Acute Communicable Disease Control Program

Special Studies Report

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Los Angeles County
Department of Public Health

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ACUTE COMMUNICABLE DISEASE CONTROL
SPECIAL STUDIES REPORT 2016

TABLE OF CONTENTS

ZIKA COMMUNITY ENGAGEMENTS MEETINGS
LOS ANGELES COUNTY, 2016[1]

Although large-scale, sustained outbreaks of Zika have not yet occurred in the United States, transmission is widespread and ongoing throughout much of Latin America and the Caribbean. Limited local transmission has occurred in Southern Florida and in Texas. Conditions that increase the risk of local transmission include introduction of the Zika virus by infected travelers arriving from a country experiencing an outbreak and the local presence of *Aedes* mosquitoes that can spread the infection. Based on the large numbers of travelers from affected countries and the widespread presence of *Aedes* mosquitoes, Los Angeles County (LAC) has been identified by the Centers for Disease Control and Prevention (CDC) as one of the seven jurisdictions in the country most likely to experience a local Zika outbreak. The risk of a local Zika outbreak in LAC underscores the importance of effective vector control before and during an outbreak. Vector control strategies differ in effectiveness, cost, timeliness, and acceptability. Aerial pesticide application has seldom been used due to public opposition, but preferred methods such as “dumping and draining” standing water requires an entire community to respond in order to be effective. New technologies are in development to help fight against vector breeding and illnesses. The new technologies are not available at this time to local agencies but could be introduced over the next few years. As communities face new disease threats, local agencies must work with locals to prevent future outbreaks and have a strategy available for if one occurs in the near future.

In December 2016, the LAC Department of Public Health (DPH), Los Angeles Vector Control, and San Gabriel Vector Control agencies, in coordination with the Keystone Policy Center, convened five community workshops to gain information on public values and preferences to inform policy about mosquito control in LAC. These workshops also served to provide information to the LAC DPH and the county’s five vector control districts to improve the effectiveness and acceptability of mosquito control and disease control efforts. The process ultimately focused on helping inform LAC’s strategy, investment, and communications for vector control, public health, and preparedness. Workshop objectives included:

- To gather information about community preferences, values, and concerns associated with various mosquito control techniques;
- To gain a greater understanding of community values, motivations, barriers, and decision-making processes that drive individual behavior changes related to mosquito control and exposure; and
- To learn what information is needed at the community level about Zika virus infection and mosquito control and how this information can best be delivered and disseminated.

Overall, 177 people participated across the five workshops. Participants described a need for more information on Zika risks and illness, mosquito control, and protective behaviors. Once educated, most reported intending to “dump and drain” standing water but were skeptical that neighbors would do so. Concern about pesticide exposure was widespread. Most participants would accept aerial application to

[1] The full report on Greater Los Angeles County Vector Control and Public Health Community Engagement can be accessed at http://publichealth.lacounty.gov/acd/docs/VectorCommunityReport.pdf

control a Zika outbreak if provided sufficient information and advanced notice when applications would occur (Figure 1). In electronic polling, protecting babies from birth defects and preventing pesticide exposure were considered “very important” by >80% of participants. When asked what would be more important during a local Zika outbreak, 67% identified preventing birth defects and 33% preventing pesticide exposure. People also widely support the use of new technologies to reduce the spread of *Aedes* mosquitoes, particularly *Wolbachia*-infected sterile male mosquitoes (Figure 2). County support, including funding to further study this approach and share information, would be important if this strategy is to be a viable option.

Figure 1. Support (and Lack of Support) for Aerial Spraying Before and During a Zika Outbreak in LAC

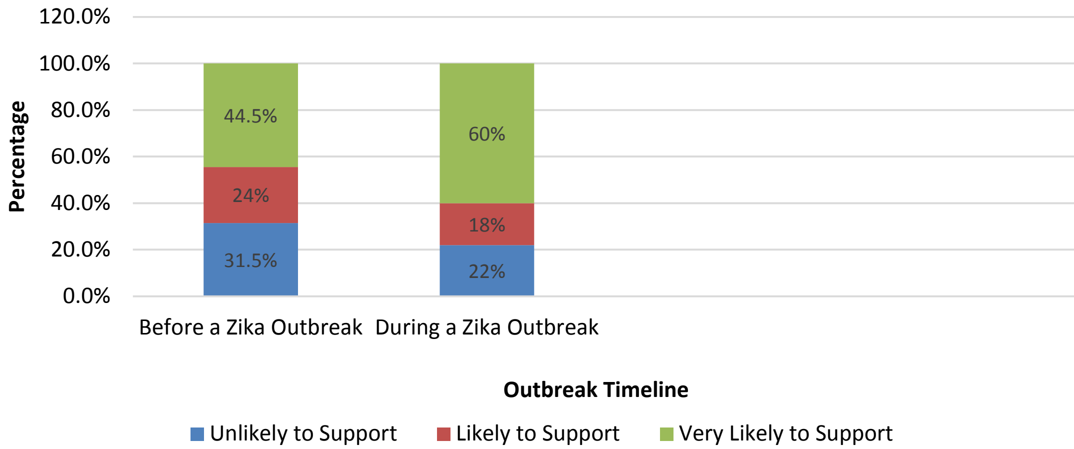
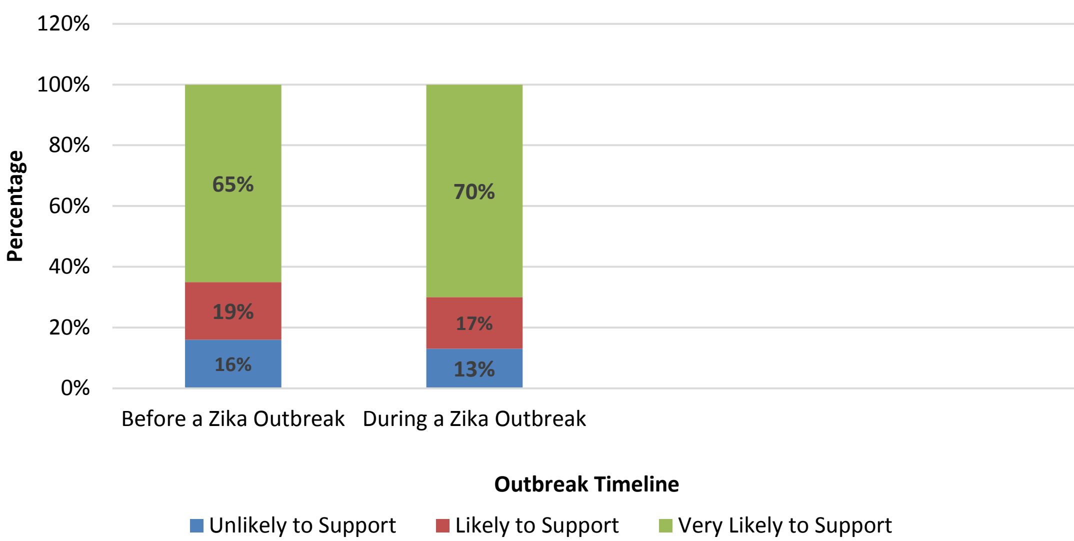


Figure 2. Support (and Lack of Support) for *Wolbachia*-Infectedor GMO Mosquitoes Before and During a Zika Outbreak in LAC



ZIKA VIRUS SURVEILLANCE IN LOS ANGELES COUNTY, 2016

ABSTRACT

In 2014, an outbreak of Zika virus occurred in Brazil and rapidly spread to neighboring countries. The first Los Angeles County (LAC) resident became ill with this virus after returning from El Salvador in late 2015. In 2016, 101 Zika cases were investigated by the Acute Communicable Disease Control Program (ACDC) of the LAC Department of Public Health (DPH). Cases were identified with either Zika virus RNA (52%) or Zika acute phase antibodies (48%). Cases were primarily female (76%), Latino (71%), average age of 36.9 years (range: 9-66 years), and residence throughout the county. None were hospitalized. The annual disease rate was 1.1 per 100,000 and was highest among Latinos (12.1 per 100,000) followed by Whites (5.6 per 100,000). This rate was higher in females than males (1.6 vs. 0.6 per 100,000). All cases traveled to a Zika-endemic region prior to their illness (50% Central America, 27% Mexico), and most became ill in July and August (54%). No instances of local transmission of Zika virus, either vector or sexual transmission, were identified. A total of 11 infants were born to LAC residents with travel-associated Zika virus infection; all 11 appear healthy to date. Although the number of cases in LAC where relatively small, creating a surveillance system for any new emerging diseases is challenging, requiring the development of disease case definition, testing methods, and disease procedures and protocols while simultaneously assessing the disease impact to the community.

BACKGROUND

Zika virus is an arbovirus primarily spread by the bite of an infected *Aedes* species mosquito (*Ae. aegypti* and *Ae. albopictus*) [**1**]**.** Infection during pregnancy can result in severe fetal consequences including microcephaly and other birth defects. A large outbreak of Zika virus occurred in Brazil in 2015 and has spread across South and Central America and northward to the US. Local vector-borne transmission has been reported in Miami-Dade County, Florida [**2**] and Texas. Persons infected with Zika virus often have no symptoms or very mild symptoms, making detection and surveillance of cases challenging. Guillain-Barre syndrome, a more severe manifestation of Zika virus infection has been reported but is very rare. The primary burden Zika virus places on a community is measured through the impact the virus has on newborns.

In November 2015, a previously healthy resident LAC sought medical care for fever, rash, chills, conjunctivitis, headache, and joint pain after returning from El Salvador. An astute infectious disease specialist reviewed the patient's symptoms, travel history, and history of mosquito bites and suspected an arbovirus infection. The Centers for Disease Control and Prevention (CDC), Division of Vector-Borne Disease Laboratory, identified Zika virus antibodies in the patient's serum specimen. Dengue, Chikungunya, and West Nile testing results were all negative. The first case of Zika virus in LAC had been identified. By the end of 2016, over 100 cases were reported to LAC DPH for investigation.

With both imported human cases and the mosquito vector (*Aedes aegypti* and A. *albopictus* mosquitoes) present in LAC, Public Health officials became concerned that local vector-borne transmission of Zika in LAC was possible. A multi-agency, multi-disciplinary approach was developed to ensure that this new arbovirus did not establish itself in LAC. ACDC and Community Health Service (CHS) conducted interviews with all reported cases to assess for Zika risk, pregnancy status, and Zika-like illness in other household members. The presence of *Aedes* mosquitos around cases' residences was assessed by local vector control programs. If any indication of local transmission was identified, the investigation was elevated.

DPH also monitored all participating pregnant Zika cases throughout their delivery. Newborns were tested for Zika virus at birth, and infants' development was assessed and documented at 2, 6, and 12 months of age. The mother's placenta may have also been collected and tested for Zika virus. These efforts required a coordinated effort with the LAC Public Health Laboratory (PHL), Maternal, Child and Adolescent Health (MCAH), and Children's Medical Services (CMS) Programs in LAC. In addition, DPH investigated any report of an infant born with microcephaly and tested those having a mother with Zika risk.

This report summarizes the Zika case investigations conducted in LAC in 2016 including the number and demographics of cases, infection rates, symptoms, exposure risk, laboratory tests performed, and instances where an elevated public health response was required to rule out local vector-borne transmission of Zika virus. The follow-up and testing of infants born to Zika cases and also infants born with microcephaly were reviewed. Zika reporting and investigation timeliness was also reviewed.

METHODS

All LAC health care providers and laboratories are mandated to report any suspect Zika cases to DPH (Title 17, CCR). Zika reports are investigated by ACDC with the support from the CHS, PHL, Public Health Investigators (PHI), and local vector control programs (VCD). ACDC interviewed cases by phone to document travel history and symptoms and identify any recent illness in the household that may suggest local vector-borne transmission. CHS nurses interviewed cases at home that could not be reached by ACDC. PHI assisted when CHS was unable to locate a case or the case was uncooperative. Local VCDs assessed cases' neighborhoods for presence of *Aedes* mosquitoes and mitigated presence if identified.

The demographics of all cases investigated by LAC DPH were reviewed and demographic rates calculated. Zika risks such as travel country were reviewed. LAC DPH also reviewed the types of laboratory testing performed and timing of case notification as well as factors leading to prolonged notification. LAC DPH reviewed Zika testing results and follow-up assessment available for infants born to Zika cases in LAC. Zika testing results were also reviewed for newborns identified with microcephaly and a mother with a history of potential Zika risk.

All statistical calculations were performed in SAS version 9.3. LAC DPH utilized the case definition established by the Council of State and Territorial Epidemiologist (CSTE) [4] and included in Appendix B. LAC cases must have: 1) Zika RNA identified in a serum or urine specimen via RT-PCR laboratory technique, or 2) Zika IgM antibodies detected in serum via plaque reduction neutralization test (PRNT) technique.

RESULTS

A total of 101 LAC Zika virus cases were reported to and investigated by ACDC in 2016. All cases met the case definition as stated by the CSTE. The number of cases identified in 2016 was a substantial increase from those identified in late 2015 (N=6).

RESULTS - *Case Demographics*

The overall annual rate of Zika cases in LAC was 1.1 per 100,000 residents (Table 1). The majority of cases were female (n=75, 74%) with a case-rate of 1.6 per 100,000. Females were 2.8 times more likely to be identified cases than males. The age of cases ranged from 9-66 years old (median=35 years, mean=36.9 years). Many cases were 15-34 years old (n=37, 37%); however, the case rate was highest in the 45-54 years old age group (1.5 per 100,000).

Latinos accounted for the majority of cases (n=71, 74%) and also had the highest case rate of the race ethnicity groups reviewed (1.5 per 100,000). By Service Planning Area (SPA), SPA 2 had the largest number of cases by residence (n=27, 28%); however, the case rate was highest in SPA 5 (2.0 per 100,000). A map of case residence by Health District is presented in Appendix A.

Table 1. Demographic of Zika Cases
Los Angeles County, 2016

	n	%	Annual Rate* per 100,000	Relative Risk
Total Cases	101	100	1.1	-
Gender				
Female	75	74	1.6	2.8
Male	26	26	0.6	Reference
Age Group (years)				
<1	0	0	0.0	-
1-4	0	0	0.0	-
5-14	9	9	0.7	1.7
15-34	37	37	1.3	3.0
35-44	17	17	1.3	2.9
45-54	20	20	1.5	3.5
55-64	13	13	1.2	2.8
65+	5	5	0.4	Reference
Race -Ethnicity				
Latino	71	74	1.5	12.1
White	19	20	0.7	5.6
Asian	5	5	0.4	2.9
Black	1	1	0.1	Reference
Other	1	1		
SPA				
1- Antelope Valley	3	3	0.8	2.1
2- San Fernando	27	28	1.2	3.4
3- San Gabriel	6	6	0.4	Reference
4- Metro	13	14	1.1	3.1
5- West	13	13	2.0	5.4
6- South	16	17	0.2	0.4
7- East	14	14	1.1	2.9
8- South Bay	6	6	0.6	1.5

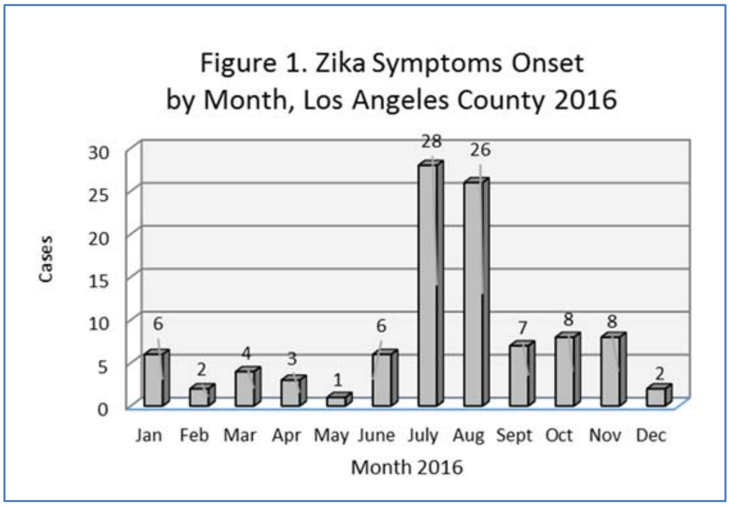
*Rates based on 2015 population data

Draft 6/12/2017

RESULTS - *Symptoms and Onsets*

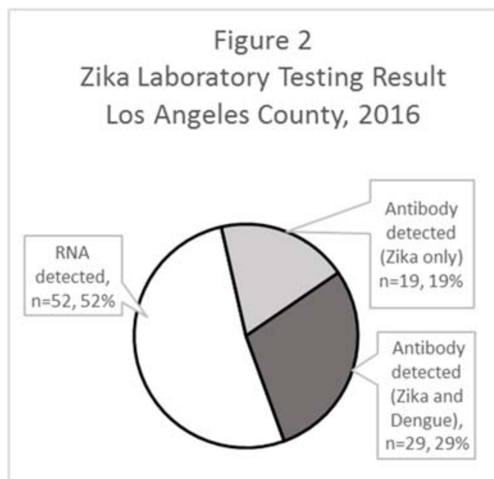
Nearly all Zika cases reported symptoms (91%), which included rash (78%), fever (56%), arthralgia (52%), and conjunctivitis (28%). A total of 78% of cases reported two or more symptoms, 55% reported three or more symptoms, and 13% reported all four symptoms. Only ten cases (10%) were asymptomatic. No cases were identified with Guillain-Barre syndrome. Zika cases reported by month of symptom onset throughout 2016 is shown in Figure 1. The majority of cases reported symptoms occurring in July and August (54%). The specimen collection month was used for asymptomatic cases.

RESULTS - *Risk Assessment*



All Zika cases reported a history of travel to a Zika-endemic area within three months of seeking medical care and testing. Nearly all cases (99%) were exposed to Zika virus in areas of Central America (50%) and Mexico (27%). Only one case had no foreign travel history; this case traveled to Miami, Florida, which had local vector-borne Zika transmission. Only four case investigations identified an additional household member with Zika-like illness. In three of these households, the ill household member had also traveled to a Zika-endemic region with symptoms onset consistent with exposure during travel. In one household, two ill family members were identified that did not travel with illness onsets concerning for local vector-borne transmission of Zika virus. The details and results of this investigation are presented in **RESULTS - *Case Investigation 2 – Rule Out Vector-borne Transmission in a Household***. VCD staff mitigated any vector issues in the case neighborhoods of all four of these investigations.

Results - *Laboratory Testing*



There were 2,500 patients who submitted specimens to the LAC PHL for Zika virus testing in 2016. This count does not include all patients tested through commercial laboratories. There were 101 patients with a positive Zika laboratory result that met the Zika virus case definition. All Zika cases either had Zika virus RNA detected in a serum or urine specimen (52%) or Zika virus acute phase antibodies detected in serum (48%), as shown in Figure 2. Many of those identified with Zika virus antibodies also had Dengue virus antibodies (29%), as identified by PRNT. Of interest, only one of the ten asymptomatic cases were identified with Zika virus RNA. Of the asymptomatic cases, seven of the ten cases also had antibodies for Dengue, as identified via PRNT. No Chikungunya and West Nile Virus antibodies were detected with any of the Zika cases.

Of the 52 cases identified with Zika RNA in serum and or urine, 33 were positive on a serum specimen (34%), 28 were positive on a urine specimen (29%) , and 10 were positive on both specimens (10%). There were 18 cases where Zika virus was detected in urine but not in blood (19%), and only 3 cases where Zika virus was detected in serum but not urine (6%).

A majority of cases were reported from a state or federal laboratory (68%) followed by commercial laboratory (20%) or the PHL in LAC (12%).

RESULTS - *Pregnant Zika Case and Infant Follow Up*

DPH followed up on the progress of pregnant Zika cases in LAC by reviewing prenatal care records and ultrasound results from each patient's maternal health provider. In addition, collection of newborn specimens and birth products (placenta, umbilical cord, placental membrane) for Zika virus testing was discussed with the patient's delivery hospital. Information was collected on the newborn's health at birth such as Apgar score, head circumference, weight, and length as well as any birth abnormalities at time of delivery. DPH followed up with the patient's pediatrician to track the progress of the infant's health, recording head circumference, weight and length at 2, 6, and 12 months of age and monitored the infant's overall development.

In 2016, there were 11 infants born to LAC mothers infected with Zika virus while traveling outside of LAC. All 11 infants appear to be healthy and developing normally at the time of this report (January 1st, 2017). All infant mothers were identified with acute phase Zika antibodies in serum and none had Zika virus RNA (Table 2). A total of six of these mothers also had acute phase antibodies for Dengue virus. Another six mothers reported symptoms consistent with Zika virus infection, and the remainder were asymptomatic. During the DPH follow-up of the progress of pregnant mothers, one mother's fetal ultrasound revealed abnormalities on week 19 of gestation, increasing concern for the possibility of fetal infection and lag in brain development (#4). An amniocentesis was performed and amniotic fluid tested for Zika virus RNA. No evidence of Zika virus was identified. The fetus appeared normal on a follow-up ultrasound. All other mothers progressed to delivery without complication.

Placenta, umbilical cord, and/or membranes were collected and tested from 8 of the 11 mothers at delivery. Only one mother (#1) was identified with Zika virus RNA present in an umbilical cord specimen. All other tissue testing results found no evidence of Zika virus infection for this mother and the other seven mothers. Eight of the 11 newborns were tested for Zika virus. No evidence of Zika infection was identified in any of the eight, including the infant of the mother with a questionable ultrasound (#4) and the infant of the mother with umbilical cord positive for Zika RNA (#1). Only one infant was admitted to the NICU (#8) for four days with respiratory distress and low birth weight (4.9 lbs.). This newborn was discharged home after four days. All other infants had a normal hospitalization stay.

Figure 3 displays each infant's head circumference (HC) measurements at 2, 6, and 12 months of age plotted against a line representing the third percentile of HC measurement for age and gender. Microcephaly is a birth defect defined as a newborn or infant with a smaller than expected HC (<3rd percentile) when compared to babies of the same sex and age. Only two infants were identified with a small HC at birth (#6, #8). Infant #6 had a HC well below the 3rd percentile at birth and was diagnosed with microcephaly by the patient's pediatrician at that time. The HC measurement at birth was verified at one week of age (30.1 cm). However, this infant's HC measurement was within normal HC range by two months of age (36.8 cm) and remained normal at 12 months of age. A cranial ultrasound performed at three months of age did not reveal any abnormalities, and the microcephaly diagnosis has been dropped for infant #6. The HC measurement for infant #8 also measured slightly below the 3rd percentile (31.0 cm); however, this was an overall small infant, with short length (47 cm) and low weight (4.9 lbs.), born at week 38 of gestation. This infant was not given a microcephaly diagnosis. The infant's head size continued to grow to normal size by 12 months of age (44.5 cm).

A total of two pregnant Zika cases chose to discontinue participation in the DPH infant follow up program after their infants were born healthy and with normal HCs (#3, #5), so no further information on these infants could be obtained. There were two pregnant Zika cases identified in 2016 that chose not to participate in the DPH infant follow up, so the outcomes of these births, or possible terminations, remains unknown.

Table 2. Zika Case and Infant Testing and Infant Follow-up, Los Angeles County 2016

	Zika Case									Infant						
		Serum Testing			Fetal Health Indicators		Tissue Testing			Serum Testing		Infant Health Indicators				Follow-up Month Completed
	Symptomatic	Zika IgM	Zika RNA	Dengue IgM	Cranial Imaging CT	Amniotic Fluid Zika RNA	Central Placenta Zika RNA	Umbilical Cord Zika RNA	Placental Membrane Zika RNA	Zika IgM	Zika RNA	Apgar Score	Small Head Circumference	Admitted to NICU	Cranial Imaging CT	Month Completed
1	+	+	-	-	-	NT	-	+	-	-	-	9	-	-	-	0,2,6,12
2	+	+	-	+	-	NT	-	-	-	NT	NT	9	-	-	NT	0,2,6,12
3	-	+	-	-	-	NT	NT	NT	NT	NT	NT	9	-	-	NT	0, NP
4	-	+	-	-	+	-	-	-	-	-	-	9	-	-	NT	0,2,6,12
5	-	+	-	+	-	NT	-	NT	-	-	-	9	-	-	-	0, NP
6	+	+	-	+	-	NT	-	-	-	-	-	9	+	-	-	0,2,6,12
7	+	+	-	+	-	-	NT	NT	NT	-	-	9	-	-	NT	0,2,6,12
8	+	+	-	+	-	NT	-	NT	NT	-	-	9	+	+	-	0,2,6,12
9	+	+	-	-	-	NT	-	-	-	-	-	9	-	-	NT	0,2,6,12
10	-	+	-	+	NT	NT	NT	NT	NT	NT	NT	9	-	-	NT	0,2,5,12
11	-	+	-	+	-	NT	-	-	-	-	-	9	-	-	NT	0,2,6,12

NP - Not participating

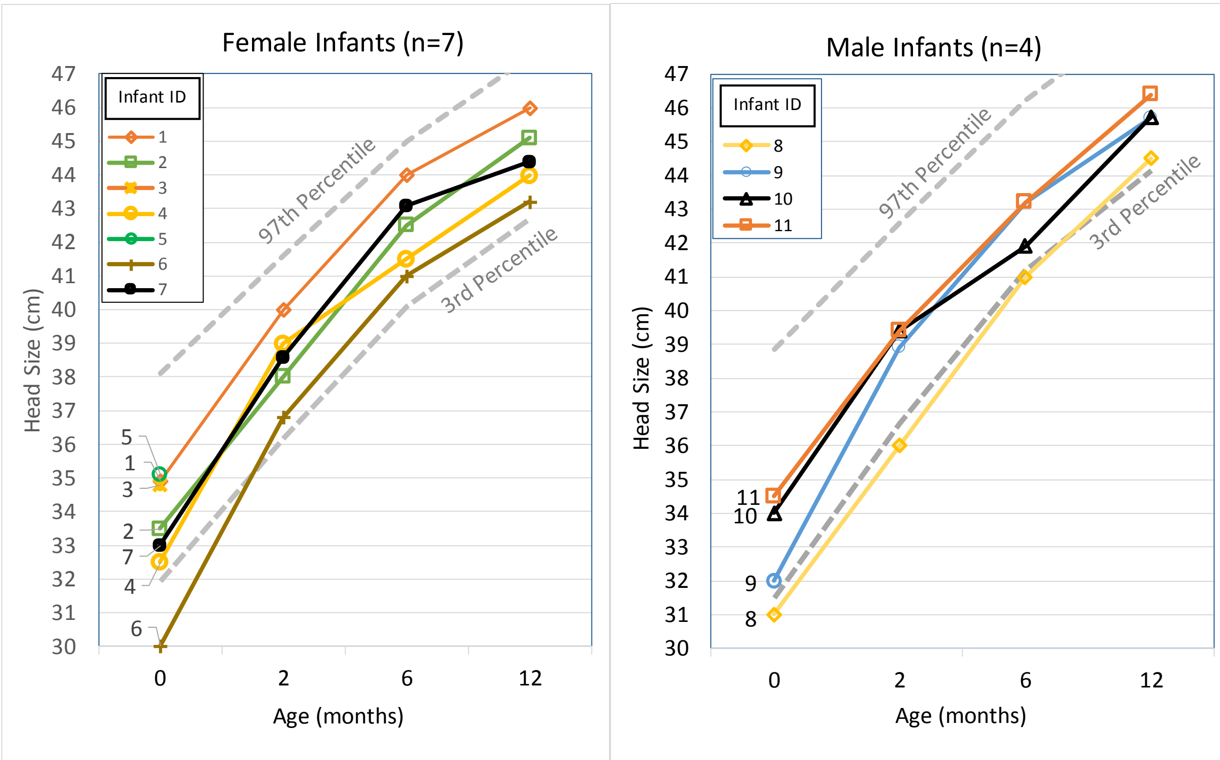
NT - Not Tested

6 - Dx microcephaly at birth

7 - Infant urine also with PCR negative result

8 - Admitted to NICU for 4 days for respiratory distress and low birth weight. Born at 38 weeks gestation. Discharged home.

Figure 1. Infant Head Circumference, Los Angeles County 2016 (N=11)



RESULTS - *Newborns Identified with Microcephaly*

In 2016, there were 11 newborns identified with microcephaly and born to a mother with Zika risk, but had no positive Zika lab test or chose not to test. No evidence of Zika infection was identified with any of these infants. All 11 were tested for the presence of Zika virus RNA in serum, and all were negative. There was one fatality who died shortly after delivery due to severe brain malformation. In addition to the negative Zika RNA test result obtained for this infant, a negative Zika virus RNA test result was obtained on mother's placenta and a pathology review revealed no evidence of infection. All other infants are stable as of last update, but many have very complicated health issues. Only 2 of the 11 infant mothers were also tested for Zika virus at time of delivery, and both had a negative test result. The remaining nine infant mothers were either outside the three-month time period of detectable acute phase antibodies for Zika or declined testing. One newborn was later identified with a gene deletion (4.22q11 deletion) that has been associated with microcephaly. All 11 infants were transferred to CMS for further investigation.

RESULTS - *Case Reporting and Investigations*

All Zika cases were evaluated and tested by a clinician in an outpatient setting, and none were hospitalized. The majority of cases were tested through a private LAC health care provider (90%) followed by DPH health clinics (8%) and facilities outside of LAC (3%). Cases were primarily reported to DPH by the performing laboratory via a faxed laboratory report (49%) or as an electronic laboratory report (48%) with a few cases reported from another public health jurisdiction (3%). Only one case was reported by a health care provider. Cases were primarily interviewed by ACDC staff (83%) followed by CHS staff (19%).

For symptomatic cases (n=91), the average time from the case's symptom onset to the DPH notification date (T1) was 38 days (range: 4 to 195 days, median: 24 days). The average T1 measure was much shorter for cases with a PCR test result notification (18 days, median=15 days, n=52) than cases with a PRNT test report notification (67 days, median=61 days, n=39) ($p<0.01$, T-test, unequal variances). In addition, the average T1 value for cases that were reported by Electronic Laboratory Reporting (ELR) were shorter (14 days, median=11 days, n=26) than those reported via fax transmission (56 days, median=30 days, n=29) ($p<0.01$, T-test, unequal variances). All ELR reports were also PCR reports.

RESULTS - *Case Investigation 1 – Rule out Vector-Borne Transmission in a Neighborhood*

In August 2016, DPH received a positive Zika result (Zika IgM- and PRNT-positive, Zika PCR-negative) from a governmental laboratory for an LAC patient. This patient met the CSTE case definition for a Zika case., The patient was uncooperative with public health and refused to provide a complete travel history. Because the patient's travel history was unclear, the possibility of local vector-borne transmission of Zika virus needed to be ruled out. VCD assessed the case's residence and the nine surrounding properties. No *Aedes* were identified, and no obvious sources for mosquito breeding were found in the patient's yard such as overgrowth of brush, trash, or standing water.

The Infectious Disease (ID) specialist that oversaw the care of this patient stated that this patient presented with fever, vomiting, and headache and was hospitalized and diagnosed with viral meningitis. The ID physician felt that the patient's meningitis was due to herpes simplex virus 1 (HSV1) infection, not Zika virus. The examination of the patient's cerebrospinal fluid (CSF) revealed mild pleocytosis with lymphocyte predominant as well as identification of HSV1 in CSF via PCR. In addition, the governmental reference laboratory repeated the Zika testing on the patient's original serum specimen, and no Zika virus antibodies were identified. The findings of this investigation indicate that this patient had a false positive Zika result.

RESULTS - *Case Investigation 2 - Rule Out Vector-Borne Transmission in a Household*

In October 2016, DPH received a positive Zika PCR result for an LAC resident from a private clinical laboratory. This patient met the CSTE case definition for Zika virus. Upon interview, the case reported being symptomatic after returning to the US from Guatemala (Zika-affected area). The case also reported two adult household contacts (HHC) ill with Zika-like symptoms eight days after the case's return to the US. HHC1 reported symptoms of conjunctivitis, cough, sneezing, and sore throat. HHC1 also reported having unprotected sexual contact with the case in the week prior to onset, suggesting possible sexual transmission of Zika. HHC2 reported symptoms including conjunctivitis, fever, chills, and sore throat and had no sexual contact with the case. The symptoms reported by both HHCs were suggestive of a number of illnesses including Zika virus**.** Neither HHC had traveled to a Zika-affected area, prompting concerns of local vector-borne Zika transmission. Adding to this concern was the identification of *Aedes aegypti* mosquitoes within five miles of the case's residence earlier in the year.

To rule out local vector-borne transmission in this household, ACDC requested VCD staff to assess for the presence of *Aedes* mosquitoes in the case's neighborhood and a CHS staff to obtain urine specimens from the HHCs for Zika testing. VCD inspected 86 properties and 30 businesses and placed mosquito traps (ova cups) around the case's residence. No *Aedes* were observed at any stage of growth. The urine specimens collected from the HHCs by CHS and tested by LAC PHL were both negative for Zika virus RNA. Overall, the investigation found no evidence suggesting local transmission of Zika virus in this household**.** The investigation was closed within one week of the original DPH laboratory notification of the case.

DISCUSSION

Female residents in LAC were more likely to be identified as Zika cases than males in 2016. This difference likely reflects gender-specific screening criteria and not a true difference in risk by gender. The 2016 Zika virus testing protocol recommends testing of all pregnant females with Zika risk, whereas all other persons had to present with a Zika symptom in order to be tested. Latinos were also more likely to be identified as Zika cases compared to other race-ethnicities in LAC. This may reflect the difference in travel patterns by race-ethnicity. Latinos are more likely to travel to Zika-affected areas to visit family for longer durations and visit more rural areas than other race-ethnicities. Mexico and Central American countries were likely travel locations for most LAC cases. Only two cases traveled to Brazil where the Latin American Zika virus outbreak was originally identified in 2015**.**

Interpretation of Zika laboratory results can be complicated [**5**]**.** Dengue virus antibodies identified via PRNT were 29% of LAC Zika cases. It is unclear whether this represents a Dengue infection with antibodies that cross-react to Zika antigens resulting in a false Zika result, a Zika infection with antibodies that cross-react to Dengue antigens resulting in a false-positive Dengue result, or infection with both viruses. Dengue virus also circulates in many of the same regions as Zika virus and is also transmitted by the *Aedes* mosquito.

Zika RNA detection in urine via RT-PCR appears to be more sensitive than serum—10 of 52 cases (19%) were identified with RNA in urine and not in serum. Collection of urine as compared to serum is simpler, does not require a phlebotomist, and patient compliance is generally higher. However, 3 of 52 cases (6%) were identified with RNA in serum but not in urine, and these cases would have been missed if urine were collected alone. Similar results were found with a review of cases identified in Florida in 2016 [**2**]**.**

Infants born to Zika cases and identified with Zika-related birth defects have been reported in California [**3**]; however, the impact of Zika virus on newborns in LAC appears to be minimal with only 1 of 11 newborns presenting with a questionable Zika-related birth defect diagnosis. In addition, 11 LAC infants with a suspect Zika-related birth defect tested negative for Zika virus. It is not clear whether any virus or antibody could be detected in these newborns, limiting any conclusion drawn from these findings. Additional causes of microcephaly such as toxoplasmosis, cytomegalovirus, and other infections should also be assessed in these newborns, which requires additional follow up. Future studies should assess any change in newborn microcephaly trend with the introduction of Zika virus in LAC. A review of hospital discharge data suggests a newborn microcephaly rate of 4.2 per 10,000 live births in LAC prior to the introduction of Zika virus, or an average of 55 per year.

Local vector-borne transmission of Zika virus had been identified in Florida [**6**] and possibly Texas in 2016 [**7**]**.** As a large metropolitan county with known *Aedes* mosquito populations, LAC was also at risk for local vector-borne Zika transmission. However, no instances of local vector-borne transmission in LAC were identified in 2016. The introduction of Zika virus among LAC travelers highlights many of the surveillance challenges posed by any new emerging diseases. Laboratory tests were initially not widely available nor were testing protocols, case definitions, and survey tools for this disease. As these tests and guidelines became available, they required constant review and modification to keep them up-to-date with the best science available for this disease. In addition to the Zika case activities, Zika virus surveillance required follow up of newborns associated with pregnant cases for testing and birth defects surveillance.

LAC DPH is continually working to refine Zika surveillance and work with local VCDs to optimize agency collaboration. This collaboration will improve utilization of resources to prevent Zika virus from becoming endemic in LAC. Many lessons were learned from Zika surveillance in 2016, which will help improve efforts to minimize Zika disease risk to LAC residents in the future.

Acknowledgments
Special thanks to the many LAC staff that contributed to the investigations presented in this report. Special thanks to VCD staff Wakoli Wekesa, Ken Fujioka, and Susanne Kluh. Special thanks to CHS staff Clarlotta Payton and PHI staff Sandra Rogers and Jorge Perez. Special thanks to PHL staff Heran Berhanu, Niki Green, and Lee Borenstein.

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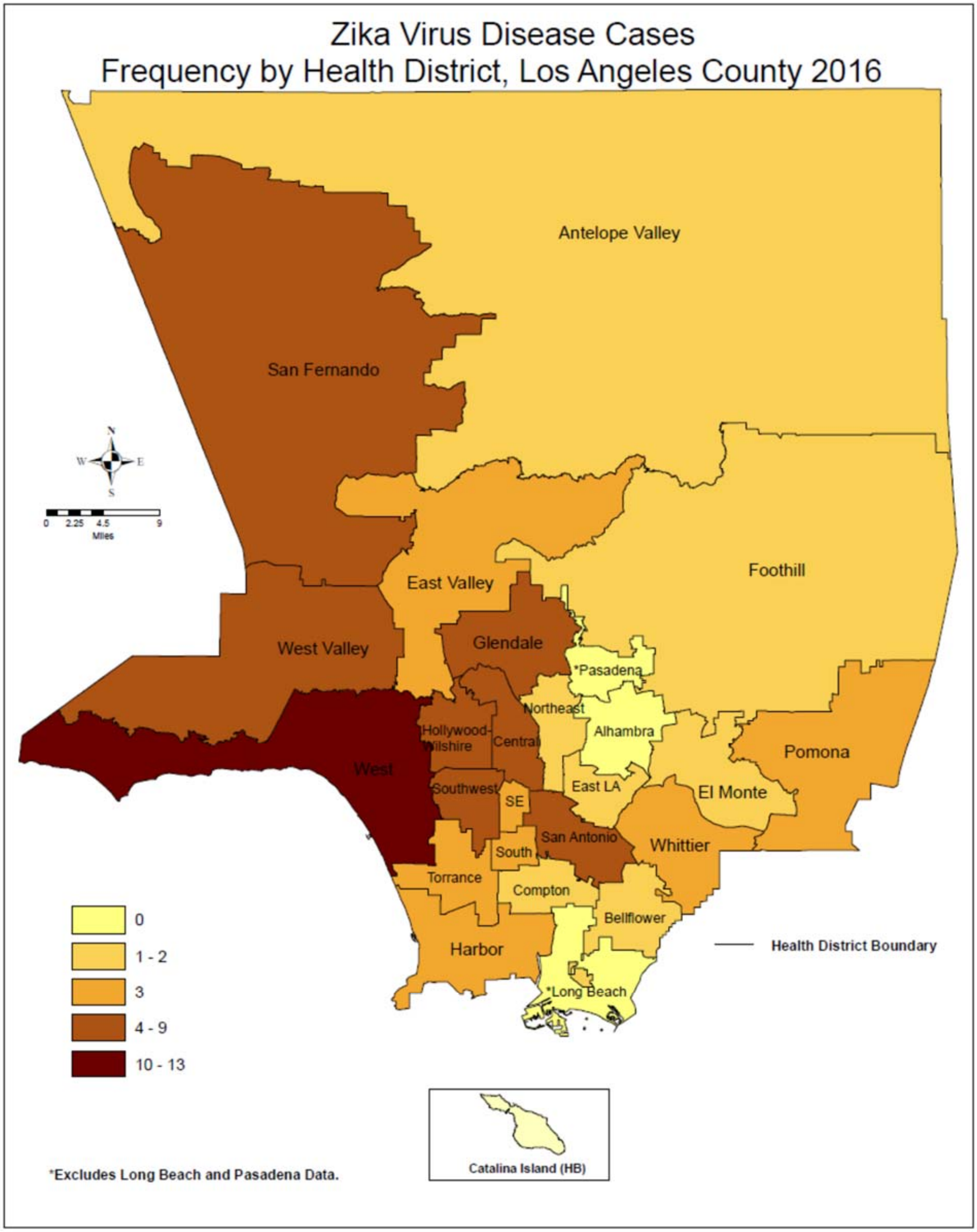
Appendix A


Zika Virus Disease Cases
Frequency by Health District, Los Angeles County 2016
Antelope Valley
San Fernando
Foothill
East Valley
West Valley
Glendale
*Pasadena
Northeast
Alhambra
Hollywood-Wilshire
Central
West
Pomona
Southwest
SE
East LA
El Monte
San Antonio
South
Whittier
Torrance
Compton
Bellflower
Harbor
*Long Beach
0
1 - 2
3
4 - 9
10 - 13
Health District Boundary
0 2.25 4.5 9
Miles
Catalina Island (HB)
*Excludes Long Beach and Pasadena Data.

Appendix B

ZIKA CASE CLASSIFICATION

Confirmed: A clinically compatible case and confirmatory laboratory results, OR a person who does not meet clinical criteria but has an epidemiologic linkage and confirmatory laboratory results.

Probable: A clinically compatible case and presumptive laboratory results, OR a person who does not meet clinical criteria but has an epidemiologic linkage and presumptive laboratory results.

Flavivirus infection of undetermined species: A clinically compatible case and evidence of recent infection with a flavivirus where the neutralizing antibody test results on a single specimen are insufficient to determine the identity of the infection virus, OR a person who does not meet clinical criteria but has an epidemiologic linkage and evidence of recent infection with a flavivirus where the neutralizing antibody test results on a single specimen are insufficient to determine the identity of the infection virus.

RAPID COMMUNITY INVESTIGATION AROUND IMPORTED ZIKA CASES
LOS ANGELES COUNTY, 2016

Los Angeles County (LAC) has been identified by the Centers for Disease Control and Prevention (CDC) as one of the highest risk jurisdictions in the country for a local Zika outbreak due to the amount of travel from Zika-affected areas, the number of imported cases, and the presence of indigenous *Aedes aegypti* and *Albopictus* mosquitoes that can transmit infection. The CDC has recommended investigation and mosquito abatement within a 150-meter radius of case residences to reduce this risk.

To implement this recommendation, the LAC Department of Public Health (DPH) collaborates with three vector control districts (VCDs) in the county where *Aedes* mosquitoes have been identified. This collaboration serves to immediately share information on the case location once a positive laboratory report is obtained, leading to an investigation, abatement, and community education about eliminating sites where mosquitoes can breed. Epidemiology and Laboratory Capacity (ELC) funding supports the epidemiologist who developed LAC DPH's Zika surveillance system and databases and who serves as the focal point for receiving positive case reports and communicating this information to the VCDs. ELC support also contributes to the LAC Public Health Laboratory's (PHL) ability to test for Zika and to the VCDs capacity for investigation and response.

To evaluate the timeliness of investigation and response and improve quality, LAC DPH in conjunction with the VCDs determined the time between patient symptom onset and completion of mosquito abatement. Beginning in June 2016, for PCR-positive cases identified in commercial laboratories, there was a median of three days from symptom onset until specimen collection, three days until laboratory results were obtained at DPH, and less than one day for this information to be communicated to the VCDs. When specimens were tested at the LAC PHL, it took significantly longer to obtain results because of the need for additional screening information, which was often missing from the forms. To reduce delays, screening requirements were changed. It then took a median of six days for completion of that investigation with a median of 86 properties investigated when *Aedes* were found in the area. Overall, 26% of investigations detected *Aedes* mosquitoes, and two newly infested cities were identified. These timely, collaborative investigations reduced the risk of local Zika spread in LAC.

In 2017, we will continue to monitor performance and, as needed, implement quality improvement to further improve timeliness. Also, recognizing that many Zika cases are not detected and reported because illness is asymptomatic, we will expand vector surveillance, abatement, and education in higher risk areas defined by the presence of *Aedes* mosquitoes and higher numbers of likely travelers to at-risk areas. Finally, we are expanding vector control capacity by training DPH Environmental Health staff to assist VCDs in investigation, thereby establishing a trained cadre who also can respond should a local outbreak occur.

NEWBORN MICROCEPHALY: HOW OFTEN IS IT DIAGNOSED IN LAC?
A FIVE-YEAR REVIEW OF COUNTY HOSPITALIZATIONS WITH A MICROCEPHALY DIAGNOSIS

ABSTRACT

Background

Zika infection has been identified among California's pregnant travelers, which may lead to an increased rate of microcephaly in the state and in Los Angeles County (LAC). Currently, there are no published rates of newborn microcephaly for LAC, description of the racial-ethnic populations affected, nor reports of severity of disease. The national microcephaly rate is estimated to range from 2-12 babies per 10,000 live births. We performed an analysis of microcephaly hospitalizations to establish a baseline, trend, and severity of LAC patients diagnosed with microcephaly.

Methods

A total of five years of microcephaly hospitalizations were reviewed using a hospital discharge dataset obtained from the California Office of Statewide Health Planning and Development (OSHPD). A newborn microcephaly case was defined as any newborn seen at an LAC hospital from 2010-2014 and had a discharge diagnosis of microcephaly. Annual rates of newborn microcephaly were calculated using LAC birth data, and rates were stratified by race-ethnicity. Burden indicator variables such as length of stay, hospital charge, and fatality rate were compared by gender and race-ethnicity.

Results

We identified 274 newborns hospitalized in LAC with microcephaly over the five-year study period (mean: 54.8 per year, range: 42-67 per year). The newborn microcephaly rate for LAC was 4.2 per 10,000 live births. Rates were higher among African American newborns (9.0 per 10,000 live births), female newborns (5.4 per 10,000 live births), and highest among female African American newborns (11.8 per 10,000 live births). The case fatality rate among all microcephaly newborns was 5.8% (16/274) and was higher among female infants (6.5%, 11/170).

Conclusions

This review identified a newborn microcephaly rate in LAC similar to the national rate for babies. These findings indicate that microcephaly in LAC can be severe and disproportionately affects African American and female newborns. More study is needed to corroborate these findings and to better understand the causes of these racial disparities among microcephaly newborns in LAC.

INTRODUCTION

Microcephaly is a condition where an infant's head circumference is at least two standard deviations less than an infant of the same gender and age [**1**]. This condition may be accompanied by other major birth defects such as hearing and visual loss but can occur with no other health conditions. Microcephaly can occur because a baby's brain has not developed properly during pregnancy or has stopped growing after birth. The cause of microcephaly is unknown in most cases. Conditions associated with microcephaly include infections during pregnancy (rubella, toxoplasmosis, cytomegalovirus, Zika virus), severe malnutrition, exposure to toxins (alcohol or other drugs), certain genetic defects (autosomal, recessive, primary microcephaly), or interruption of the blood supply to the baby's brain during development.

Zika infection during pregnancy is associated with increased rates of microcephaly in the resulting newborn [**2, 3, 4, 5, 6**]. Zika infection has been identified in over 45 pregnant California residents who have traveled to endemic areas [**7**]. Due to the mild and often asymptomatic nature of this infection, many pregnant women who are infected are likely undiagnosed. The impact of this disease on newborns in California and LAC remains unclear.

Currently, there are no published rates of newborn, neonate, or infant microcephaly in LAC or California. The Centers for Disease Control and Prevention (CDC) estimates that there are between 2-12 cases of microcephaly per 10,000 per live births nationally [**1**]. Using this national microcephaly estimate with the approximately 124,000 live births in LAC [**8**], we can estimate that the crude rate of microcephaly in LAC babies is 25-149 cases annually. However, this estimate does not take into consideration the risk factors among LAC residents that may be different from those found nationally. It also does not distinguish newborn rates from infants diagnosed after delivery.

A better estimate for the number and rates of newborns, neonates, and infants diagnosed with microcephaly in LAC needs to be established. This will help with monitoring changes in these numbers and lead to a better understanding of the impact of Zika on infants. Data on all hospitalizations in LAC is available through the OSHPD and should be useful in establishing microcephaly rate estimates.

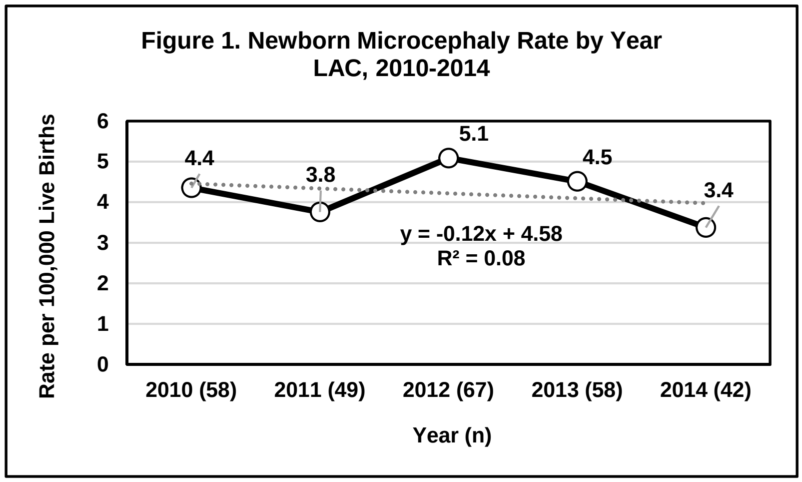
METHODS

A dataset of all hospitalizations occurring in LAC hospitals with a diagnosis of microcephaly was created. This microcephaly dataset was created from a dataset of all LAC hospitalizations obtained from the OSHPD. Although the dataset is de-identified, it contains information on each patient's age, race, length of stay, outcome (survived vs. died), hospitalization charge, and diagnoses (up to 24 diagnoses). Since birth only happens once, patients coded as being born in the hospital they were discharged from can be considered individual patients, and rates may be calculated.

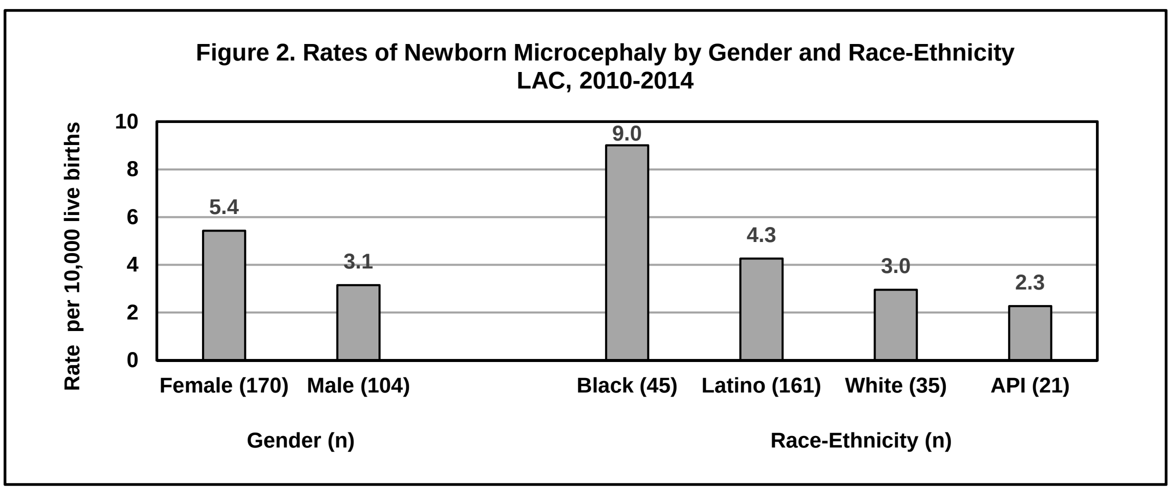
We defined a case of newborn microcephaly as any patient seen at an LAC hospital from 2010-2014, had a discharge diagnosis of microcephaly (ICD9 code = 742.1), and was born in the hospital from which they were discharged. A source admission code of 712 (7=newborn, 1=this hospital, 2=not ER) for 2011-2015 data, and the source admission code of 7 (newborn in admitting hospital) for 2010 data was used to select for newborns. Annual rates of newborn and infant microcephaly were calculated using LAC birth data and rates. Denominator data on annual births and demographic characteristics of newborns in LAC was obtained [**7**]. Rates of newborn microcephaly were compared by gender and race-ethnicity. Indicators for disease severity (length of hospitalization, hospitalization charge, and case fatality rate) were compared by race-ethnicity and gender. We also reviewed the annual trend of hospital discharges with a diagnosis of microcephaly for patients of all ages.

Results - _Newborn_ Microcephaly Cases (n=274)

There were 274 newborns diagnosed with microcephaly over the five-year study period, representing unique infants diagnosed for the first time. The number of newborn cases ranged from 42-67 per year (mean 54.8) and was relatively stable over the study period (data not shown). The annual newborn microcephaly rate was also stable over time, ranging from 3.4-5.1 per 10,000 live births per year and an average rate of 4.2 per year per 10,000 live births (274 infants/648,014 live births) (Figure 1).



The microcephaly rate was higher among female compared to male newborns (5.4 vs. 3.1 per 10,000 live births, rate ratio 1.7) (Figure 2). By race-ethnicity, the highest microcephaly rate was identified among African American infants (9.0 per 10,000 live births), which was greater than twice that of Latino newborns, the race-ethnicity group with the second highest rate (4.3 per 10,000 live births). The rate was higher for African American female (n=29) compared to African American male (n=16) newborns (11.8 vs. 6.3 per 10,000 live births). The rates for other female race-ethnicity categories were closer to the overall rate.



***API refers to Asian Pacific Islanders**

The median length of hospital stay for a newborn with microcephaly was 4 days (mean 12.1 days). The median length of stay was longer for African American newborns (8 days) as compared to White (4 days), Latino (4 days), and Asian newborns (4 days). There appeared to be no difference in length of stay by gender (both with a median of 4 days). The median hospitalization charge for a newborn with microcephaly was $26,346 (mean $125,068). The median charge was higher for African American newborns ($47,145) than Latino ($24,337), White ($20,280) and Asian newborns ($15,569). The median charge was comparable by newborn gender ($25,092 male vs. $25,339 female). The case fatality rate for a newborn with microcephaly was 5.8% (16/274). The fatality rate was higher for female (6.5%, 11/170) than male newborns (2.9%, 3/104). The rate was also higher for African American (7.6%, 3/29) and Latino newborns (7.4%, 12/161). The number of deaths among White and Asian Pacific Islander (API) newborns were too small to calculate stable rates (≤1).

RESULTS - All Patients Hospitalizations Diagnosed with Microcephaly (n=1813)

We identified 1,813 microcephaly-associated hospitalizations in LAC from 2010-2014. The annual number of microcephaly-associated hospitalizations ranged from 307-419 per year (mean 362.6 per year), increasing slightly over time (Figure 3). Patients ranged in age from newborn to 88 years old (mean age 7.6 years, median age 3 years), and most were older than one-year-old (67%) (Figure 4). There were 598 hospitalizations for infants under one-year-old (33%), including 361 for neonates under one month old (20%) and 274 newborns (15%). The total number of hospitalization days exceeded 17,000 days (annually 3,515 days, mean number of days per patient 9.7 days, median 4 days). A total of fifty deaths were identified: 30 infants, 16 newborns, 4 non-infants. Latino infant deaths accounted for 68% of the total deaths for patients diagnosed with microcephaly (34/50).

With the exception of newborn hospitalizations, which represent unique infants diagnosed for the first time, all other hospitalizations may be due to initial diagnosis or subsequent diagnosis for the same patient. De-duplication is needed to be able to calculate the unique number of microcephaly neonates (≤1 month of age) and infants (≤1 year of age), which is not possible due to the de-identified nature of this dataset. However, an upper limit for the rate of infants diagnosed with microcephaly can be calculated assuming all infant hospitalizations are for a unique patient: 9.2 microcephaly cases per 10,000 live births (598 infants/648,014 live births).

Figure 3. Total Number of Hospitalizations and Newborns Diagnoses with Microcephaly by Year LAC, 2010-2014

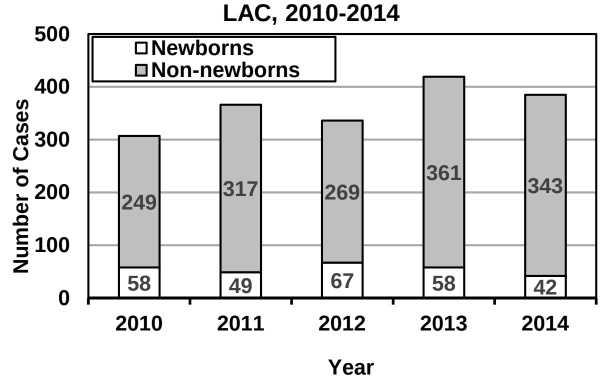
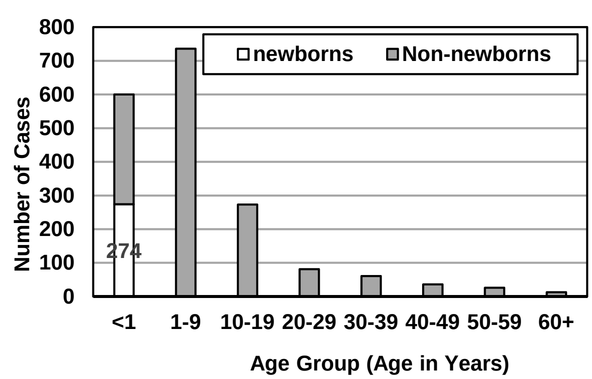


Figure 4. Microcephaly Hospitalization by Newborn Status LAC, 2010-2014



DISCUSSION

In this study, we identified an LAC baseline rate of newborn microcephaly of 4.2 per 10,000 live births (55 cases annually). This rate is similar to the nationally estimated microcephaly rate of 2-12 babies per 10,000 live births reported by the CDC. Because no definition of "babies" is provided with this estimate, the rate identified in our study for newborns may not be directly comparable. A clearer national microcephaly rate is needed for newborns, neonates, and infants diagnosed with microcephaly. The results of this study indicates that many patients may be diagnosed later in life.

This study identified a higher rate of newborn microcephaly among African Americans (9.0 per 10,000 live births) than newborns of other race-ethnicity groups. African American newborns with microcephaly also had a longer, costlier hospital stay with a higher fatality rate than newborns of other race-ethnic groups, indicating that this group is more severely impacted by the disease. More study is need to understand the causes for this trend in this race-ethnicity group. The higher rates of microcephaly identified among African American newborns is a trend consistent with other findings of low birth weight and higher infant mortality rate in this race-ethnicity group [**8**].

This study also identified a higher rate of newborn microcephaly and higher case fatality rate among female newborns (5.4 per 10,000 live births). This finding is consistent with another recent study of 32 microcephalic infants associated with Zika infection in Brazil [**4**] where 69% of the cases were female (n=22). More study is needed to confirm this gender trend. One possible explanation for this trend includes a sex-linked gene responsible for at least some microcephaly cases. A less likely, but plausible, explanation would be a prenatal infection such as Zika, toxoplasmosis, or cytomegalic virus infection affecting the developing fetus and having a differential fetal impact by gender. However, other indicators of disease severity such as length of hospital stay and hospital charges were not higher among female newborns.

CONCLUSION

We were able to establish the annual number and rate of newborn microcephaly in LAC using the OSHPD dataset. Our study identified African American newborns as having a higher rate of microcephaly and more severe illness than newborns of other race-ethnicity groups. However, more research is needed to corroborate these findings. Additional research is needed to establish a microcephaly rate for neonates and newborns in LAC that could not be done with this de-identified dataset.

LIMITATIONS

The definition of microcephaly may vary by clinician and by region [**1, 9**] and may affect the results presented here. In addition, the race-ethnicity of newborns is reported by the parent(s). If the parent is unwilling or unable to declare the infant's race-ethnicity, then the mother's race is reported. This may bias the microcephaly rates by race shown here.

ACKNOWLEDGEMENTS

Special thanks to Louise Rollin-Alamillo in the Health Assessment and Epidemiology Department of LAC DPH for providing the demographic data on newborns in LAC.

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ASSESSING INFECTION PREVENTION PRACTICES IN LOS ANGELES COUNTY AMBULATORY SURGERY CENTERS

OVERVIEW

In Los Angeles County (LAC), outpatient healthcare settings such as ambulatory surgery centers (ASCs) are almost always unlicensed, have limited oversight from the LAC Department of Public Health (DPH), and have been the site of several outbreak investigations in recent years [1]. Furthermore, ASCs do not report any patient encounter or healthcare-associated infection data to LAC DPH. As a result, LAC DPH has a limited understanding of their infection control practices and the extent of their healthcare-associated infections. Meanwhile, the number of patient visits and procedures in outpatient settings has grown steadily as has the number of unlicensed ASCs [2,3]**.**

In response to the West Africa Ebola epidemic in 2014, LAC DPH secured funds to support the development of robust infection prevention (IP) programs across the continuum of care. Using these funds, LAC DPH Acute Communicable Disease Control Program (ACDC) conducted comprehensive on-site assessments in a sample of the approximately 500 ASCs in the county with the goal of obtaining insight into demographic characteristics, IP policies, and healthcare workers' IP practices.

METHODS

ACDC staff performed assessments of IP policies and practices in ASCs utilizing tools developed by the Centers for Disease Control and Prevention (CDC). Assessed domains included infection control program and infrastructure, infection control training and competency, healthcare personnel safety, disease surveillance and reporting, and direct observation of facility infection control practices. Each ASC completed the tool for the first four domains; the tool was then reviewed by ACDC staff and direct observations were made during a one-day on-site visit to the ASC. Teams of four ACDC staff members conducted the assessments. Observations of staff infection control practices were made throughout the ASC, including pre- and post-operative areas, post-anesthesia care units, operating/procedure rooms, and sterile processing departments. Auditing was defined as a formal process that included both monitoring and documentation. An ASC could provide feedback but not have a formal auditing process.

Assessments by ACDC were voluntary for ASCs. Recruitment communications were sent in Fall 2015 through Spring 2016 using contact lists from previous DPH surveys and via communication sent to members of the California Ambulatory Surgery Association and the Los Angeles County Medical Association. Following the assessment, each setting received a detailed summary and completed assessment tool via email, which included resources specific to identified gaps.

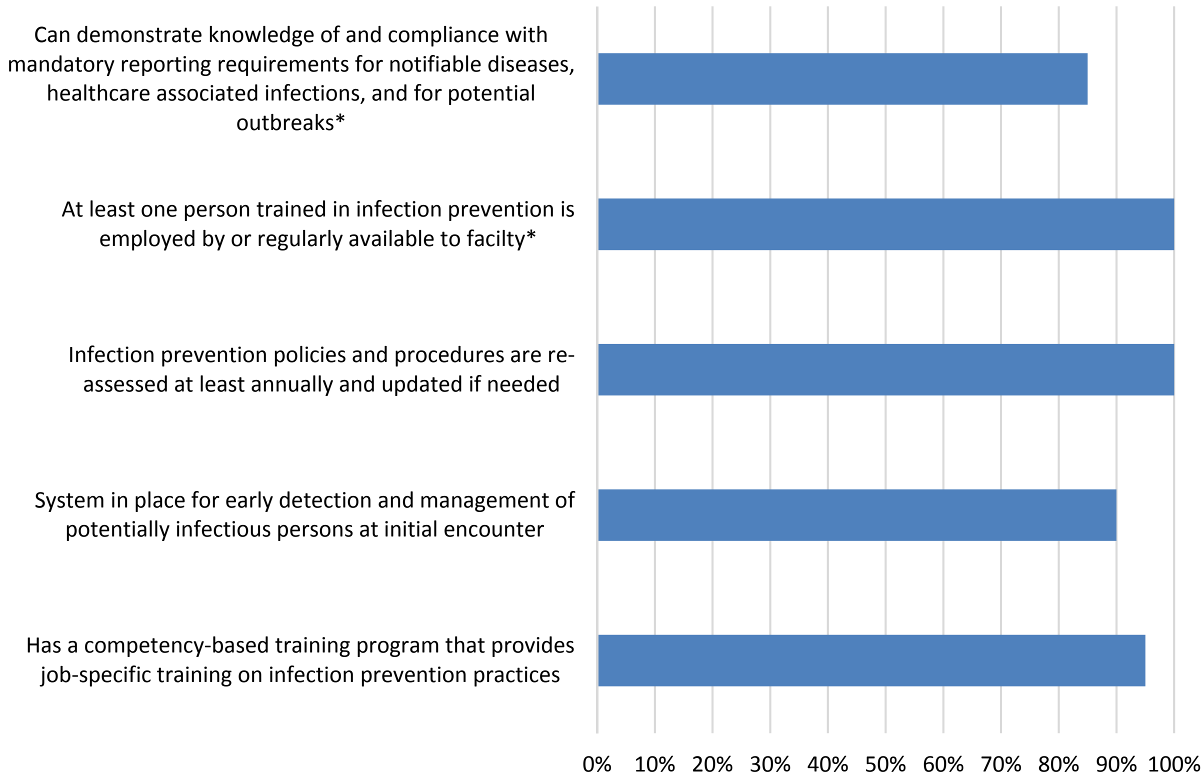
RESULTS

All ASCs that volunteered, a total of 20, were assessed by ACDC from January 2016 through June 2017. Results of the assessments are shown in the below tables and figures.

Table 1. Demographic characteristics of assessed ASCs

Characteristic	Number of ASCs (%) (N=20)
Certified by Center for Medicare and Medicaid Services (CMS)	18 (90%)
Accredited	16 (80%)
Median number of physicians who work at facility (range)	16 (1-100)
Median number of patients seen per week (range)	53.5 (12-200)
Average number of operating and/or procedure rooms (range)	2.6 (1-5)

Figure 1. Features of infection control programs at assessed ASCs



* Mandated by Centers for Medicare and Medicaid Services Conditions for Coverage - infection control § 416.51 for certified ASCs

Figure 2. Audit and feedback practices for assessed ASCs, by domain

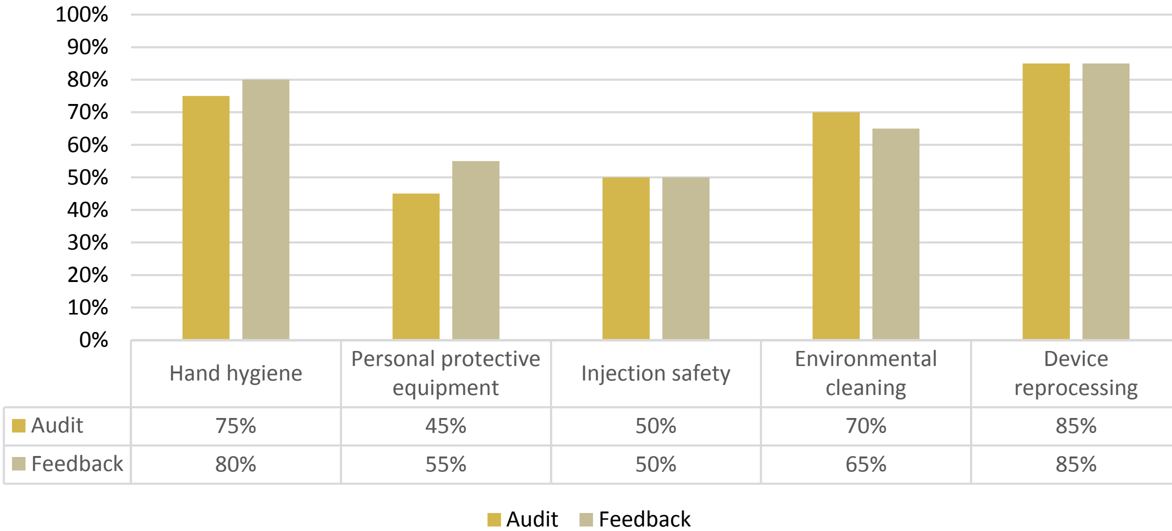


Table 2. Number of assessed ASCs with at least one identified gap, by infection control domain

Domain	Number of settings with at least one gap in domain (%) (N=20)
Hand hygiene	17 (85%)
Personal protective equipment	16 (80%)
Point-of-care testing	9 (50%)
Injection safety	19 (95%)
Respiratory hygiene/cough etiquette	10 (50%)
Environmental cleaning	14 (70%)
Device reprocessing	8 (40%)
Sterilization of reusable devices	5 (28%)
High-level disinfection of reusable devices	6 (46%)

The two most common deficiencies noted from direct observations both pertained to injection safety. Amongst the 19 ASCs where observation was applicable, 58% failed to disinfect the rubber septum on a medication vial prior to piercing with needle during medication preparation. A total of 79% allowed multi-dose vials to be used on more than one patient to enter immediate treatment areas rather than be kept in a centralized medication area. Hand hygiene moments most commonly missed occurred after contact with objects in the immediate vicinity of the patient (53% of ASCs deficient) and after removing gloves (63% deficient). Other common gaps included instruments that undergo immediate-use steam sterilization used immediately and not stored (38% deficient) and reusable devices stored in a manner to protect from damage or contamination after high-level disinfection (38% deficient).

The on-site assessment also allowed for the opportunity to obtain feedback on DPH outreach. Several infection preventionists felt that LAC DPH and other public health agencies have few resources specific to the ASC and outpatient audience.

DISCUSSION

Overall, it appears that the ASCs assessed during this project had the necessary IP program elements in place, though only some are mandated per Centers for Medicare and Medicaid Services Conditions for Coverage. Nearly all ASCs had a designated, trained infection preventionist, updated IP policies, appropriate infection surveillance, and a robust staff training program. Some inadequacies were noted related to communicable disease reporting. Most commonly, ASC infection preventionists were not aware that outbreaks were to be reported to DPH. A, the results of the direct observation of staff practices often did not reflect written policies and procedures. The domains with the most frequently observed gaps included injection safety, hand hygiene, and personal protective equipment (PPE) use. These findings are very similar to common lapses identified during inspections conducted by the CDC in several states, which included the same domains [4]. Identified gaps related to audit of IP practices and feedback of those results to staff. Audit and feedback are well-recognized methods of improving practice, and higher intensity is associated with improved compliance [5]. Of note, two of the domains with the most gaps (injection safety and PPE use) were also the two domains with the least amount of audit and feedback. Auditing tools for all IP domains were provided to assessed ASCs.

In 2015, ACDC conducted a multi-modal, cross-sectional study of facility characteristics and the IP program in all LAC ASCs. A total of 130 ASC representatives were interviewed for that survey. Compared to self-reported survey results from 2015, it appears that the presence and quality of written policies were comparable to those ASCs visited in-person [6]. This project allowed ACDC to conduct a more accurate assessment, albeit amongst a smaller sample, and illuminated gaps in staff practices.

There are some limitations to this analysis. As this was a voluntary assessment, selection bias, volunteer bias, and non-respondent bias may be present. Non-respondents may vary considerably from respondents in adherence to recommended IP practices. We hypothesize that the volunteer ASCs may have fewer IP gaps than a random sample of the general population. The groups from which we recruited ASCs to participate may represent those with more resources and generally more interest in IP. The proportion of assessed ASCs that were certified for CMS participation (90%) is higher than the total LAC ASC population of approximately 60%. Data were available for only a small portion of ASCs in LAC.

ACDC is currently following up with assessed ASCs to determine the perceived value of the assessment results and how DPH can support their IP efforts. In response to the perceived limited number of public health resources specific to ASCs, LAC DPH created a quarterly publication that will be sent electronically to outpatient infection preventionists. Further gap mitigation efforts are planned, specifically pertaining to injection safety. As outpatient IP practices are further studied and characterized, more relevant resources and outreach efforts will be designed.

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SURVEY OF HOSPITAL NURSING ROLES IN ANTIMICROBIAL STEWARDSHIP

BACKGROUND

Antibiotic/antimicrobial-resistant infections have repeatedly been recognized as an imminent and growing public health threat. Each year in the United States at least two million people become infected with bacteria that are resistant to antibiotics, at least 23,000 of these people die as a direct result of antibiotic-resistant bacteria, and many more die from other conditions that were complicated by an antibiotic-resistant infection [**1**]. The primary strategies for preventing antibiotic resistant infections are: (a) reducing the transmission of healthcare-associated infections caused by antibiotic-resistant bacteria, and (b) preserving antibiotic efficacy by promoting the judicious use of antibiotics, formally known as Antimicrobial Stewardship.

Hospitals were the first healthcare facility type to widely adopt the implementation of an Antimicrobial Stewardship Program (ASP). The Centers for Disease Control and Prevention (CDC) have outlined necessary components of a ASP [**2**]. While the CDC had previously listed nurses as key support for an ASP, their significant contribution had been largely unrecognized. Bedside registered nurses (RNs) are not usually represented in ASPs. This gap has been recognized in recent literature [**3**]; however, summarizing the intersection of nursing roles with antimicrobial stewardship has been based largely on experience. To objectively identify these opportunities, a survey was sent to the Directors of Nurse Education in all of Los Angeles County (LAC) acute care hospitals. Data was collected online via Google Forms from November 2015 until January 2016.

METHODS

An online survey was created in Google forms for nurse education directors or their designees who could best speak to nurse education and competency. The invitation link for all 93 LAC Acute Care Hospitals (ACHs) was sent in November 2015, and responses were received by mid-January 2016. The Institutional Review Board (IRB) of the LAC Department of Public Health (DPH) designated this survey as IRB-exempt. Question formats included multiple choice, select all that apply, or fill in with text. A single question with several subparts comprised the bulk of the survey. Each subpart listed a different activity or knowledge component related to antimicrobials, which respondents identified as “mandatory/required,” “optional/offered,” or “not offered” for bedside RNs in their hospital. We combined responses of “mandatory/required” and “optional/offered” to identify topics that hospitals include in bedside RN knowledge and competency. Additional questions included policies related to antimicrobial administration and orders as well as communication of results.

RESULTS

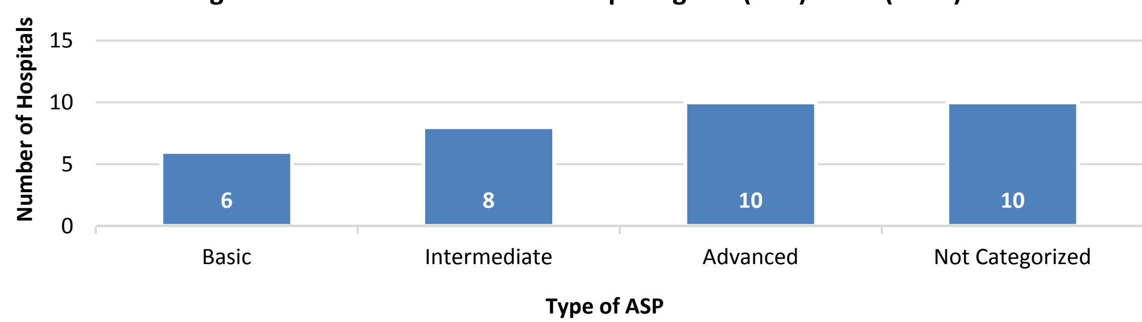
Respondent Hospital Characteristics

The rate of response to this survey was 36.6%. The 34 hospitals represented in this survey comprise approximately one-third of the hospitals in LAC. In most cases, the survey was completed by the self-identified Director of Nursing Education (n=19, 56%); however, additional surveys were completed by nurse education designees such as Clinical Nurse Specialists of Bedside Nurse Educators (n=9, 26%), Directors of Nursing or Chief Nursing Officers (n=4, 12%), or other nurse administrators (n=2, 6%). Out of the 34 hospitals that completed the questionnaire, 24 of them had additionally completed a different survey [**4**] describing their ASP. Based on the results of that survey, it was possible to categorize the respondents' ASPs level of basic, intermediate and advanced using the California Department of Public Health (CDPH) criteria [**5**].

Hospitals that had a basic ASP accounted for n=6 (18%) of the respondents; n=8 (24%) had an intermediate ASP; and 10 (29%) had an advanced program. The remaining 10 (29%) were unable to be categorized as they had not completed the second survey sent in November 2015 (Figure 1).

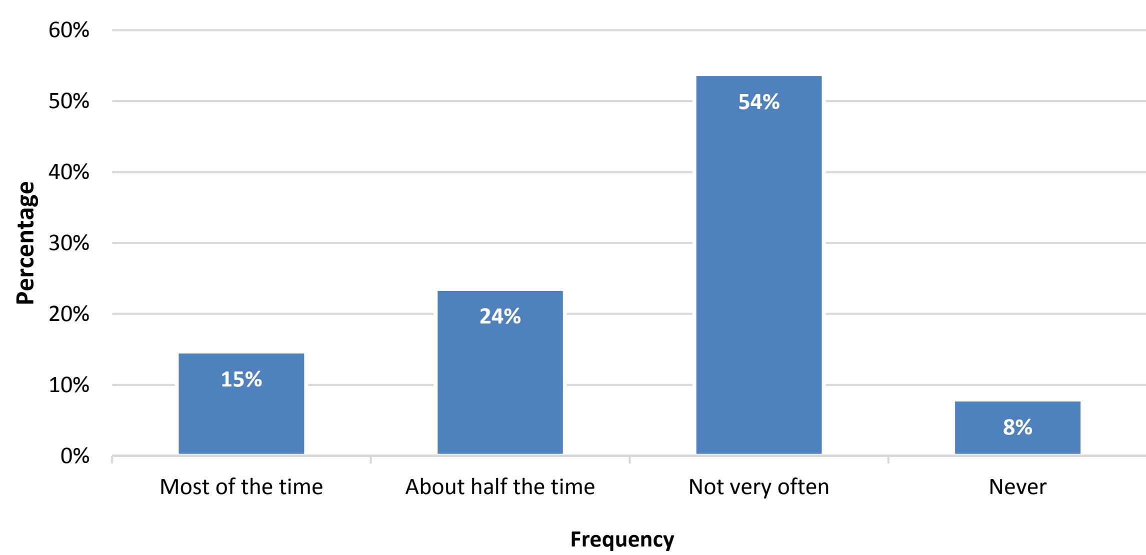
Respondents were asked about the structure of their ASP (Figure 1) as well as facility norms related to medication orders (Figure 2) and results communication (Figure 3).

Figure 1. Antimicrobial Stewardship Program (ASP) Level (n=24)

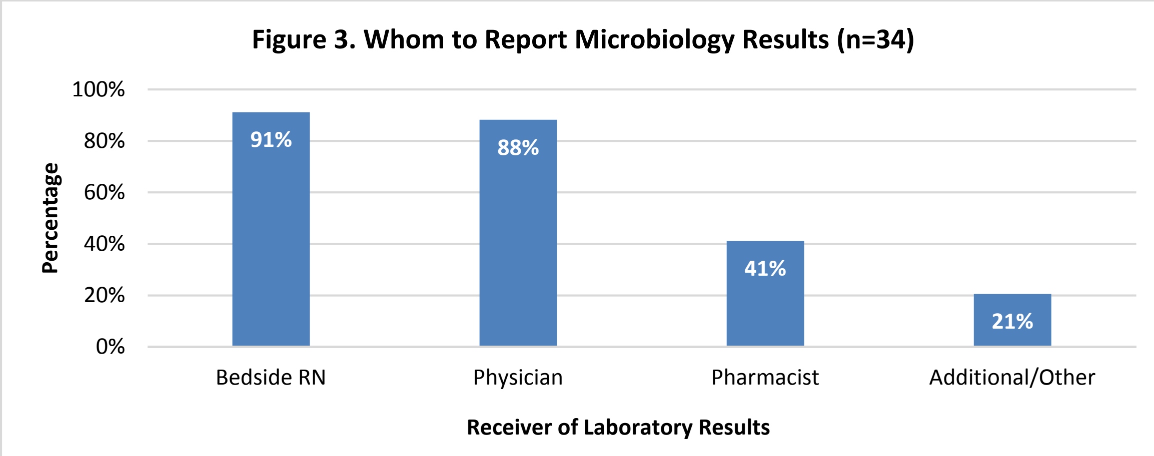


Question: "At your facility, how often do bedside registered nurses take phone and/or verbal orders from the physician for antimicrobials?

Figure 2. Entering Orders (n=34)



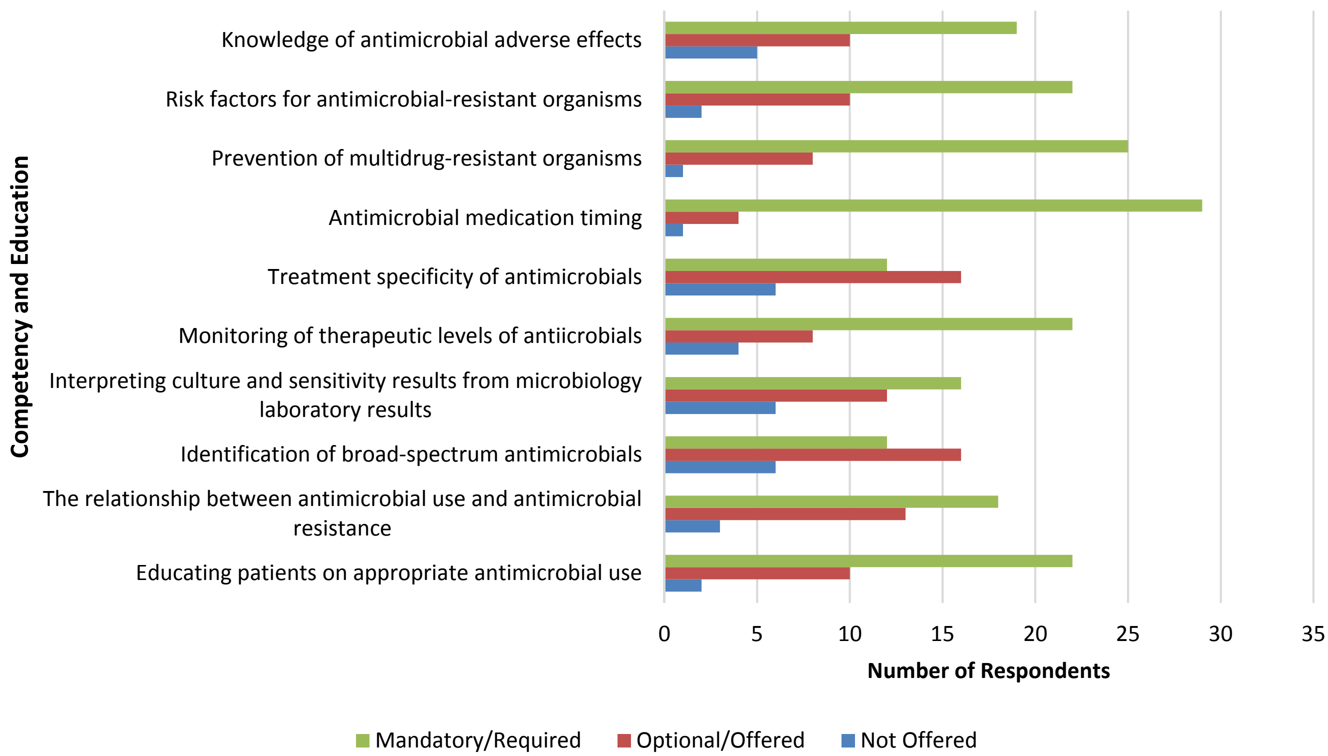
Question: "To whom are critical microbiology laboratory results reported?" *(Select all that apply)*



<u>Competency and Education Series</u>

In a select-all-that-apply question, respondents identified how bedside RNs participate in antimicrobial stewardship at their hospital. Overall, 5 hospitals (15%) reported no bedside RN participation in antimicrobial stewardship. In 3 hospitals (9%), at least 1 bedside RN is on the ASP committee; however, in 19 hospitals (56%), nursing leadership represents them and no bedside RNs are on the ASP committee. Bedside RNs participate in quality assurance for antimicrobial treatment in 9 responding hospitals (26%), and in 3 hospitals (9%), they participate on subcommittees that promote antimicrobial stewardship knowledge on their respective units. Finally, in just 1 hospital (3%), bedside RNs have an antimicrobial resistance/multidrug-resistant organisms advisory group.

Figure 4. Competency and Education Series



DISCUSSION

Bedside RNs have an important role in the administration and evaluation of antimicrobial treatment. Respondents to the survey reported that bedside RNs are trained to recognize broad-spectrum antibiotics, to understand culture/susceptibility results, to monitor therapeutic level of antimicrobials, and to assess antimicrobial treatment for appropriateness (Figure 4).

When an antimicrobial (such as penicillin) is inappropriately listed as an allergy, other antimicrobials may also become eliminated as medication options, reducing the prescriber's choices for optimal treatment. A total of 97% of the hospitals represented in this questionnaire require bedside registered nurses (RNs) to appropriately assess allergies. By incorporating allergy assessment into their patient assessment, bedside RNs may be able to verify allergies and potentially increase antimicrobial medication options available to that patient [**6**].

Literature suggests that bedside RNs have been shown to influence prescribing; with increased awareness, that influence can be redirected to more judicious use of antimicrobials [**7**]. Respondents demonstrated that bedside RNs may have frequent opportunities to clarify the indication of a treatment prior to ordering or administering antimicrobials because bedside RNs often take phone and/or verbal orders from physicians for these medications. Although these opportunities may exist, it is not known how common a practice this is among bedside nurses.

Antimicrobial use can be narrowed down to a more optimal treatment by assessment of the patient and available information. Bedside RNs reportedly are expected to interpret culture/susceptibility results, monitor therapeutic levels of antimicrobials, and have knowledge of treatment specificity.

Bedside RNs are typically the center of communication for results critical such as microbiology lab results. In some cases, the bedside RN is the sole member of the patient care team notified of such results, and it is their responsibility to communicate critical information to other members of the patient care team.

LIMITATIONS

The rate of response to this survey was 37% (n=34). Although the survey questions were specific, a nurse education director unfamiliar with antimicrobial stewardship may have misinterpreted questions related to competency in antimicrobial administration and/or evaluation [**8**].

CONCLUSION

Bedside RNs are the frontline staff who administer antimicrobials, and they access the same information that ASPs use to optimize antimicrobial treatment. By empowering bedside RNs, ASPs can potentially achieve increased compliance to and adherence with antimicrobial stewardship activities across all disciplines.

PREVIOUS PRESENTATION OF STUDY RESULTS:

This information was previously published in the journal *Infection Control and Hospital Epidemiology* and is available through Cambridge core at the following hyperlink: http://dx.doi.org/10.1017/ice.2017.166. Preliminary findings were presented at the local Coastline Chapter of the Association of Professionals in Infection Control and Epidemiology (APIC) on March 10, 2016 in Torrance, California.

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INCREASING HEALTHCARE PERSONNEL INFLUENZA VACCINATION COVERAGE IN LAC HOSPITALS WITH HELP FROM THE LOCAL HEALTH DEPARTMENT, 2016

BACKGROUND

Influenza is a serious and often deadly infection. Typically, hospitalized persons are at greater risk for complications related to influenza compared to the general population. In addition, hospitalized persons are exposed to healthcare personnel, who as healthy adults can often serve as vectors for influenza transmission. The vaccination of healthcare personnel (HCP) has been widely recommended to provide direct protection against influenza infection for HCP and indirect protection for their patients.

In 2013, Los Angeles County (LAC) Department of Public Health (DPH) issued a Health Officer Order mandating all HCP in hospitals receive influenza vaccination or wear masks during the influenza season[1]. Despite this mandate, only 19% of LAC hospitals achieved the Healthy People 2020 goal of ≥90% influenza vaccination coverage. DPH's objective was to identify hospitals with disparities in resources and increase HCP influenza vaccination coverage via targeted outreach to LAC acute care hospitals.

METHODS

LAC conducted an intervention study during the 2016-17 flu season. HCP vaccination data was obtained from the Healthcare Worker Vaccination Module of the National Healthcare Safety Network (NHSN), which is only accessible via the Center for Disease Control and Prevention (CDC) authorization, for the 2015-16 and 2016-17 influenza seasons. Vaccination coverage was defined as the percentage of healthcare personnel—employees, licensed independent practitioners, adult students/trainees and volunteers, and other contract personnel who received their influenza vaccination on site at the hospital or elsewhere. Targeted (intervention) facilities were selected from those with vaccination coverage within the lowest quartile of all hospitals in LAC for the 2015-16 season. Hospitals were not randomly selected; thus self-selection bias could have affected results.

Targeted hospitals' chief executive officers received letters explaining the importance of HCP vaccination, their hospital's 2015-16 HCP vaccination coverage and ranking among hospitals in LAC, and the opportunity to participate in the HCP Influenza Vaccination Improvement Project. DPH liaison public health nurses (LPHNs) then engaged the hospital's infection preventionists and employee health directors to conduct the project.

The LPHNs conducted one in-person and two telephone meetings with each hospital before and during the 2016-17 influenza season. Using a standardized assessment tool, the LPHNs evaluated the hospital's 2015-16 vaccination campaign strategies to determine a baseline of recommendations to utilize in the upcoming season. Topics assessed included how influenza vaccination is promoted and distributed to HCP, tracking of HCP vaccination, and perceived barriers to increase vaccination rates.

[1] http://publichealth.lacounty.gov/ip/influenza_providers.htm

Based on the results of each assessment, LPHNs provided customized recommendations for each intervention hospital to implement into its 2016-17 vaccination campaign. Recommendations were determined on evidence based strategies from NHSN's "Healthcare Personnel Safety Component Protocol", a scientific literature review, and practices deemed effective in other local hospitals. At the conclusion of the 2016-17 season, the LPHNs conducted a post-season assessment with each hospital. The standardized post-season assessment tool gathered feedback and information on improvements achieved during the hospital's vaccination campaign.

Both assessment tools were reviewed after the 2016-17 season. DPH assessed which campaign strategies were newly implemented for the 2016-17 season in each hospital and what changes they perceived to be the most impactful. Common themes among all intervention facilities' responses were identified. DPH also reviewed HCP vaccination coverage data from NHSN for the 2015-16 and 2016-17 influenza seasons. Changes in HCP vaccination coverage between influenza seasons were compared via two-tailed Wilcoxon Signed Rank tests and between intervention and non-intervention facilities via two-tailed Wilcoxon Rank-Sum tests. All analyses were performed using SAS software version 9.3.

RESULTS

Out of 90 hospitals with complete HCP vaccination data for both seasons, 13 facilities were selected for intervention.

Each hospital in the intervention group experienced a significant increase in vaccination coverage (Figure 2). Intervention facilities' baseline vaccination coverages for 2015-16 ranged from 38.2% to 66.0% (mean 55.4%). Mean increase in pre- and post-season vaccination coverage was significantly higher among intervention hospitals (22.6%, range: 4.3%–46.1%) versus all others (n=77, 1.3%, range: -15.8%–26.6%). Countywide vaccination coverage increased from 74% to 79% for the 2015-16 and 2016-17 seasons, respectively (Figure 3).

The assessment responses showed that the most commonly implemented strategy was the involvement of department supervisors (n=13, 100%). Specifically, 11 (85%) facilities implemented tracking of department-based vaccination rates. All 13 facilities also cited increased leadership support as key to their success.

CONCLUSIONS

The goal of the Healthcare Personnel Influenza Vaccination Improvement Project was to increase influenza vaccination amongst HCP in acute care hospitals with the lowest vaccination coverage in LAC. All of the objectives for this project were met.

Intervention was associated with increased HCP influenza vaccination in the 2016-17 season. On average, intervention hospitals' vaccination coverage increased by 22% in one influenza season. The countywide average increased significantly by 5% over the same time period. Countywide vaccination coverage had not significantly increased since the introduction of the aforementioned Health Officer Order (Figure 3). Previously, the intervention group consistently reported lower vaccination coverage compared to other hospitals in LAC, but this disparity was greatly reduced after the DPH project.

This project relied on the innovative structure of the DPH Healthcare Outreach Unit (HOU) to work with targeted hospitals. HOU LPHNs have established relationships with hospital staff and regularly attend infection control committee meetings. The LPHNs have worked with these staff on numerous occasions, from outbreak management to consulting on infectious disease topics. When HCP influenza vaccination rates were determined to be an area source of concern, DPH was able to utilize this existing rapport. HOU staff successfully identified hospital staff who oversee their vaccination campaign and have the most influence over improving vaccination coverage. DPH and hospital staff communicated and collaborated openly and efficiently to implement new vaccination campaign strategies.

DPH will continue to promote strategies associated with increased HCP vaccination coverage, particularly in hospitals with the lowest vaccination coverage. Communication and collaboration between DPH and hospital counterparts may benefit facilities to improve vaccination coverage. Increasing HCP vaccination ultimately aids in protecting hospital patients, visitors, families, and other staff members from influenza and transmitting it to others.

Figure 1: Flowchart of Project

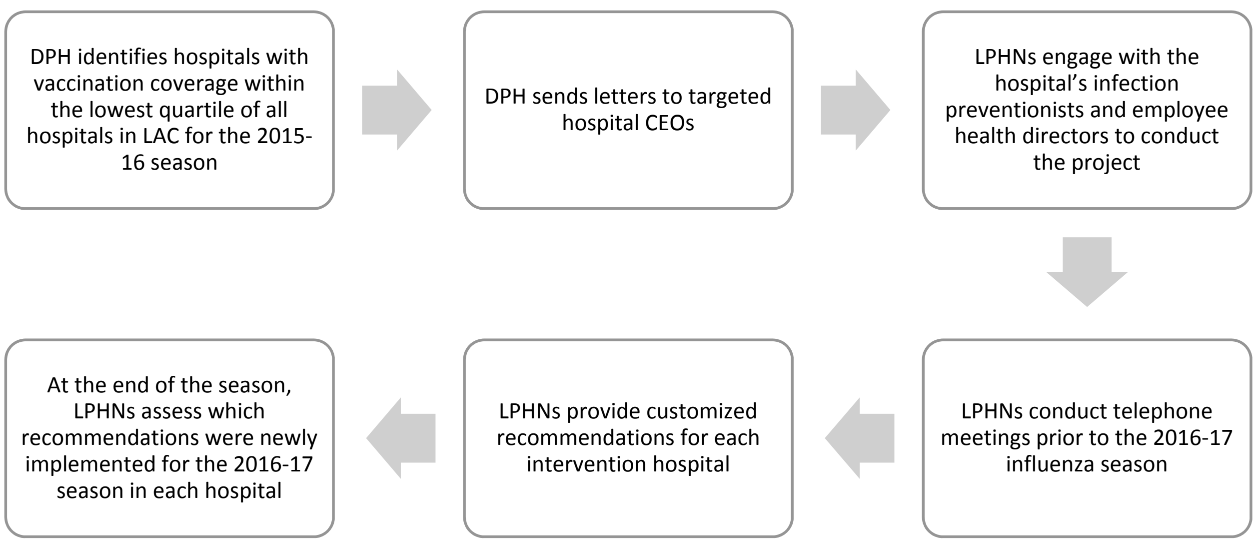


Figure 2: Vaccination Coverage by Intervention Hospital and Influenza Season

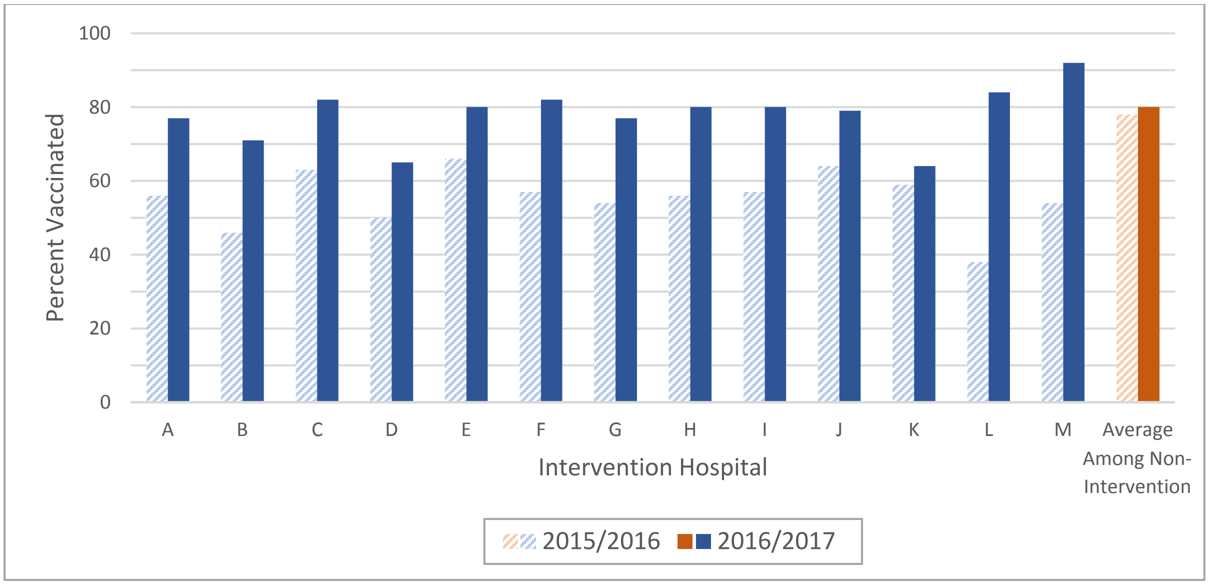
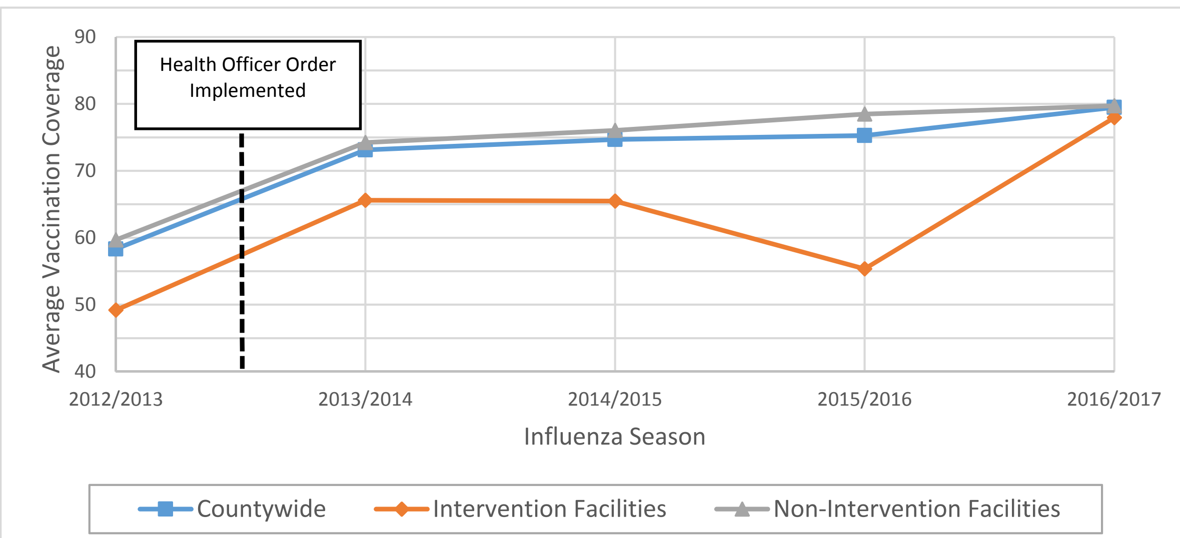


Figure 3: Average Vaccination Coverage by Season, Overall and by Intervention Group



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ON-SITE INFECTION CONTROL ASSESSMENTS: PARTNERSHIP WITH EMS

OVERVIEW

Infection control is key in preventing diseases from spreading in healthcare facilities. For many years, the Los Angeles County Department of Public Health's Acute Communicable Disease Control Program (LAC DPH ACDC) has worked with healthcare facilities such as hospitals and skilled nursing facilities to improve infection control practices. This serves to decrease healthcare associated infections (HAIs) in both patients and healthcare personnel. Emergency Medical Services (EMS) providers are a vital part of the healthcare team as they are the first to respond to pre-hospital incidents and provide care during inter-facility transports. EMS providers in LAC include emergency medical technicians and paramedics in both public (fire and sheriff departments) and private (ambulance companies) settings.

To support infection control across the continuum of care, ACDC began collaborating with the LAC Emergency Medical Services Agency (LAC EMS) to increase infection control measures in EMS providers across LAC. EMS providers face unique situations that present challenges in practicing proper infection control such as working in high stress scenarios and providing care with limited or no patient background. While performing their everyday duties, they can be exposed to patients with communicable diseases, and although there have been no documented cases of transmission in LAC to EMS providers, some have been exposed to diseases such as meningitis, tuberculosis, hepatitis A, hepatitis B, human immunodeficiency virus (HIV), etc. Their work environment (the ambulance) provides limited space for necessary resources. For example, there is no room for a sink in the ambulance to perform hand hygiene with soap and water when needed. Furthermore, if there is a breach in personal protective equipment (PPE) or if a device malfunctions or becomes contaminated, there is limited amount of room for extra supplies. Infection control by EMS providers is crucial and understanding their unique challenges is important in order to effectively help them.

ACDC received funding in 2015 through a Centers for Disease Control and Prevention (CDC) grant to perform infection control assessments in acute care hospitals, ambulatory surgery centers, and skilled nursing facilities. In 2016, ACDC expanded this project to include EMS providers. The goal of these assessments was to evaluate and understand infection control practices among healthcare personnel, identify infection control gaps and best practices, enhance disease reporting, and develop standardized infection control guidelines.

METHODS

To perform these assessments, ACDC and LAC EMS adapted CDC Infection Control Assessment and Response survey tools[1] designed for other healthcare settings. The tools assessed domains of the infection control program including: staff training, healthcare personnel safety, hand hygiene, use of personal protective equipment (PPE), injection safety, respiratory hygiene, environmental cleaning, device reprocessing, sterilization, and/or high-level disinfection of reusable devices. LAC EMS selected the ten providers with the highest call volume and invited them to participate. Additional providers volunteered to participate after the opportunity was announced at the Provider Agency Advisory Committee and LAC

Ambulance Association meeting. Providers selected included private ambulance companies as well as public fire and sheriff departments.

Each infection control assessment lasted approximately seven hours and included two parts. The first part of each assessment involved the provider completing the survey tool and onsite review with LAC staff. The second part involved direct observation of infection control practices via ambulance field observation that lasted anywhere from four to seven hours in at least two ambulances per provider. At the conclusion of each visit, the provider received verbal feedback from LAC staff. Following the assessment, each provider received a detailed written summary with feedback, recommendations, and resources specific to their identified gaps.

RESULTS

Although the goal was to assess 10 EMS providers, ACDC and LAC EMS were able to assess 14 EMS providers from September 2016 through September 2017. Results of the infection control assessments are shown in the tables and figures below. Table 1 and Figures 1-3 represent data from the infection control survey tool. Figures 4 and 5 represent data from the direct observations of staff practices.

Table 1. Demographic Characteristics of EMS Providers Assessed

Characteristic	n (%)
Medical Director is employed by company	6 (43%)
Provider has Designated Infection Control Officer (DICO)	11 (79%)
Average number of hours per week dedicated to infection prevention and control (range)	11 (1-40)
Average number of call responses per week (range)	1,406 (20-7711)
Average number of transports per week (range)	787 (7-4392)

Figure 1. Features of Infection Control Programs and Healthcare Personnel Safety

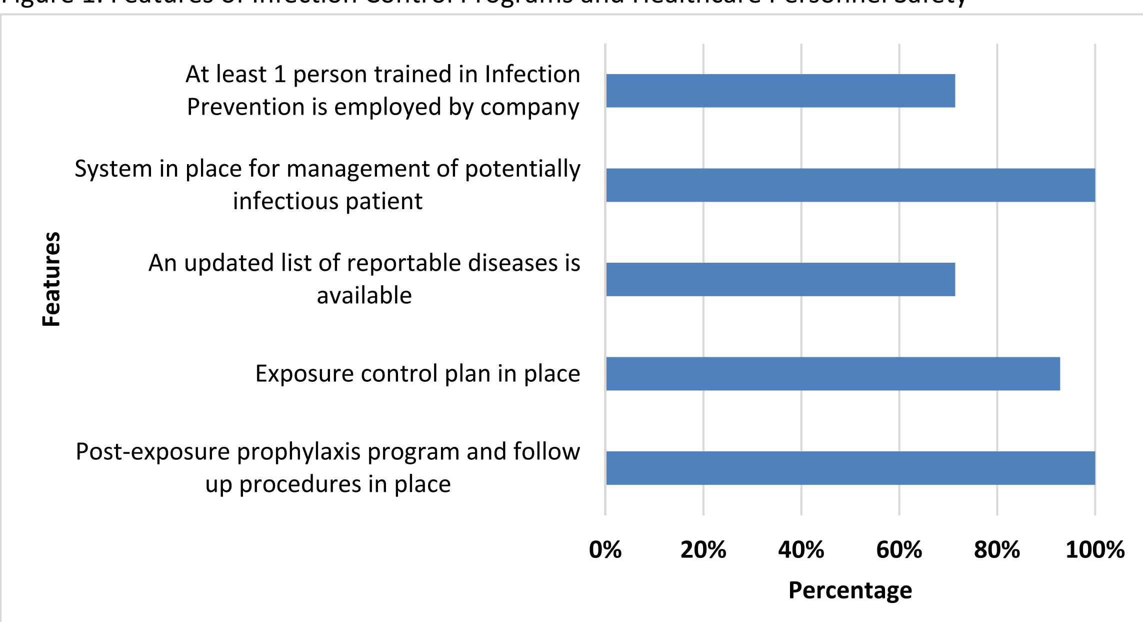


Figure 2. Percentage of Providers that Require Healthcare Personnel to Demonstrate Competency for the Four Infection Control Domains

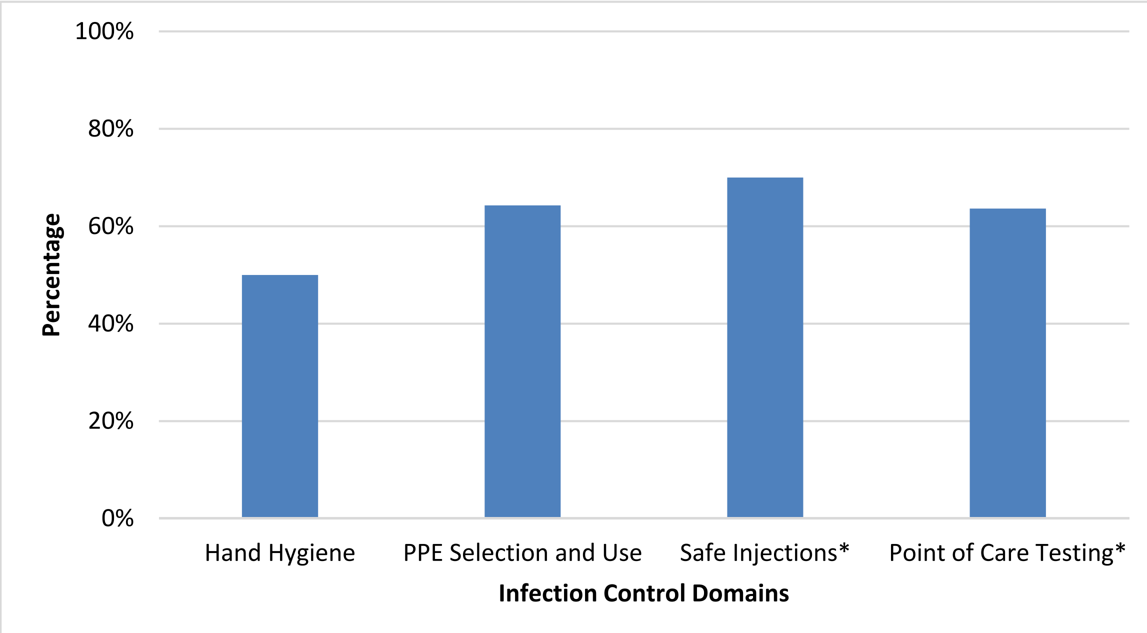


Figure 3. Audit and Feedback Practices for Assessed EMS Providers by Infection Control Domain‡

‡Per the CDC, auditing is a formal process that must include both monitoring and documentation; therefore, a facility may provide feedback but not have a formal auditing process.

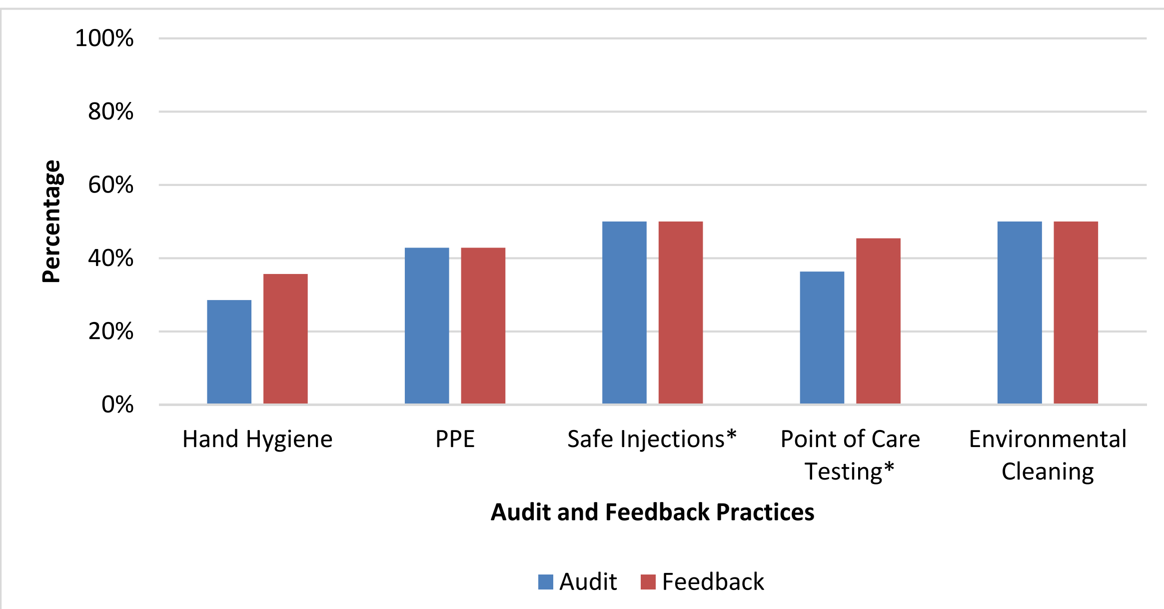


Figure 4. Observations of Hand Hygiene (HH) Practices

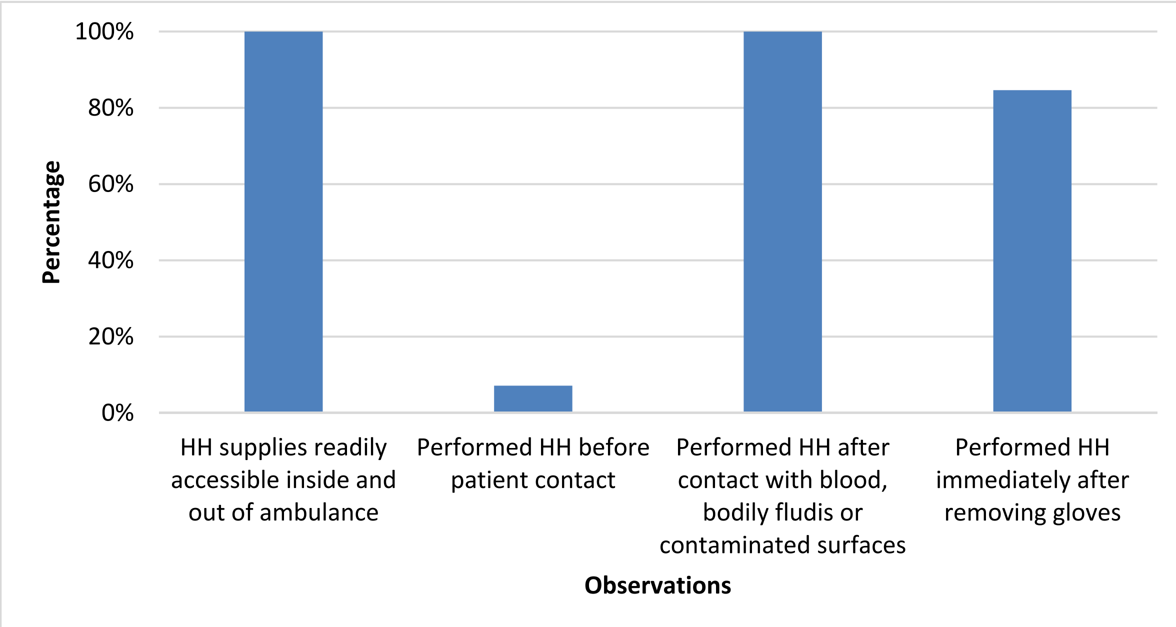
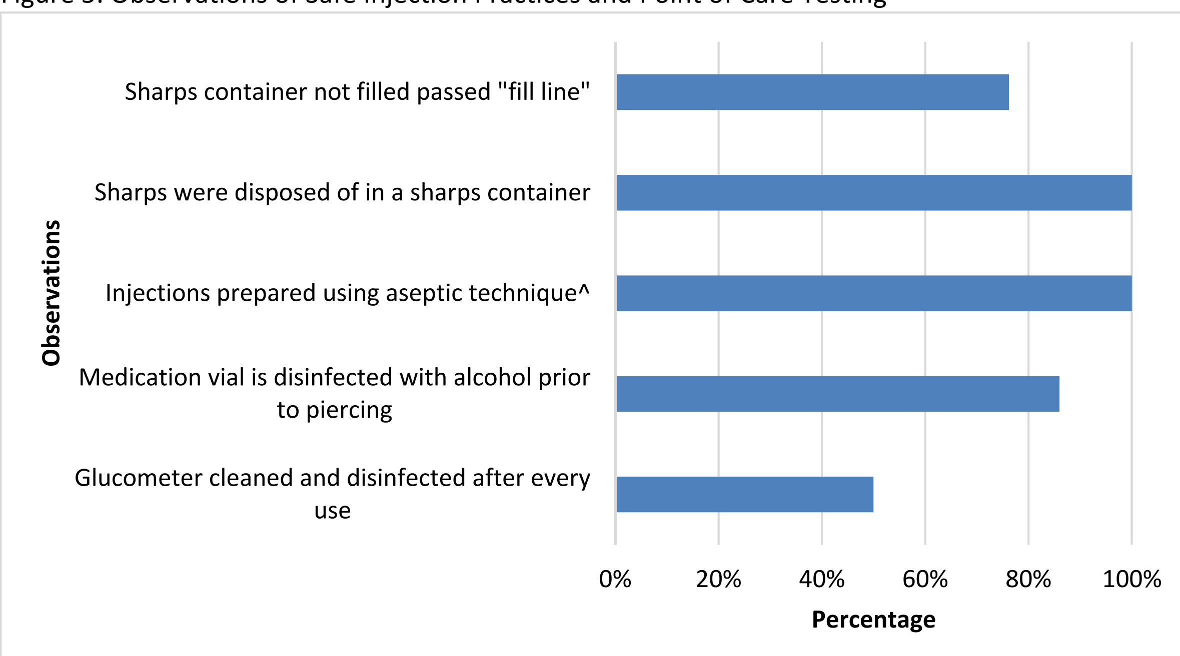


Figure 5. Observations of Safe Injection Practices and Point of Care Testing*



^Aseptic technique is a method used to keep objects and areas free from contamination with microorganisms to minimize the risk to the patient[2]; an example would be a designated medication preparation area.
*Note that some providers did not provide injections or medications (basic life support services only); therefore, they were not included.

DISCUSSION

Overall, findings from the infection control assessments were positive. All but one provider had staff assigned to infection control duties prior to our visit; 79% of whom had a single designated infection control officer. In addition, observed providers were aware and able to state companies' infection control policies such as appropriate contact time for disinfectants/cleaners.

However, while all providers provided infection control policies, direct observations did not always reflect what was written. For example, during policy and procedure review, the exposure control plan for blood borne pathogens stated that all sharps containers shall be closeable and sealable in accordance with OSHA standards to prevent leaks and punctures. However, during observation, several sharps containers did not have a lid or the lid was loose, which could cause potential needle-stick injuries to staff and/or patients. Furthermore, cleaning policies were not always followed during direct observations as a new and clean cloth/wipe was not always used to decontaminate the gurney. In addition, staff stated that glucometers were wiped down after each patient use; however, actions observed varied. Lastly, while the CDC recommends hand hygiene before and after all patient encounters[3], only 7% performed hand hygiene before patient contact, and only two providers included hand hygiene before patient contact in their written policy. To fully support infection control efforts among EMS providers, their leadership should require regular skills demonstration by staff to assess competency. By doing this, as well as regularly observing staff practices, they can improve infection control.

There are some limitations to this overall study and analysis. First, this was a voluntary study with a small sample size. In LAC, there are 38 licensed private providers and 31 public providers. We were only able to assess nine private (24%) and five public (16%) providers. Furthermore, as providers were allowed to say no and others volunteered for the assessment, it is possible that the companies who participated performed better than those who were not assessed. Additionally, it was hard to compare companies as they varied in size and services provided. For example, some of the smaller private ambulance providers only provided Basic Life Support (BLS) services, whereas the larger providers perform both BLS and Advanced Life Support (ALS) services. It is likely that these larger providers have more resources available to them compared to the smaller providers. The types of calls also posed a limitation as care differed for each call for BLS versus ALS response. In addition, the amount of calls varied from zero to five responses, limiting the LAC staff's opportunities for observations. Lastly, for these assessments the staff not only knew they were being observed, their observer was conspicuously shadowing them. Moreover, the providers were made aware ahead of time of the visit, which may have altered their infection control practices and allowed management to pre-select the ambulances that LAC staff observed. Therefore, based on these limitations, it may be hard to generalize our results for all EMS providers across the board.

In the upcoming year, LAC staff will begin conducting follow-up interviews to assess changes following the infection control assessments. Additionally, education and training opportunities are being planned to address the most prevalent gaps. ACDC will develop best practice guidelines and will develop infection control training based on best practices. ACDC in conjunction with LAC EMS will continue to work together with EMS providers to improve infection control policies and practices.

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2016 SYMPOSIUM ON INFECTION PREVENTION CONTROL IN SKILLED NURSING FACILITIES

OVERVIEW

On September 28, 2016, the Los Angeles County Department of Public Health (LAC DPH) Acute Communicable Disease Control (ACDC) program in collaboration with the Association for Professionals in Infection Control and Epidemiology (APIC) Greater Los Angeles Chapter held a symposium for key county skilled nursing facility (SNF) staff responsible for infectious disease outbreak prevention and control. Representatives from SNFs included directors of nursing, administrators, and infection preventionists. Due to the large number of SNFs in LAC, over 315, attendance was limited to two representatives per facility. The goals of the symposium were to improve partnerships between SNFs and LAC DPH as well as to improve prevention and control of infectious diseases in the SNF setting, antimicrobial stewardship programs, and management of multi-drug resistant organisms (MDROs).

SUMMARY

A total of 80 attendees from 57 local SNFs attended the day-long event. In addition, the event included 22 attendees from ACDC, APIC Greater LA Chapter, representatives from several nursing home consulting companies, nursing home corporate consultants, laboratory-serving SNFs, and partnering agencies.

The topics for this event focused primarily on the prevention and control of infectious diseases that are common in SNF settings and greatly impact the vulnerable population cared for in these settings. The presenters were representatives from ACDC and guest speakers from the Diagnostic Laboratory and Radiology, Health Services Advisory Group, University of California Los Angeles (UCLA), and other organizations. The agenda was as follows:

2016 Infection Control & Prevention In Skilled Nursing Facilities Symposium Agenda	
8:00 AM	Registration
8:30 AM	***Welcome and Opening Remarks*** Ben Schwartz, MD – LAC DPH Acute Communicable Disease Control Angela Vassallo, MPH, MS, CIC, FAPIC - Director, Infection Prevention, Providence Saint John's Health Center and President-Elect, CA APIC
9:00 AM	Dawn Terashita, MD, MPH – LAC DPH Acute Communicable Disease Control ***Outbreaks: What Skilled Nursing Facilities Need to Know***
10:00 AM	Break
10:10 AM	Dolly Greene, RN, CIC - Director of Clinical Services, Diagnostic Laboratories and Radiology ***Best Practices in MDRO Management in LTACs***
11:10 AM	Wendy Manuel, MPH – LAC DPH - ***Influenza in Skilled Nursing Facilities*** Karen Cho, RN – LAC DPH - ***Infection Prevention Assessments in SNFs***

12:10 PM	Lunch
12:40 PM	Ravina Kullar, PharmD, MPH - Infectious Diseases Scientific Director, Southern CA/Las Vegas Global Center for Scientific Affairs, Merck Research Laboratories Merck & Co., Inc. ***Antimicrobial Stewardship: Going Beyond the Inpatient Setting to LTACs and SNFs***
1:40 PM	Break
1:50 PM	James A. McKinnell, MD - Assistant Professor of Medicine, David Geffen School of Medicine, UCLA, Los Angeles Biomedical Research Institute at Harbor-UCLA ***Antimicrobial Stewardship in LTACs and SNFs***
2:50 PM	Michael Wasserman, MD, CMD – Executive Director, Care Continuum, Health Services Advisory Group (HSAG) ***CA Nursing Home Quality Care Collaborative and the Reducing C. difficile Project Update***
3:50 PM	Closing remarks

In addition to presentations, each attendee received a folder with the following materials and APIC IP Guide to LTC (Infection Prevention Guide to Long-Term Care Book):

- Los Angeles County List of Reportable Diseases and Conditions
- Antimicrobial Stewardship Guidelines Pocket Card
- CDPH Pneumococcal Vaccine Timing Flow Chart—For Adults
- Los Angeles County Infection Prevention Transfer Form
- Infection Control Assessment Tool for Long-Term Care Facilities (CDC)
- Additional Resource Materials for Infection Prevention and Control
- Listing of Useful Resources and Websites
- Packets with
    - Influenza Outbreak Prevention and Control Guidelines
    - Scabies Prevention and Control Guidelines: Acute and Long-Term Care Facilities
    - Norovirus Outbreak Prevention Toolkit
    - Health Education Materials for Influenza and Scabies
- Antibiotic Stewardship materials – posters, educational brochures, and etc.
    - “Treat True Infections, Not Colonization” Poster (English)
    - “Reassess Antibiotics at 48 Hours” Poster (English)
    - “Cold or Flu. Antibiotics Don’t Work for You.” (English/Spanish)
- Hand Sanitizers

Many of these documents and materials were developed specifically for this event. These materials and an archive of the presentations are available on the ACDC website.[1]

Overall, the symposium was very well received, and the representatives from the SNFs urged LAC DPH to host additional trainings to provide further guidance on other topics including antibiotic resistant infections. ACDC plans to hold another symposium in 2017 as these trainings have become an annual event.

[1] www.publichealth.lacounty.gov/acd/SNF.htm

BOTULISM CASE REPORT SUMMARY
LOS ANGELES COUNTY, 2016

Botulism is a rare but serious and potentially fatal paralytic illness caused by a nerve toxin produced by the bacterium *Clostridium botulinum*. The bacterial spores that cause botulism are common in both soil and water and produce botulinum toxin when exposed to low oxygen levels and certain temperatures. There are five main kinds of botulism: 1) Foodborne botulism can be triggered by eating foods that have been contaminated with botulinum toxin. Common sources of foodborne botulism are homemade foods that have been improperly canned, preserved, or fermented. Though uncommon, store-bought foods also can be contaminated with botulinum toxin; 2) Wound botulism can be triggered by spores of the bacteria getting into a wound and making toxin. People who inject drugs have a greater chance of getting wound botulism. Wound botulism has also occurred in people after a traumatic injury such as a motorcycle accident or surgery; 3) Infant botulism can be triggered by the spores of the bacteria getting into an infant's intestines. The spores grow and produce the toxin, which causes illness; 4) Adult intestinal toxemia (also known as adult intestinal toxemia) botulism is a very rare kind of botulism that can be triggered by spores of the bacteria getting into an adult's intestines, growing, and producing the toxin (similar to infant botulism). Although we do not know why people get this kind of botulism, people who have serious health conditions that affect the gut may be more likely to get sick; 5) Latrogenic botulism could occur if too much botulinum toxin is injected for cosmetic reasons such as for wrinkles or medical reasons such as for migraine headaches or cervical dystonia.

Because botulism infections may be fatal, they are considered medical emergencies, and reporting of suspected cases is mandated by the Los Angeles County Department of Public Health (LAC DPH) immediately by telephone. Specialized antitoxin is used to treat botulism, which can only be released when authorized by LAC DPH or the California Department of Public Health (CDPH). Testing for case confirmation by mouse bioassay can be conducted at the LAC DPH Public Health Laboratory and matrix-assisted laser desorption/ionization-time of flight (MALDI-TOF) is conducted by the Centers for Disease Control and Prevention (CDC). Clinically compatible cases with botulinum toxin detected by either mouse bioassay or MALDI-TOF are considered confirmed cases. The CDPH Division of Communicable Disease Control is responsible for the investigation and surveillance of infant botulism cases identified in the county and across the state. LAC DPH is responsible for reporting suspected cases of infant botulism to CDPH's Infant Botulism Treatment and Prevention Program[1] for their investigation.

The number of confirmed botulism cases (non-infant botulism) in LAC fluctuates from year to year. For the past five years, an average of three cases were confirmed annually. The botulism cases in LAC usually have injection drug use as a risk factor. Foodborne botulism in LAC is rare, in the past 10 years only one instance of foodborne botulism was reported with two associated cases confirmed (2012).

In 2016, seven cases of suspected botulism were reported in LAC. Upon notification and review of case history and symptoms, ACDC physicians authorized the release and use of botulism antitoxin for all seven suspected botulism cases. Ultimately, five were classified as confirmed cases (laboratory-confirmed), and

[1] https://www.cdph.ca.gov/Programs/CID/DCDC/Pages/InfantBotulism.aspx

one was classified as a probable (negative testing with clinically compatible findings and history of injection drug use) botulism case. One suspected case was determined not to be botulism based on absence of risk factors, negative botulism testing, and an alternate diagnosis of atypical Guillain-Barre Syndrome with stool positive for *Camplylobacter*. All six cases (five confirmed, one probable) had wound botulism. Two had infected wounds upon illness presentation, and all six had a history of injection drug use: three used black tar heroin, three used other injection drugs (e.g., heroin/methamphetamine). Laboratory cases were confirmed as follows: one case had botulinum toxin A detected by both mouse bioassay and MALDI-TOF in serum; two cases had negative mouse bioassay testing in serum but were confirmed positive for botulinum toxin A by MALDI-TOF; two cases were confirmed by mouse bioassay for botulinum toxin A by mouse bioassay (MALDI-TOF not performed).

MONITORING THE 2016 LOS ANGELES COUNTY SAND FIRE WITH MULTIPLE EARLY DETECTION SYSTEMS

INTRODUCTION

On July 22, 2016, the Sand Fire began burning in the Santa Clarita Valley of Los Angeles County (LAC), CA. This urban-adjacent wildfire breached the city limits of Santa Clarita (population 180,000). Fueled by record heat and an ongoing exceptional drought, the Sand Fire burned over 40,000 acres in 13 days [**1**] and caused a large increase in the air concentration of fine particulate matter [**2**].

The syndromic surveillance team was tasked with reporting possible health effects from the fire. Fire, asthma, and heat-related data were monitored until the fire was reported as 98% contained. The team prepared and distributed a daily special summary report to key stakeholders in the LAC Department of Public Health (DPH).

OBJECTIVE

To detect increases in health complaints resulting from the July 2016 Sand Fire near Santa Clarita, CA using syndromic surveillance and complementary systems.

METHODS

The data sources utilized were: 1) Emergency Department (ED) visits, 2) Volume from 19 Reddinet hospitals (Hospital admissions, ED visits, ICU admissions, and ED deaths), 3) Local temperatures from the Weather Underground website, 4) Air quality for the Santa Clarita Valley from the South Coast Air Quality Management District (AQMD), 5) Over-the-counter medication sales, and 6) Nurse call hotline.

Emergency department (ED) data were queried for cases related to fire, asthma, cardiac events, eye irritation, heat, and total volume. Queries were conducted on all participating syndromic EDs in LAC and also restricted to nine EDs closest to the fire. The resulting line lists were reviewed daily to rule out visits that were unrelated to the Sand Fire. The fire query was refined periodically with additional exclusion terms.

Chief complaint, diagnosis, and triage note fields were searched separately for the following groups of terms:

Wildfire: *smoke inhalation, fire,* and '*sand fire'*

Asthma: *asthma, COPD, shortness of breath,* and *difficulty breathing*

Heat: *heat exposure, heat stroke, heat rash, sun stroke, overheat, hyperthermia, feel hot,* and *hot radiation*

RESULTS

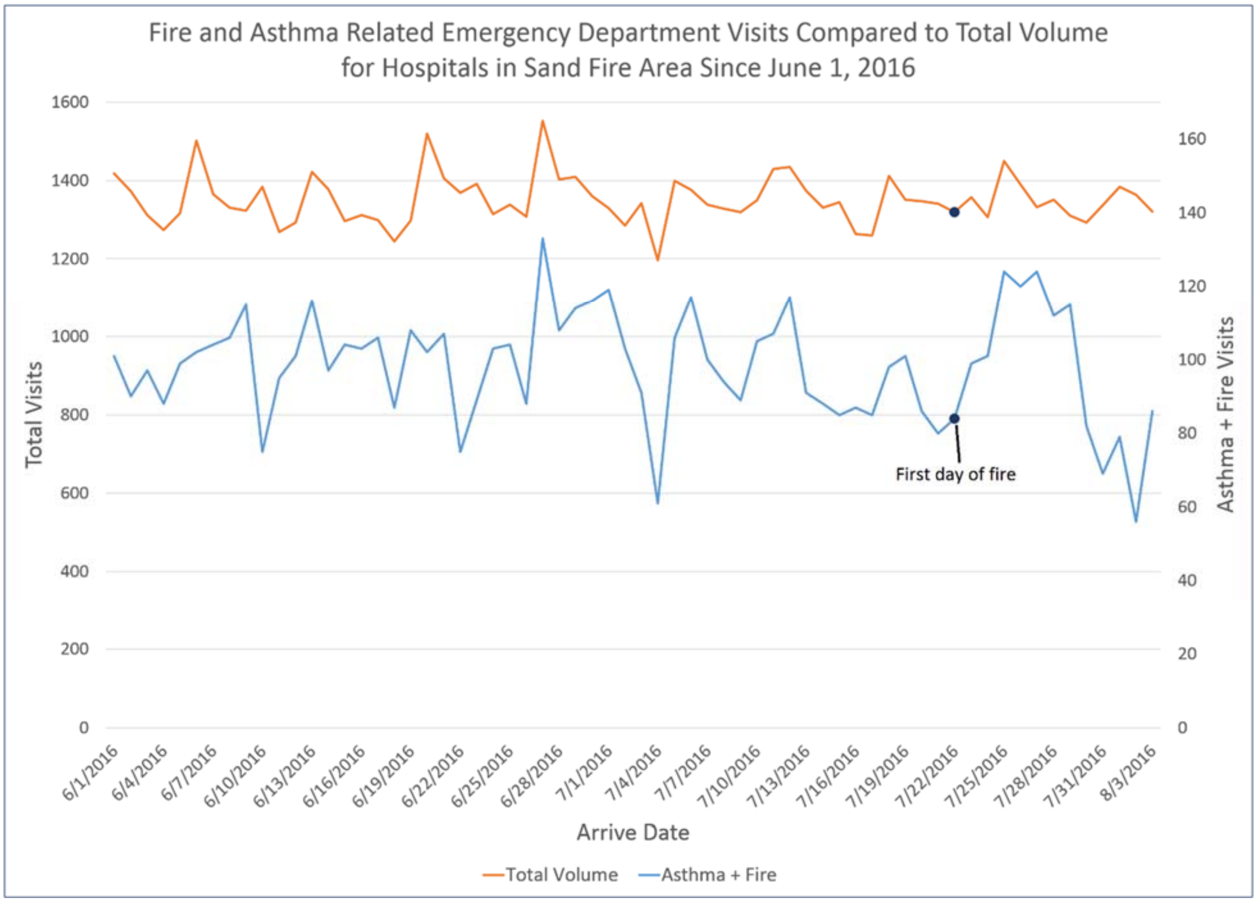
There were 48 syndromic ED patient records with direct mention of the fire in LAC's syndromic hospitals in 13 days. Of these, 22 were asthma cases, and 32 came from the nine hospitals in the Sand Fire region; 32 were identified from the chief complaint, six by diagnosis, and ten by triage note.

Despite an increase in fire-related visits, overall trends in ED data were not affected (Figure 1). No increase was found for cardiac events, eye irritation, heat-related illness or total volume. Asthma visits increased at the time of the fire, which correlates with a sharp increase in the concentration of fine particulate matter in the Santa Clarita Valley following the start of the fire [**2**].

The trend in asthma visits increased around the time of the fire (Figure 1) but had been high earlier in the summer as well, which may be partially attributable to the fact that LAC was experiencing an overall decline in air quality during the summer [**3**].

No increases in calls to a nurse hotline or over-the-counter medication sales were observed. Among Reddinet hospitals, admissions increased slightly, but ED visits remained unchanged.

Figure 1. Trend Graph of Syndromic Data for Hospitals in the Sand Fire Area



DISCUSSION

ED volume alone was not enough to estimate the subsequent health effects on residents of LAC; instead, a specific query was needed. Distinguishing between asthma increases from air pollution and those exacerbated by wildfire smoke in a region where air quality is already compromised is challenging. Residents may have heeded warnings about air quality during active fires, thus reducing their outdoor exposure. Most cases were identified using chief complaints. However, additional data fields such as triage notes available from some hospitals improved the ability to elicit fire-related visits. Syndromic surveillance and complementary systems continue to be the primary tools for near real-time assessments in LAC.

REFERENCES

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3. Barboza T. SoCal hit with worst smog in years as hot, stagnant weather brings surge in hospital visits. Los Angeles Times [Internet]. 2016 Aug 11 [cited 2016 Aug 19]; L.A. Now. Available from: http://www.latimes.com/local/lanow/la-me-ln-summer-smog-20160805-snap-story.html.