure	7
34	Jul	Mon	12pm - 5:59pm	Hospital	Info/advice on current case	0
34	Oct	Sat	12pm - 5:59pm	Other	Advice on medicine/therapy	3
31	Dec	Fri	12pm - 5:59pm	Med. professional	Possible case/exposure	7

*Names of the physician on-call were masked for this table, 0=Unknown/Not specified



The rest of the results are presented from a quality assurance and control perspective. Hospitals were the most common caller type (n=98, 42%) in 2007 (Table 2). Advice for possible case/exposure was the most common reason for the call (n=66, 28%) (Table 3). Out of 38 calls from the sheriff/police (Table 2), 33 were made to seek advice for possible case/exposure. The sheriff/police made 50% of the calls pertaining to possible case/exposure (Table 3). Physician on-call was unknown/not specified for 80 (34%) of 235 emergency calls.

Regarding calendar time, June (n=30 calls), October (n=27), and November (n=27) had the most emergency calls outside of regular business hours (Figure 2). Saturday, Sunday, and Friday had the most number of calls (Figure 3). Most of the emergency calls from Saturday to Monday were between 12pm and 5:59pm, and from Tuesday to Friday were between 6pm and 11:59pm.

Caller type	Number	Percent
Hospital	98	41.70
Sheriff/police of any jurisdiction	38	16.17
Urgent Care/ER	27	11.49
Medical professional	25	10.64
Other LA County agency (not police/sheriff)	17	7.23
Other	20	8.51
Public	10	4.26

Reason for call	Number	Percent
Advice for possible case/exposure	66	28.09
Report illness	41	17.45
Request for info/advice on current case	38	16.17
TB (tuberculosis) clearance	26	11.06
Other	23	9.79
Report/request info/advice: possible outbreak	20	8.51
Advice/info on medicine/therapy	15	6.38
Not Specified/Unknown	6	2.55

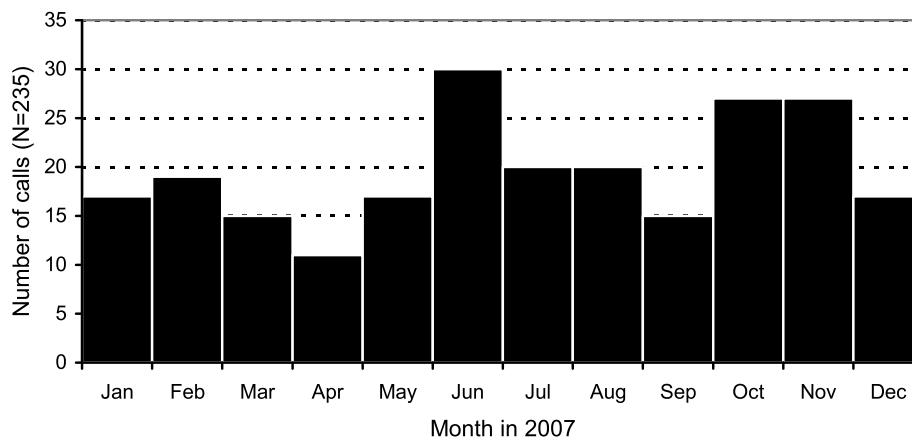


Figure 2. Number of emergency calls (N=235) outside of non-office hours to the Los Angeles County Call Operator by month in 2007.

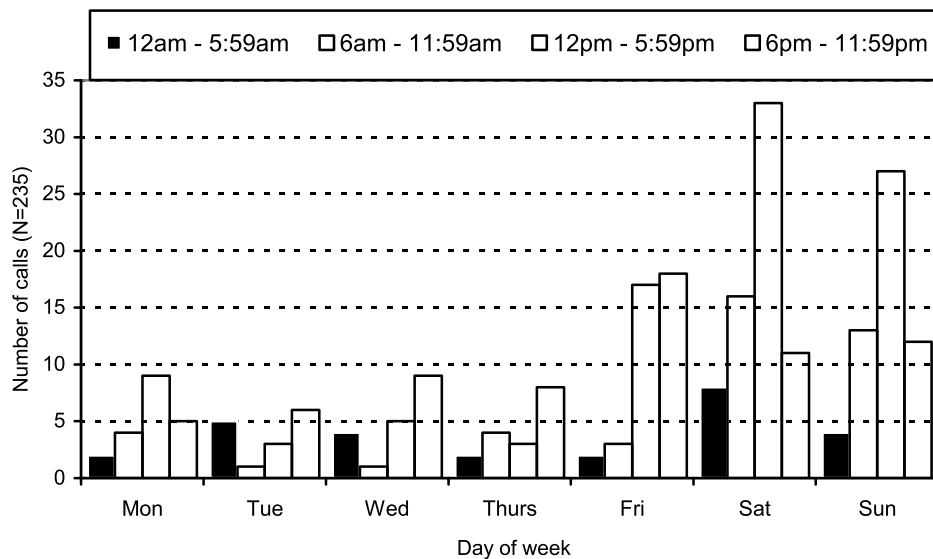


Figure 3. Number of calls (N=235) outside of non-office hours (holidays, weekends, and weekdays between 5pm and 8am) to the Los Angeles County Call Operator by day and time of day in 2007.

DISCUSSION

The accuracy, completeness, and non-transferability of the LAC Call Operator data are issues to be considered when regarding the data as a source to measure quality assurance. The details of the call are sometimes vague and categorizations can change with more specifics. For example, a call about a current case wanting to leave the hospital can change to a call about TB clearance with one mention of TB. Regarding completeness, details of the call are sometimes truncated or not entered. The details missing the most were time of connection and which physician was connected to the call. Finally, the Operator data could not be transferred into a database file and had to be manually entered. This was the most time-consuming part of this effort and took about an hour of data entry per page. The absence of transferability also allowed for data entry errors which had to be corrected during the analysis. In addition, the pages received from the LAC Call Operator had to be copied and adjusted in the photocopier because the call log came as one long sheet that folded between call entries.

LAC DPH may want to review or revise the standard operating procedures with the Call Operator and ACDC to prevent emergency calls from taking more than 30 minutes to get connected to a DPH physician. However, recommendations to decrease the response time of the physician on-call or to ensure a response within a certain time period are outside the scope of this report.

In summary, 87% of 183 calls were connected by the LAC Call Operator to the physician on-call within 30 minutes and the median response time for all emergency calls made outside of regular business hours was seven minutes. In addition, using the Call Operator data as source for quality assurance is a feasible alternative to making planned calls disguised as emergency calls if new staff resources are made available to establish an efficient and routine system of data collection, analysis, and reporting. Finally, the results of this report are presented as a guide to perform quality assurance and control, and as a source of information for emergency call-related issues the LAC DPH might want to explore to improve emergency call management. LAC DPH aims to improve in responding to all emergency calls in a timely manner.

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REDDINET[®] TOOL FOR SITUATIONAL AWARENESS: SAN FERNANDO VALLEY WILDFIRES

Patricia Araki, MPH and Bessie Hwang MD, MPH

INTRODUCTION

During October of 2008, the Marek and Sesnon wildfires scorched nearly 15,000 acres of land and spread throughout the San Fernando Valley destroying fifteen residences and sixty three non-residential buildings [1]. ReddiNet[®] is a biosurveillance project which polls 65 participating hospitals throughout Los Angeles County on a daily basis to assess Emergency Department (ED) volume data. In order to gauge the burden of ED visits attributable to the wildfires, a special polling question was created and distributed to select ReddiNet[®]-participating hospitals within close proximity to the wildfire locations.

METHODS

On three consecutive days after the beginning of the wildfires, fifteen hospitals within geographic proximity were asked to additionally report the “Number of ED patients complaining of upper respiratory problems resulting from exposure to smoke/fire related particles”. The questions were open to responses for one week from the date of posting, and no advanced warning or notification was given prior to posting of the additional question.

RESULTS

Data were received from 8 of the 15 hospitals (53.3%) (Table 1). Results from the eight hospitals show wildfire-related ED visits ranging anywhere from 0 to 10 per hospital, with a total of 20 visits observed overall for October 13. In contrast, visits for October 14 only totaled 7, with 6 hospitals reporting no visits, and two hospitals reporting more than 3 visits each. Only one hospital reported seeing any wildfire-related ED visits on the third day. The average number of wildfire-related ED visits seen on the first day was 2.5 per hospital (Table 2). This number dropped to less than one for the second and third days, collectively, which suggests that the burden of wildfire-related ED visits occur early, most likely due to sudden changes in air quality, especially for chronic respiratory or asthmatic sufferers, and larger initial exposure population (pre-evacuation). The total number of visits reported for all three days was 28. This, however, is likely an underestimate, given that there were a few hospitals in closer proximity to the wildfires than those reporting wildfire-related ED visits which did not respond to the poll.

Hospital	Oct. 13	Oct. 14	Oct. 15	Total Visits
A	10	0	0	10
B	0	0	0	0
C	1	0	1	2
D	4	4	0	8
E	4	0	0	4
F	0	0	0	0
G	1	3	N/A	4
H	0	0	0	0
Total Visits	20	7	1	28



<u>Day (Date)</u>	<u>Avg. per hospital</u>
Monday, October 13, 2008	2.5
Tuesday, October 14, 2008	0.875
Wednesday, October 15, 2008	0.14

Reporting by the eight hospitals was highly consistent, with only one non-reporting hospital on October 15. Timeliness of reporting for October 13 ranged anywhere from 1 to 3 hospital responses per day, with complete reporting within four days. October 14-15 had similar rates of reporting, with the majority of hospitals responding within the first 24 hours (Table 3). The increase in timeliness of reporting between October 13 and those of October 14-15, collectively, may be a reflection of the hospitals' late observance of the additional polling question due to there being no prior training, notification, or warning. Consistency in reporting and thoroughness of responses throughout the exercise demonstrate high reliability by hospitals that choose to participate.

<u>No. of hospitals Reporting (%)</u>	<u>Oct. 13</u>	<u>Oct. 14</u>	<u>Oct. 15</u>
Within 1 day	1 (12.5)	5 (62.5)	5 (71.4)
Within 2 days	2 (37.5)	2 (87.5)	1 (85.7)
Within 3 days	3 (75)		
Within 4 days	2 (100)		
Within 5 days			
Within 6 days		1 (100)	1 (100)
Total	8	8	7*

*Total number of hospitals reporting for Oct. 15 was 7.

DISCUSSION

Currently, no special polling sections exist on the ReddiNet[®] system. As a result, all additional polling questions presented to hospitals appear in the same font, font size, and text as all other daily polling questions. Future improvements may include the development of an additional polling section which will alert users when a special poll is being conducted.

Overall, this exercise provided a baseline for measurement of participation and response to any future special polls administered via the ReddiNet[®] system. Results from the exercise suggest possible increases in participation through regularly administered practice polls. This may breed familiarity for staff members entering data. In addition, improved communication with individual hospital staff responsible for entering polling data (e.g., email lists of key hospital staff) should be established for sufficient hospital notification of special polls or updates. With the stated improvements, the future shows promise for using this instrument to assess near real-time burden of ED visits attributable to large outbreaks, pandemics, and many other local public health emergencies.

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A CASE OF CONGENITAL RUBELLA IN LOS ANGELES COUNTY

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BACKGROUND

Women who are non-immune to rubella and who become infected with rubella during pregnancy are at risk for delivering an infant with Congenital Rubella Syndrome (CRS). About 85% of infants born to women that were infected with rubella during the first trimester of pregnancy will be affected. Congenital rubella can be a devastating disease with multi-organ involvement and severe congenital defects. Deafness is the most common single manifestation of congenital rubella; however, many infants will also have severe eye defects including cataracts and structural heart disease. These three features are the hallmark of CRS. Neurologic abnormalities, bone lesions, splenomegaly, hepatitis, and thrombocytopenia are also common.

The last major rubella epidemic in the US occurred in 1964-1965, during which there were an estimated 12.5 million cases of rubella infection with about 20,000 cases of CRS [1]. Following rubella vaccine licensure in 1969, the annual incidence of rubella rapidly declined reaching a record low of seven US cases in 2003. In October of 2004, CDC declared rubella to be no longer endemic in the US [1].

In Los Angeles County (LAC), rubella incidence has followed the national trend; the 5-year average incidence of rubella cases in LAC for the years 1992-1996 was only 0.04, equivalent to an average of 3.6 cases per year [2]. During the five-year period of 2003-2007, only one case of rubella was reported in LAC (2005) [3].

Despite the success in eliminating the endemic circulation of rubella in the US, the risk for importation of rubella from parts of the world where rubella continues to circulate is significant.

THE CASE

In November 2008, the Los Angeles County Department of Public Health received a confidential morbidity report on a suspect Congenital Rubella Syndrome (CRS) case from the neonatal department of a local hospital. The infant had a positive IgM serological test result for rubella. Upon interviewing the infectious disease physician who consulted on the case and reviewing the medical records, it became immediately clear that this was, in fact, a case of CRS. The infant was born at 34 weeks gestation, had significant thrombocytopenia requiring a platelet transfusion, bilateral cataracts, a patent ductus arteriosus, an atrial septal defect, an enlarged liver, and bone radiolucencies. Although not known initially, the infant went on to fail a hearing test at the time of hospital discharge. Subsequently, a viral culture from the nasopharynx yielded positive growth of rubella at the State of California Viral and Rickettsial Disease Laboratory.

The mother of the child was a 33 year old licensed health care professional, born in the US, without a history of acute or chronic illness. This infant was the result of her first pregnancy. She initiated prenatal care for this infant during her second trimester, upon returning to the US from a three month extended stay (with her husband) in India that included a two week trip to China. The result of her rubella screening test during her initial prenatal visit was positive (immune).

The mother stated that she became pregnant during the trip. She denied any signs or symptoms of rubella during her trip. (Rubella often presents as a very mild, minimally apparent disease in adults.) She did note that during her time overseas, she worked as a volunteer at an elementary school in a very poor area of Mumbai, India.

The mother believed that she was vaccinated as a child against rubella and this was further supported by a discussion with her mother. However, no immunization records could be found. When she first went to work at a local dental clinic two years ago, she was only required to be vaccinated against hepatitis B. At



that time, she was not assessed for immunity (or vaccination status) against rubella. She received services at a travel medicine clinic prior to her extended overseas trip and again there was no assessment of immunity (or vaccination status) against rubella.

DISCUSSION

Lessons Learned

This CRS case illustrates several important points. First, it's important to remember that exposure to a vaccine preventable disease that is no longer endemic in the US is often just an airplane ride away. With the significant number of US measles outbreaks in 2008, most of which were linked to importation cases, many foreign travelers are now aware of the importance of being protected against measles before embarking on their trip. However, there appears to be less emphasis on ensuring protection against rubella.

Lesson 1: The Centers for Disease Control and Prevention categorizes vaccines for travel into three categories: routine, recommended, and required. All travelers and their families must ensure they are up-to-date on all routine vaccinations. These vaccines are necessary for protection from diseases that are still common in many parts of the world even though they rarely occur in the US (<http://www.cdc.gov/travel/content/Vaccinations.aspx>).

Secondly, documentation of positive rubella immunity during an initial prenatal visit, especially if that visit is made late in the first trimester, does not rule out very recent maternal rubella infection that could put the developing fetus at risk. Most often, the only rubella test that is obtained is a single IgG and that test provides no information about current disease. Unfortunately when an IgM test is also obtained early in pregnancy, the high false-positive rates obtained by many laboratories limits the value of that test as well.

Lesson 2: Although serological testing during the first prenatal visit is important to assess rubella immunity, there can be rare instances where a positive serological test during pregnancy does not eliminate the possibility of an infant being born with congenital rubella. Ideally, women of childbearing age should have their rubella immunity status determined when not pregnant. Consideration should be given to making rubella immunity testing an important part of preconception care.

Thirdly, there is documentation in the medical literature of women who were previously immune to rubella (either by vaccination or natural disease) losing their immunity and subsequently becoming re-infected with rubella and giving birth to an infant with congenital rubella [4,5,6,7]. Vaccine failure probably accounts for some of these occurrences as it has been well documented that persons vaccinated with two of the early rubella vaccines (HPV-77 and Cendehill) had a 50% or greater risk of re-infection with rubella if exposed [8]. The much better performing RA27/3 rubella vaccine was licensed in the US in 1979 and the previously licensed vaccines were withdrawn from the market. If the mother of this CRS infant was, in fact, vaccinated against rubella, she would have been vaccinated in 1976, based on her birth year being 1975. She therefore would have received one of the two poorer performing vaccines. However, because her childhood vaccination records were never found, it is not possible to determine that she was ever vaccinated against rubella.

Lesson 3: Women of childbearing age who were vaccinated before 1979 could benefit from serological testing and subsequent rubella revaccination if the serological test result fails to show rubella immunity.

Fourthly, there were major "missed opportunities" to assess the rubella immunity status of the mother of this CRS case when she entered dental school several years ago as well as when she visited a travel medicine clinic prior to her travels. Furthermore, she only received immunizations against hepatitis B when she began her work at a local dental clinic two years ago. All health care workers are recommended to have immunity against rubella (among other diseases) and immunity is defined as serological evidence of past infection or documentation of vaccination [9]. Since she lacked documentation of vaccination, she should have received serological testing.



Lesson 4: Strict standards for health care worker immunity assessment and immunization for vaccine preventable diseases need to be implemented by all employee health departments that evaluate health care workers. In addition, all travelers and travel medicine service facilities and providers must visit the Centers for Disease Control and Prevention travel health website to ensure that all recommended, required, and routine (i.e., rubella) vaccines have been received prior to travel.

NEXT STEPS

The Los Angeles County Department of Public Health Immunization Program will be sharing this information along with additional “lessons learned” from previous years’ rubella cases with the public, and general medical and travel medicine providers via presentations and published alerts.

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PERSONAL AND SYSTEM BARRIERS ASSOCIATED WITH LOW INFLUENZA IMMUNIZATIONS AMONG HEALTH CARE WORKERS: PRELIMINARY ANALYSIS OF TWO LOS ANGELES COUNTY HOSPITALS

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INTRODUCTION

Voluntary influenza immunizations among Health Care Workers (HCW) have not improved above the national average of 40% in spite of a “call-to-action” from the National Foundation for Infectious Diseases [1]. Low rate of influenza immunizations are thought to be a source of infectious disease outbreaks in hospitals, especially influenza [2]. These outbreaks have been linked epidemiologically to higher patient morbidity, mortality, and cost in hospital settings.

BACKGROUND

From 2005 to 2007, the Immunization Coalition of Los Angeles County (ICLAC), a constituency of hospitals, clinics, health plans, and vaccine companies, collaborated with its members from two large urban hospitals in Los Angeles County (herein referred to as Hospital A and Hospital B) to recognize National Adult Immunization Awareness Week (NAIAW) activities. The adult population selected for vaccination outreach was hospital-based health care workers (HCW). The goal of the partnership was to increase baseline influenza vaccination coverage rates among HCW and provide technical assistance in promoting institution-wide awareness about the importance of influenza vaccinations for hospital employees. An influenza vaccine campaign promotional toolkit was developed and tailored for hospital managers to plan the components of an effective vaccination effort. Educational materials were compiled and distributed to HCW and placed in strategic locations throughout the hospital. Subsequently, this activity provided a brief “window of opportunity” to gather additional preliminary data to explore the specific factors influencing influenza immunization coverage rates among HCW at these two hospitals.

OBJECTIVES

The objectives of the collaborative project were to increase influenza vaccination coverage rates amongst employees from Hospital A and B by 10% from a baseline of less than 40%. Infection Control and Employee Health Managers at each hospital received the ICLAC Health Care Worker Influenza Toolkit which consisted of educational materials (template employee reminder letters, flyers, timelines for influenza promotion activities), and ready-made vaccination and influenza declination forms to monitor influenza vaccination and declination rates. In addition, ICLAC developed a brief, self-administered knowledge, attitude and behaviors (KAB) survey to assess the demographic and KAB factors associated with increasing influenza immunization coverage rates and to identify specific strategies and barriers to achieving optimal vaccination rates at both hospitals.

METHODS

Determination of Baseline Coverage Rates

At the time of collaboration, the baseline influenza immunization coverage rates at these two hospitals were self-reported by the manager of Infection Control and/or the Director of Employee Health. At Hospital A (2005), the baseline coverage rate was reported to be 36%. At Hospital B in 2006 and in 2007, the baseline coverage rate was reported to be 32% and 38%, respectively.

Overview of NAIWA Campaign Procedures

The NAIWA campaign activities were held during the influenza seasons 2005 through 2007; hospital-based NAIWA influenza campaigns were implemented at urban hospitals in Los Angeles County (LAC). Both of these hospitals were Level 3 trauma facilities and Hospital B has several primary care clinics.



A variety of participation strategies were used to engage both hospital managers (e.g., Employee Health Directors, Infection Control Practitioners) and employees. During the NIAAW campaigns, influenza vaccination posters were strategically placed in locations within the hospitals, such as employee/physician lounges, cafeterias, and on medical-surgical floors. The educational toolkit for HCW consisted of a “personalized health record” along with educational materials. Recruitment strategies included use of e-mail announcements, flyers and incentives.

Knowledge, Attitude and Behavior (KAB) Survey

The self-administered knowledge, attitude, belief (KAB) survey was distributed to assess demographic, attitudinal and behavioral factors associated with receiving an influenza immunization. Specifically, the survey measures included the following variables: 1) respondent demographics (i.e., age, gender and occupation); 2) self-reported measure of the physical proximity of HCW to patient’s respiratory droplets; 3) self-report of receipt of a influenza vaccination in the previous year; 4) future intention to be vaccinated; 5) suggested strategies to increase vaccination rates; and 6) perceived barriers to vaccination for HCW.

Given that the original intent of the project was to improve vaccinations through social awareness activities, the KAB survey and methodology evolved over time. Therefore, in 2005 and 2006, the KAB survey was distributed simultaneously during the NIAAW campaigns. However, in 2007, only Hospital B chose to participate and administer the KAB survey. This report will highlight data from Hospital A in 2005; Hospital B in 2006 and 2007. The sampling methodology used at Hospital B in 2007 changed due to internal priorities and a desire to focus on high risk departments. In addition, the KAB survey was administered two weeks prior to the launch of their annual influenza campaign.

NIAAW Campaign at Hospital A – 2005

NIAAW was celebrated in the last week of September, 2005 during a hospital-wide employee barbeque luncheon. A “brown bag” influenza educational presentation was provided in a nearby auditorium to accommodate a large number of employees. These incentives were used to enhance employee participation in the NIAAW campaign. A vaccine clinic was held simultaneously during the barbeque luncheon to facilitate the employee’s access to influenza vaccinations. At the time of vaccination, the influenza educational materials packet was provided to the employee along with a raffle ticket. The KAB survey was administered simultaneously during the barbeque event and vaccination clinic. For evening shift employees, a mobile vaccination cart was taken to each medical and surgical floor so employees could be vaccinated. For these evening shift employees, ICLAC educational materials and the KAB survey were provided and collected on the same day.

NIAAW Campaign at Hospital B – 2006

NIAAW was observed during Hospital B’s annual employee influenza vaccination campaign the first week of October, 2006. The ICLAC HCW Influenza Toolkit was distributed to the hospital’s Infection Control Practitioners and to the Employee Health Director. The Employee Health Department expanded the influenza vaccination hours and set up satellite clinics within the hospital, so that regardless of work shift, employees could easily obtain influenza vaccinations at various times. In addition, a mobile immunization cart was used in the morning and late afternoon to vaccinate employees from the Emergency Department (ED) and the Pediatric, Medical and Surgical hospital units. The KAB survey was administered at the same time as influenza vaccine was administered using the mobile vaccination carts. Special influenza vaccination clinics were also established at the hospital’s three primary care comprehensive health centers for two full days.

NIAAW Campaign at Hospital B – 2007

In 2007, Hospital B modified the existing NIAAW campaign activity by administering the KAB survey two weeks prior to the influenza vaccination campaign and respondents consisted only of employees from departments identified to have patients at higher risk for influenza (i.e., Medical and Surgical, Pediatric, Neonatal, Burn Intensive Care Units (ICUs), and ED). Otherwise, Hospital B implemented similar methods to promote vaccination and completion of the KAB survey as in 2006.



Data Analyses

The data presented in this report was stored, managed, and analyzed by the Epidemiology Unit of the Los Angeles County Immunization Program (LACIP). Descriptive and bivariate analyses were performed using SAS System for Windows, version 9.0 (SAS Institute, Cary, NC). Chi-square tests were used to determine significant associations between demographic variables, receipt of vaccination in prior year and future intention to be vaccinated for Hospital A (2005); Hospital B (2006) and Hospital B (2007). Two logistic regression models were created to determine independent predictors of "future intention to vaccinate" controlling for age, gender, occupation, prior receipt of vaccine. Four independent variables were tested for association with either receiving influenza vaccinations or not receiving influenza vaccinations. The first set of independent variables were categorized as "passive" strategies (reminder emails, letters, and flyers), and "active" strategies (employee luncheons, raffle prizes, mobile vaccination carts). The last sets of independent variables were categorized as "personal" barriers (perceptions about disease risk, vaccine side effects, vaccine efficacy, and fear of needles) or "system" barriers (accessibility to vaccinations and cost).

RESULTS

Respondent Characteristics and Vaccination Coverage Rates

Hospital A – 2005

Of the 1,600 employees, 500 (31%) HCW responded to the KAB survey. Of the 500 respondents, 44% were non-patient care staff; 41% were nurses; 9% were ancillary staff, and 4.2% physicians. Eight (1.6%) of the respondents did not provide an occupation. Of the 500 respondents, 94% were hospital employees; 4% were contract employees and nearly 1% listed themselves as volunteers. Four individuals did not provide their specific work status. The majority of the participants were female (78%) and over 41 years of age (52%). Sixty-three percent of the respondents reported that they "currently interact on a daily basis within 5 feet of a patient's respiratory droplets". Seventeen respondents (3%) did not answer this question. Lastly, 47% of respondents self-reported receiving the influenza vaccination in the prior year. According to Director of Employee Health, the influenza vaccination coverage rate increased from 36% at baseline to 40% post NAIWA campaign activities.

Hospital B – 2006

Of the 7,800 employees, 2,724 (35%) HCWs responded to the KAB survey. Of the 2,724 respondents, 41% were non-patient care staff; 27% were nurses; 20% were physicians; and 9% were ancillary staff members. Eighty (3%) respondents did not answer the occupation question. One hundred twenty-seven (5%) individuals did not provide their specific work status. The majority of the participants were female over the age of 41 (61%). Eighty respondents (3%) did not answer the occupation question. Lastly, 45% of respondents self-reported receiving the influenza vaccination in the prior year. Sixty-three individuals (2%) did not report their prior year's vaccination status. According to the Infection Control Practitioner, baseline coverage rates for Hospital B improved from 32% to 38% between September 2006 and March 2007. However, from the period September 2007 and March 2008, influenza immunization coverage rates declined from 38% to 30%. The decline may have been for reasons not entirely clear.

Hospital B – 2007

As previously described, the KAB survey was distributed only to "high risk" departments. Of the 7,800 employees, 580 (13%) HCW responded to the survey. Of the 580 respondents, 52% were nurses; 21% were non-patient care staff; 11% were ancillary staff members and 10% were physicians. Thirty

(5%) respondents did not answer the occupation question. Lastly, 38% of respondents self-reported receiving the influenza vaccination in the prior year. Six individuals (1%) did not report their prior year's vaccination status.



KAB Survey Results

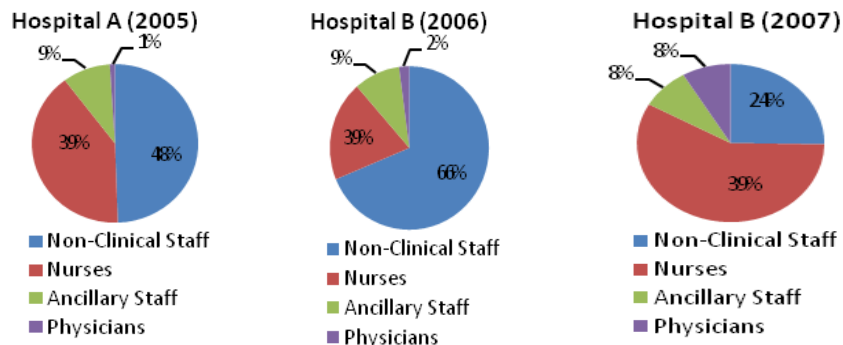
In Table 1, the data profile illustrates by year and by occupation the HCW vaccinators (those who receive influenza vaccine-YES) ranged from 35% to 71% and for non-vaccinators (those who did not receive influenza vaccine – NO) ranged from 28% to 65%.

	Hospital A (2005)		Hospital B (2006)		Hospital B (2007)	
	Yes	No	Yes	No	Yes	No
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Non-Patient Care Staff*	96 (46)	111 (54)	473 (51)	461 (49)	39 (35)	73 (65)
Ancillary Staff**	23 (53)	20 (47)	123 (60)	81 (40)	24 (44)	30 (54)
Nurses	97 (44)	102 (56)	309 (50)	306 (50)	118 (42)	73 (58)
Physicians	15 (71)	6 (29)	292 (62)	177 (28)	25 (44)	32 (56)

*Non-patient care staff is defined as dietary, administration, building & safety, and security
**Ancillary staff is defined as radiology technician, phlebotomist, respiratory and occupational therapy

In Figure 1, the data highlights the percentage of HCW (by occupation) who were not vaccinated in the prior year and responded that they did not intend to vaccinate in the coming year.

Figure 1. Percentages of HCW Who Did Not Vaccinate in the Past Year And Did Not Plan to Vaccinate In Coming Year



Personal vs. System Barriers among Non-Vaccinators

Several factors were assessed that have been shown to influence HCW influenza immunization coverage rates. LACIP identified and categorized perceptions about disease risk; vaccine side effects; vaccine efficacy; and fear of needles as personal barriers, whereas accessibility to vaccinations and cost were categorized as system-related barriers.

Among non-vaccinators who did not intend to be vaccinated in the future, personal barriers were cited more frequently than system barriers at Hospital A (2005) and Hospital B (2007). In Hospital A (2005), personal barriers were cited by all of the physicians (100%); followed by 89% for non-patient care staff; 86% for ancillary staff and 85% for nurses. In Hospital B (2007), personal barriers were cited by 90% of the nurses; followed by 81% of non-patient care staff; 80% of ancillary and 61% of physicians (see below in Table 2).



	Hospital A (2005)			Hospital B (2007)		
	Personal N (%)	System N (%)	Other* N (%)	Personal N (%)	System N (%)	Other N (%)
Non-Patient Care Staff	94 (90)	3 (3.0)	8 (7)	54 (81)	12 (18)	1 (2)
Ancillary	19 (86)	1 (5.0)	2 (9)	20 (80)	5 (20)	0 (0)
Nurses	62 (85)	2 (3.0)	9(12)	147 (90)	13 (8)	1 (2)
Physicians	3 (100)	0 (0)	0 (0)	17 (61)	9 (32)	2 (8)

*Refers to miscellaneous strategies

Logistic Regression Model – Predictors Associated with Future Intention to be vaccinated

A logistic regression model was created to identify the predictors associated with the dependent variable, “future intention to receive an influenza vaccination in the upcoming season”. The logistic regression model controlled for covariates, age, gender, occupation and consisted of three independent variables, previous year’s vaccination status; type of barrier cited for not getting the influenza vaccine and preferred strategies to promote vaccination. Due to limited variability in the dependent variable in 2006, the model was initiated for only 2005 and 2007.

For 2005, the strongest predictors of future intention to vaccinate were the prior year’s vaccination status (OR=34.0; 95% CI=15.0-77.0) and the identification of personal and system barriers (OR=2.33; 95% CI=1.23-4.43). Specifically, individuals who had received the influenza vaccine in the prior year were more likely to report a future intention to be vaccinated in the current year. In addition, individuals who reported a “combination of personal and system barriers” were more likely to report future intentions to be vaccinated in comparison to those who identified only “personal barriers”.

For 2007, the strongest predictors of future intention to vaccinate were the prior year’s vaccination status (OR=30.0; 95% CI=14.4-65.3); being an ancillary staff member (OR=3.0; 95% CI=1.12-7.79); and the identification of personal and system barriers (OR=1.87; 95% CI=1.06-3.29). Specifically, ancillary staff members were more likely to report future vaccination intent compared to nurses. Individuals who had received the influenza vaccine in the prior year were more likely to report a future intention to be vaccinated in the current year. In addition, individuals who reported a “combination of personal and system barriers” were more likely to report future intentions to be vaccinated in comparison to those who identified only “personal barriers”.

DISCUSSION

Immunization Coverage

Across both hospitals and years 2005-2007, very modest improvements in vaccination coverage were appreciated in spite of the NAIWA special outreach strategies (e.g. Health Care Worker educational toolkits, mobile carts, and raffle prizes, expanded clinic hours) to address system and personal barriers.

Chronic Non-Vaccinators by HCW Occupation

This study quantified the proportion of specific (HCW) at two hospitals who self-identify to have continuous and close contact with hospitalized patients, but for personal reasons (beliefs about vaccine efficacy, safety, perceptions of low disease risk) more than system factors (cost, accessibility) choose not to be vaccinated in the future. For example, in this study, 80% of nurses across both hospitals self-reported that personal barriers were reasons they chose not to receive influenza vaccinations currently or in the future. Over 35% of ancillary personnel and physicians across both hospitals self-report not being vaccinated in the previous influenza season and did not intend to be vaccinated in the current influenza season. The proportion of non-patient care staff was equally divided between getting vaccinated in the



upcoming influenza season and not intending to vaccinate in the upcoming influenza season. However, in this survey it is difficult to clearly discern which of the non-patient care staff (dietary, administration, building & safety, security) hold these personal beliefs.

Study Limitations

The results of the survey should be interpreted cautiously since the survey had several important methodological shortcomings, threatening the internal and external validity of the findings. First, administration of the survey in 2005 and 2006 was conducted at the time of vaccination which may have influenced the respondent's answers to the survey questions. Secondly, the survey was not administered to the population in a standardized fashion, disallowing for comparability of the results across hospitals and occupations. Similarly, in 2007, the survey was handed out in specific departments and the respondents merely self-selected to participate in the survey. Third, ethnicity data was not collected to identify potential trends in cultural similarities and differences, thereby compromising the ability to generalize these findings to similar settings.

CONCLUSIONS AND FUTURE DIRECTIONS

The NAIWA outreach and subsequent KAB survey provided a unique opportunity to engage immunization stakeholders from hospitals, health departments, and health plans to leverage resources and work collaboratively toward identifying their baseline employee influenza immunization coverage levels and work toward the goal of improving the coverage levels of high risk adults to at least 60% to meet the Healthy People 2010 goals [3]. The KAB survey assisted employee health directors and Infection Control Practitioners at these two hospitals to identify and therefore prioritize the health care personnel (e.g., nurses) needed for targeted educational interventions with an aim toward changing attitudes about the efficacy and safety of the vaccine to decrease influenza outbreaks in hospitals. Future research should include the implementation of evaluation studies that can rigorously test the efficacy of educational interventions with an aim toward changing personal beliefs and attitudes about vaccine safety, effectiveness, and disease risk to patients and their families, in order to effectively improve and sustain influenza immunization coverage levels among HCW.

Since 2007, legislative hearings spearheaded the introduction of specific health policy to change the entire landscape of health care worker influenza immunization coverage levels in California. Acute care hospitals are now required to adopt and implement California Health and Safety code 1288.5-1288.9 [4] standardizing hospital employee influenza policies and practices to include the provision of influenza vaccinations to all employees free of charge, and to systematically monitor the influenza immunization coverage and declination rates of all employees. To assist hospitals in compliance, the ICLAC health care worker subcommittee has implemented a baseline hospital survey amongst over 100 acute care hospitals in LAC to assess the hospital's policies and procedures used to monitor health care worker influenza coverage and declination rates and to assess the components of their employee influenza program. The results of the survey will be analyzed to determine if ICLAC members can provide any technical assistance in meeting the new health and safety code. Future plans include testing the effectiveness of educational interventions systematically in a randomized controlled design to determine the types of educational strategies that are more successful to improve influenza immunization coverage levels among HCW throughout Los Angeles County.

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HEPATITIS A VACCINATION OUTREACH TO FOOD SERVICE WORKERS IN LOS ANGELES CENTRAL CITY EAST/SKID ROW

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BACKGROUND

Hepatitis A is an acute viral disease, transmitted by the fecal-oral route. Minute concentrations of hepatitis A can transmit the virus from contaminated food to person and from person to person. The Centers for Disease Control and Prevention (CDC) recommends routine hepatitis A vaccination for children; for adults, vaccination is recommended for those who meet the following criteria: diagnosis of a chronic liver disease, diagnosis of a clotting-factor disease; users of street drugs (injecting and non-injecting), working in a laboratory with hepatitis A research, traveling to or working in countries with endemic disease, an adult 40 years of age or younger who had a possible exposure to hepatitis A within the previous two weeks, and any adult who desires immunity. Although medical specialists have determined that one dose of hepatitis A vaccine confers strong protection against the disease, the Immunization Action Coalition recommends that adults complete a series of two doses of hepatitis A vaccine, with the second dose administered six months after the initial dose [1].

In late 2005, an increased number of hepatitis A cases in Los Angeles County (LAC) was reported to Department of Public Health (DPH), and beginning in October 2005, an outbreak of hepatitis A occurred among staff, volunteers, and residents of a homeless shelter in the Central City East/Skid Row area. In total, 45 cases (13% of the total outbreak) associated with area homeless services were confirmed, with multiple overlapping exposures of shelters, soup kitchens, and food sources. In early 2006, a series of vaccination outreach sessions were conducted by LAC DPH Service Planning Area (SPA) 4-Central Public Health Center and Acute Communicable Disease Control Program (ACDC) staff, reaching 88 food service workers (FSWs) in community-based organizations (CBOs) in Skid Row with education and a first dose of hepatitis A vaccine.

In February 2008, the DPH Immunization Program encouraged DPH providers to vaccinate individuals in high risk groups, including men who have sex with men (MSM), injection and non-injection substance users, individuals with chronic liver disease, and those who have received a previous dose of Hepatitis A vaccine at a Public Health Center.

The ACDC Planning and Evaluation Unit activities focus on building community capacity to prevent acute infectious diseases (excluding HIV/AIDS, STD, and TB). Since December 2007, unit staff members have convened and facilitated meetings with DPH colleagues (including SPA 4-Central Public Health Center and the Immunization Program), the Department of Health Services (DHS) Homeless Coordinator, and diverse stakeholders in the downtown community to work collaboratively on homeless health and infectious disease prevention planning and activities.

Central City East, commonly referred to as Skid Row, is a 52-square block area in downtown Los Angeles, which is estimated to have the highest concentration of homeless residents in the United States [2]. Since the Skid Row FSWs, if infected, would be at risk of transmitting hepatitis A to vulnerable, homeless individuals, ACDC sought out an opportunity to plan and facilitate a collaborative education and vaccination outreach with the aim of reaching a higher number (than previous outreach) of individuals volunteering and working in food service in order to participate in vaccinating individuals in high risk groups which in this case are the FSWs in the Skid Row. This opportunity would provide strengthening the past outreach efforts and opportunity to gather more data on a hard-to-reach population such as the homeless.



METHODS

Outreach

A team was established and introductory planning meetings held by March 2008 to discuss the approach and logistics of the project. The team consisted of the ACDC Health Education Unit and epidemiologist, Central Health Center clinic staff, Adult Viral Hepatitis Coordinator, and the Immunization Program. Along with vaccination, group education on hepatitis A and a voluntary survey was administered.

Building on the previous experience in SPA 4 of conducting post-outbreak hepatitis A outreach, the project team identified potential local sites for further education and vaccination activities reaching FSWs. ACDC staff researched, compiled, and verified with community stakeholders a listing of LAC Infoline (2-1-1) providers and Skid Row Health and Housing Initiative sites and identified 20 homeless services agencies with FSWs serving Central City East/Skid Row.

The team met with shelter staff in Central City East/Skid Row to learn more about how large kitchens operate. It was determined that on-site outreach efforts will be an effective method for larger agencies to reach the high number of individuals rather than referring them to seek vaccination from the local public health clinic. Five well-established community-based social service organizations were selected to serve as hub outreach locations for smaller agencies.

DPH Immunization Program trained staff on how to input records into the California Immunization Registry (formerly known as Los Angeles-Orange Immunization Network—LINK) a confidential vaccination tracking system coordinated locally by the DPH Immunization Program.

Vaccine Administration

Vaccination outreach sessions took place at five sites and were modeled after traditional public health influenza clinic outreach activities. Priority during this outreach was to utilize the least amount of clinical staff to vaccinate as many FSW as possible in a timely manner. Two phases of vaccination outreach were conducted six months apart. The first phase targeted FSWs who never had a hepatitis A vaccine. The second phase targeted those FSWs who received the first dose of hepatitis A vaccine to receive their second dose. FSWs who never received the vaccine also were given their first dose during the second phase outreach. FSWs who received their first dose during the phase two outreach sessions were referred to Central Public Health Center to receive their second dose.

Survey

Participants were asked to complete a voluntary survey designed to characterize the population receiving vaccine. The survey consisted of indicators of demographics, status of homelessness and behavioral characteristics. During the phase one outreach sessions, a health educator gave a presentation on hepatitis A and then introduced the survey as voluntary and helpful for providing future outreach services. After the surveys were collected, responses were entered into a Microsoft Access database and analyzed in SAS 9.1.

Health Education

At each of the phase one sites, the health education procedure included introduction, pre-test, PowerPoint presentation, and post-test. Pre- and post-tests were not conducted at a large kitchen/food delivery organization due to time limits of explanation in Spanish with English translation. An ACDC health educator prepared and delivered an interactive presentation, “The Basics of Hepatitis A in Los Angeles County and in the Homeless,” at three of the homeless shelter sites, and variations of it at the two other community sites.



RESULTS

Outreach

Staff and volunteer FSWs from nine organizations serving Central City East/Skid Row participated, and five of the nine sites served as host agencies where education and vaccination activities were conducted. These host agencies consisted of two large faith-based shelters, a nonprofit apartment complex for low-income and formerly homeless residents, a grassroots volunteer-run soup kitchen, and a large door to door food preparation and delivery organization serving vulnerable individuals. The four additional CBOs that participated included a grassroots volunteer group, community center, community organizing nonprofit, and a subsidized housing program. All nine nonprofit CBOs serve food to homeless and very low income area residents; the organizations serve a total of over 2.94 million meals each year. Eight of the nine organizations are based in Central City East/Skid Row (Figure 1).

Figure 1. Map of outreach education and vaccination sites and participating organizations.



Vaccine Administration

One hundred seventy (170) FSWs from nine local organizations participated in the first phase of hepatitis A vaccination outreach. All 170 FSWs received their first dose of hepatitis A vaccine at the first phase outreach, held in April, May, and June 2008. One hundred fifty four (154) FSWs from six local organizations participated in the second phase; in which 88 received their first dose and 66 received their second dose, held at four of the phase one sites in October, November, and December 2008 (Figure 2). In total, 258 FSWs received vaccinations and 324 shots were administered.

Survey

The demographic and behavioral characteristics survey was conducted at four sites during the first phase only; it was not distributed at one site because of time limitations in the schedules of the FSWs. Of the four sites where the survey was conducted, 109 FSW of the 170 reached during phase one received hepatitis A vaccine between April 24, 2008 and June 4, 2008. Of these 109, 76 (69.7%) completed a survey. Overall demographics reflected a predominantly male population (88%) with median age of 47 years (range 24-66 years).



Figure 2. Number of hepatitis A vaccines distributed during outreach phases 1 and 2.

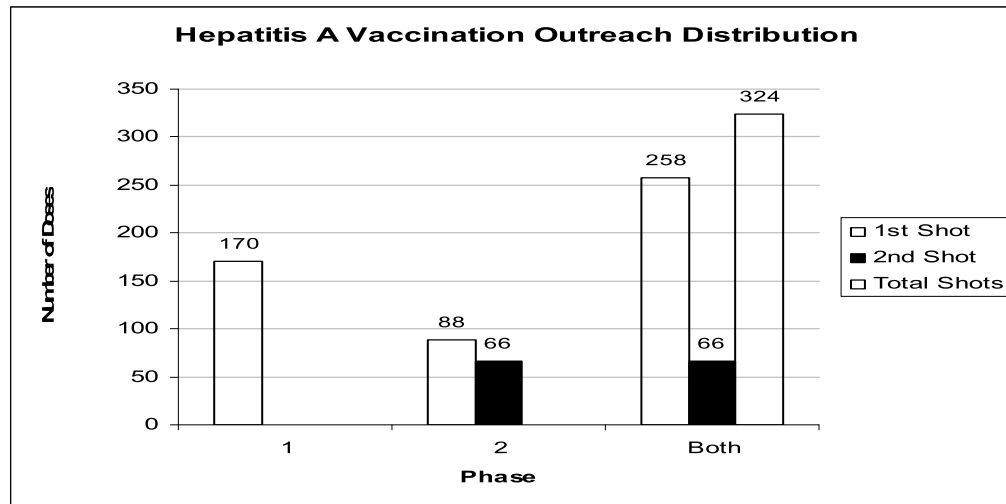
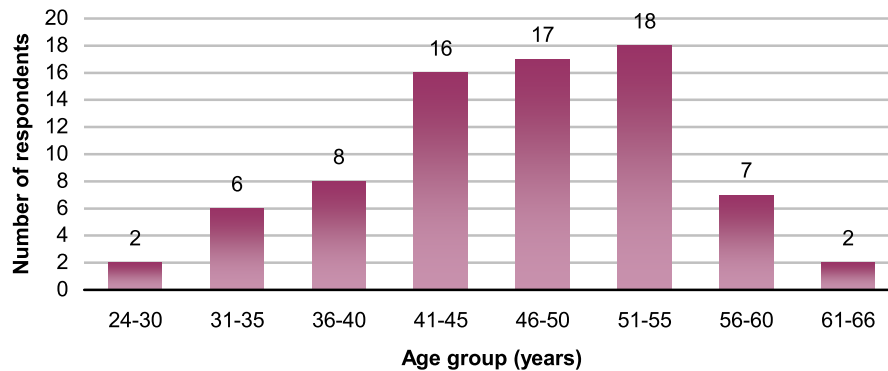


Figure 3. Age distribution of survey respondents (N=76) receiving hepatitis A vaccine during outreach in April – June 2008.



A plurality of FSW completing the survey (48.7%) identified as Black; 25% identified as white, while 22.4% self-reported a Hispanic-Latino ethnicity. Of those providing sexual orientation information, 72.4% (n=55) indicated heterosexual practice.

Regarding homelessness and shelter living, 52.6% (n=40) of survey participants considered themselves homeless and 65.3% (n=49) reported living in a homeless shelter (Table 1). Some survey participants were sensitive to the word “homeless” and less than five surveys had alternative terms such as “transitional” or

explanations that they did not think that their program or place of work was a homeless shelter. Responses were not altered in the analysis and reflected the perspectives of the survey participants. Thirty-six respondents (47.4%) reported being homeless and living in a homeless shelter. Thirteen respondents (17.1%) indicated that they were not homeless but were living in a homeless shelter. Three respondents (3.9%) indicated that they were homeless and were not living in a homeless shelter. Twenty-two respondents (28.9%) indicated that they were neither homeless nor living in a homeless shelter. Of the 30 respondents who answered how long they had been homeless, the median time of homelessness was one year (range 30 days to 37 years).

Fifty-eight respondents (76.3%) said they resided in downtown Los Angeles, while 16 (21.1%) said they did not. The median time of residency downtown was 0.5 years (3 days to 29 years) among 45 respondents. Fifty-



one respondents (67.1%) reported working in a homeless shelter while 24 (31.6%) reported that they did not work in a homeless shelter (Table 1).

The survey respondents shared three common behavioral characteristics; the most frequent of which is distributing or serving food to others at least once a week (69.7%). Among the 56 respondents completing the second (reverse) side of the survey, 60.7% (n=34) reported an indication of a history of alcoholism. In addition, 46.4% (n=26) of 56 respondents reported using non-injection street drugs, excluding marijuana, in the past year (Table 1).

Table 1. Behavioral characteristics of volunteer survey participants (N=76).

Risk factor	n	%
Males who have sex with males	3	3.95
Frequency of cooking or making meals for others		
4-7 days/week	31	40.8
1-3days/week	10	13.2
<1 days/week	8	10.5
Never	26	34.2
Distribute or serve food to others at least once a week	53	69.7
Chronic liver disease	2	2.6
More than one sex partner in past six months		
Yes	5	8.9*
No	50	89.3*
Don't know	1	1.8*
Frequency of sex without condoms		
Always	3	5.4*
Most of the time	2	3.6*
Sometimes	11	19.6*
Rarely ever	9	16.1*
Never	22	39.3*
I don't have sex with other people	8	14.3*
Use injection street drugs		
Yes	3	5.4*
No	52	92.9*
Use injection street drugs in past year		
Yes	5	8.9*
No	48	85.7*
Excluding marijuana, use non-injection street drugs		
Yes	16	28.6*
No	40	71.4*
Excluding marijuana, use non-injection street drugs in past year		
Yes	26	46.4*
No	30	53.6*
Indication of alcoholism		
Yes**	34	60.7*
No	22	39.3*

* Percent of respondents completing second side of survey (n=56).

** Answering "yes" to any one of four standard questions (1. Have you ever felt that you should cut down on your drinking? 2. Have people annoyed you by criticizing your drinking? 3. Have you ever felt bad or guilty about your drinking? 4. Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover?)



Health Education

Two hundred and fifty eight (258) FSWs received Hepatitis A education. During first phase activities, bilingual (English and Spanish) pre-/post-tests were administered before and after interactive group sessions with PowerPoint presentations. Pre-/post-test questions were revised or eliminated as needed. The results of pre-/post-tests demonstrated the percentage differences in the increase in knowledge based on matched-name-sets (only), ranging from 11% to 32% (average 22.5%) increase. Knowledge increases were most significant in the areas of mode of transmission, source of infection, and risk factors of hepatitis A. During the second phase of outreach vaccination and education activities, ACDC staff provided FSWs with health education individually and in small groups; throughout both phases, printed Hepatitis A information was distributed to all participating FSWs.

DISCUSSION

The project team received consistent high scores and positive feedback from outreach site representatives. Project team members stated that the collaboration within DPH was very effective. ACDC, Central Health Center, the Immunization Program, and the Hepatitis Coordinator worked together on a common goal, maintaining communication and high energy. The team benefited from Central Public Health Center's coordination of two groups of nursing students and SPA 4-Central Public Health Center PHNs, who assisted in administering vaccinations at two outreach sites.

The project team members involved in health education, vaccine administration, and LINK devoted numerous hours each week to coordinating logistics for this project. The project team identified a ratio of staff or volunteers to vaccines that may be useful in public health-emergency preparedness and/or point-of-distribution (POD) planning and implementation. At one outreach site, a large homeless shelter, the project team members worked with the site's contact person, to recruit two security staff and three well respected residents to assist in traffic flow and client screening. This increased the team roster to 13 from the DPH staff total of eight on that occasion. Involving the targeted population, FSWs, with their organization staff proved effective in increasing the sense of shared responsibility, the credibility, and the efficiency of the intervention.

ACDC staff conducted a brief survey seeking feedback from representatives of participating outreach sites during the month of July. Feedback included:

- "We were extremely satisfied. Participation was beyond my expectations. Everything went as planned. We were well informed and there were no surprises. The staff response was good and I heard no complaint which in itself is positive feedback. Everyone felt special on receiving their vaccination card."
- "They were very efficient, very organized. Continue your good work. You were very organized, professional, and responsive to the needs of our employees. They enjoyed the experience. They found it very social and effective. The team was so pleasant to each other as well as the people they were serving. It was a great opportunity. We all worked well together. They [staff receiving vaccinations] were very thankful and asked for more opportunities such as the Hep A. We loved it; it was wonderful. We took it in stride. We liked the demeanor and the information you gave. The participants were glad-it was good for everybody."
- "I was glad to see the health department in the role of preventative medicine. I didn't know they still did it; it reminded me of my childhood with vaccination and booster shots a regular event. The cooperation between DPH, the Mission, and me was great. They were wonderful at answering all questions. They had friendly attitudes. Everyone involved worked well together. "; "These guys [FSWs] are afraid of

getting the disease from the shot. They need to know about the different kinds of hepatitis. People are walking around with misinformation about having Hep C and working in the kitchen."

The project team found that staff at both faith-based and non-faith based CBOs were open to and interested in receiving training and technical assistance on infectious and/or communicable disease prevention and control from DPH. Furthermore, project team members felt that these hepatitis A vaccination outreach efforts helped to strengthen relationships with participating CBOs, relationships vital for future capacity-building interventions that project staff members envision. These CBOs are important partners for not only disease prevention, but



also for emergency preparedness and response planning efforts. The project team recommends hepatitis A vaccination to be accessible, integrated and sustained in existing health care delivery systems, in partnership with community stakeholders, for FSWs in Skid Row.

Like the demographics of the larger resident population in Central City East Skid Row, this population of FSWs had very few females. Not all the participants were residents of downtown Los Angeles, and some came from other areas of Los Angeles to work in the community. Prevalent behavioral characteristics were a history of alcoholism and use of non-injections street drugs. Given the large hepatitis A outbreak associated with downtown homeless services in the past, the FSW population working in downtown Los Angeles may be a good prevention target for ongoing hepatitis A and B vaccination and education.

As for the health education component, methods needed to be tailored to each site, considering that these community agencies have varying staff capacity, amenities, and audio/visual equipment.

CONCLUSION

Reaching more FSWs in downtown Los Angeles with hepatitis A education and vaccination will require coordination between CBOs, healthcare providers, and public sector organizations. The outreach conducted in 2008 is an example of an effective strategy to combat adult viral hepatitis. As a result of lessons learned in this experience, DPH integrated hepatitis A education and vaccination into the activities of Project Homeless Connect in downtown Los Angeles, held in December 2008 and 2009. Further, CBOs in the downtown Los Angeles area that did not participate in this project have, since the project's conclusion, requested hepatitis A vaccination for their staff. No further hepatitis A outbreaks in downtown Los Angeles or in Central City East/Skid Row have been reported to date since this outreach. Although future outbreaks are not proofed due to high turnover characteristics of this population, this outreach has established firm foundation of working relationships with these homeless service agencies for future efforts of vaccinations and infection control.

In order to prevent hepatitis A as well as other infectious diseases, it is critical for all FSWs to practice frequent and careful hand washing, wear gloves when handling food, and stay home from work when sick. Collaboration was critical in promoting and facilitating access to adult vaccination. This effort included DPH programs, community health services, CBOs, and a student nurse program. The outcomes of these efforts led to the establishment of a DPH adult viral hepatitis vaccination outreach task force.

The ACDC Planning and Evaluation Unit aims to continue to develop and initiate future collaborative projects to strengthen the capacity of community based homeless services organizations to prevent the transmission of infectious disease and improve community health.

ACKNOWLEDGMENTS

The authors wish to thank everyone who participated in the project. Special thanks to the food service workers, staff, and volunteers of the following organizations: Downtown Women's Action Coalition, Downtown Women's Center, Grassroots Volunteers (FNB), Hospitality Kitchen (aka Hippie Kitchen), Los Angeles Community Action Network, Midnight Mission, St. Vincent Meals on Wheels, Union Rescue Mission, and Volunteers of America/The Ballington. They also thank Roberto Avitia, RN, MPA, Laurie Chow, MA, Cristin Mondy, RN, MSN/MPH, Ben Techagaiciyawanis, MPH, Alan Wu, MPH, and the members of the Homeless Community Mobilization for Infectious Disease Prevention Working Group.

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