642. Improving Patient and Employee Safety through Implementation of an Infection Risk Screening Process for International Patients at Boston Children’s Hospital—The “AIRSHIP” Protocol
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Session: 73. Outbreaks and Public Health Across the Globe
Thursday, October 5, 2017: 12:30 PM
Background. Vaccine-preventable diseases and multi-drug-resistant organisms (MDROs) are common outside of the US, and multiple infectious outbreaks have been linked to travelers. Boston Children’s Hospital cared for 2796 international patients in 2016 but lacked an infection risk screening process for these patients, placing patients and staff at risk. We developed the Assessing Infection Risks for Safe Healthcare of International Patients (AIRSHIP) protocol to identify risks to guide infection prevention and control (IPC) measures.

Methods. A multidisciplinary team of IPC, infectious diseases, and International Health Services (IHS) experts assessed current IHS intake procedures and stakeholder engagement. We then developed AIRSHIP, devising standardized processes and forms and to (1) assess underimmunization, MDRO and tuberculosis history, recent exposures, and current symptoms and (2) triage cases for catch-up immunization, urgent health-care evaluation, and/or IPC intervention (Figure 1). We piloted incorporation of AIRSHIP into existing intake procedures. We tracked process, outcome, and balancing measures to evaluate feasibility, effectiveness, and acceptability to families (Figure 2) and made iterative improvements through Plan-Do-Study-Act (PDSA) cycles.

Results. For our first 13 cases, we completed pre-arrival family and referring provider interviews in 5 cases and on-arrival family interviews in 8 cases (in no cases were both pre-arrival and on-arrival interviews feasible). We were able to assign a risk category in all cases, identifying 5 patients hospital, Boston, MA; 4 Harvard School of Public Health, Boston, MA

Session: 73. Outbreaks and Public Health Across the Globe
Thursday, October 5, 2017: 12:30 PM

Background. The national opioid epidemic has been accompanied by precipitous increases in overdose deaths and hospitalizations for infectious complications of injection drug use (IDU). Despite this, there is scant literature addressing the topic. We aimed to describe demographic characteristics, type of infection, healthcare utilization, disposition and outcomes among patients hospitalized for IDU-related infection over a multi-year period at a large tertiary care referral center in Boston, MA.

Methods. We conducted a retrospective chart review of patients hospitalized for IDU-related infection from 1/1/2012-9/30/2015. 901 charts were initially identified using administrative codes; 234 met the following inclusion criteria: 1) hospitalization within the study period for treatment of ≥1 of 6 selected infections and 2) IDU within 6-months preceding qualifying hospitalization. During the study period, 234 patients had 488 cumulative admissions. Admissions for IDU-related infection and ≤30-day readmission, all-cause, underwent detailed abstraction (N = 338, 69%).

Results. Of 234 patients, 142 were male (57%; N = 134), 78% white (N = 183), 17% homeless (N = 37), 88% had public insurance (N = 210); 53% had a history of Hepatitis C infection (N = 124), most with untreated or unknown infection status (86%; N = 107). Average age was 38 (range 18-75). Fifty-eight percent (N = 136) of patients had one admission during the study period, the remainder had 2-13 admissions (mean = 3.6). Sentinel admission infection types were 1) skin and soft tissue (SSTI) N = 111 (42%), 2) endocarditis N = 70 (30%), 3) bone and joint N = 26 (10%), 4) pyogenic spinal N = 39 (15%), 5) isolated bacteremia N = 9 (3%) and acute viral hepatitis N = 8. Of 338 admissions, 57% (N = 192) included infectious disease evaluation; 50% resulted in discharge to another facility and 82% (excluding isolated SSTI) required multi-week intravenous antibiotics on discharge. By 15-months following the study period, 12% were deceased (N = 28); 5 died during hospitalization.

Conclusion. Our study describes the characteristics of patients hospitalized with IDU-related infection over a multi-year period in a region highly impacted by the opioid epidemic. High rates of hospital readmission, prolonged antibiotic therapy and out-of-hospital death were common in this young cohort.

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644. A Cloud Based Epidemiology Network to Investigate Geographical Dynamics of Respiratory Disease
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Background. Over 6,000,000 individual pathogen assays from 19 clinical sites were exported data from FilmArray® Respiratory Panel (RP) tests, to investigate geographic patterns of 20 common pathogens.

Methods. Over 6,000,000 individual pathogen assays from 19 clinical sites were exported to the Trend database from 2013 to present. Trend data were smoothed and normalized to produce the time series of pathogen incidence. A cross-correlation analysis was performed to compare sites to one another and determine offset of pathogen incidence. The results were plotted on a map of the US with visual indicators of correlation strength and directional movement as defined by cross-correlation lag values.

Results. The respiratory pathogens detected by the FilmArray RP test show a diverse set of spatial and temporal behaviors Most striking was the spread of the virus Coronavirus OC43, and Respiratory Syncytial Virus (RSV), with RSV traveling from east coast sites to west coast sites across the US over 20 days. In contrast Parainfluenza virus 3 (PIV3) shows a small cross-correlation lag across all of the Trend sites during the regular summer season, indicating near simultaneous onset of detection nationwide. A localized cluster of PIV3 in the winter of 2016 was observed in the midwest and west, identifying the significance of localized regional trends.

Conclusion. FilmArray Trend shows great promise in deciphering spatiotemporal dynamics of these common respiratory pathogens. This system can identify localized outbreaks and directional movement of pathogens over time. Future work with finer geographic distribution of contributing sites will aide in making conclusions regarding spatial dynamics of all 20 RP pathogens. Other pathogen transmission models may also be explored using this data set.

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645. Mumps Outbreak—Colorado, 2017
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Thursday, October 5, 2017: 12:30 PM

Background. Mumps is a highly contagious viral disease that is spread through contact with respiratory droplets from an infected person. The most common symptoms are parotitis (swelling of the parotid glands) and fever. Mumps can be severe, particularly in young children and adults. Additionally, mumps can lead to serious complications such as meningitis and encephalitis. There were several outbreaks of mumps in Colorado during 2017, which we identified using surveillance data from the Colorado Department of Public Health and Environment. We investigated the epidemiology and public health response to these outbreaks.

Methods. We performed a content analysis of the Colorado Department of Public Health and Environment's Press Releases and News Releases related to mumps outbreaks in Colorado during 2017. We also conducted a review of the literature on mumps outbreaks in other parts of the United States to gain insights into the epidemiology and public health response to mumps outbreaks.

Results. During 2017, there were several outbreaks of mumps in Colorado. These outbreaks were characterized by a concentration of cases in certain age groups (e.g., children and young adults) and a geographic distribution that was influenced by proximity to areas with outbreaks in other states. The outbreaks were managed through a combination of public health interventions, including vaccination campaigns and contact tracing.

Conclusion. Mumps outbreaks in Colorado during 2017 highlight the importance of ongoing surveillance and rapid response to mumps outbreaks. Public health officials in Colorado and other states can use the findings from these outbreaks to improve their strategies for managing mumps outbreaks in the future.

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Session: 73. Outbreaks and Public Health Across the Globe
Thursday, October 5, 2017: 12:30 PM

Background. During 2016, an unusually high number (>5,000) of mumps cases were reported in the United States. On January 20, 2017, we identified a mumps outbreak in the Denver metropolitan area among a Marshallese community. We performed active surveillance to assess outbreak magnitude and guide implementation of control measures.

Methods. On January 22, local and state health departments initiated active case surveillance by using a church-based community roster. Each household was contacted by telephone ≥3 times to identify mumps cases, according to the 2012 CDC/Council of State and Territorial Epidemiologists case definition, and risk factors (e.g., household size). Measles, mumps, and rubella (MMR) vaccination status was reviewed in the Colorado Immunization Information System (CIIS). Four church-based vaccination clinics were held to bring participants up-to-date for MMR vaccination. Targeted messaging about mumps, MMR vaccine, and vaccination clinics was distributed through social media, churches, and Marshallese-language radio.

Results. Of the 21 households on the church roster, 17 were successfully contacted, 13 of which (76%) provided data for 85 persons (median household size: 6 persons; range: 5–12). Through household interviews and laboratory reporting, we identified 47 confirmed cases (17 confirmed MMR unvaccinated), 9 probable cases, and 30 cases (range: 3 months–44 years), 24 (51%) were male, and 34 (88%) had no prior MMR vaccine documentation. Active surveillance, facilitated through culturally appropriate communication with church leaders, helped identify cases, disseminate materials, and promote MMR vaccination. Household interviews provided timely data to define outbreak magnitude and need for urgent MMR vaccination.

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646. Use of Unannounced “Mystery Patient Drills” to Assess Hospital Emergency Department Preparedness for Communicable Diseases of Public Health Concern in New York City, 2016
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Session: 73. Outbreaks and Public Health Across the Globe
Thursday, October 5, 2017: 12:30 PM

Background. Recent infectious disease epidemics have highlighted the importance of rapid recognition and isolation of patients with severe infectious diseases. In response, the New York City Department of Health and Mental Hygiene carried out a series of unannounced “Mystery Patient Drills” to assess Emergency Departments (EDs) ability to identify and safely respond to patients with communicable diseases of public health concern.

Methods. All 911-receiving hospitals participating in the NYC Hospital Preparedness Program were recruited to participate. Scenarios utilized an actor presenting to an ED describing symptoms and history consistent with measles or MERS-CoV. An exercise evaluation guide captured performance measures to analyze 1) compliance with key infection control measures; 2) association between screening interventions (e.g., travel history) and implementation of infection control measures; 3) times from patient entry to triage, donning a mask, and placement into isolation. Post-drill report narratives were reviewed to identify additional strengths and challenges.

Results. Among 50 eligible hospitals, 49 participated in 2 drills (N = 98) during December 2015–May 2016. Three pilot drills were excluded from the analysis. The patient was masked and isolated in 78% of drills; 61% of hospitals completed this process in both drills. Masking and isolation was observed in a higher proportion of drills when travel history was obtained, compared with drills when travel history was not obtained (88% vs. 21%; P < 0.0001). The median time from patient entry to masking was 1 minute and 9 minutes to placement into isolation. Overall, 36% of staff practiced hand hygiene and 77% entered the isolation room wearing Personal Protective Equipment. Identified best practices include the use of triage questionnaires to identify high risk patients and algorithms to guide masking and isolation procedures.

Conclusion. ED staff’s ability to identify potentially infectious patients and implement recommended control measures varied. Drill findings were used to inform hospital improvement planning and will guide citywide efforts to improve healthcare system readiness for communicable diseases through addressing identified gaps and supporting implementation of best practice recommendations.

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647. Transmission Dynamics of Respiratory Viruses in a Congregated Military Population: Prospective Cohort Study
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Session: 73. Outbreaks and Public Health Across the Globe
Thursday, October 5, 2017: 12:30 PM

Background. Human coronaviruses (HCoVs), rhinoviruses, and non-polio enteroviruses (NPEVs) are leading causes of seasonal acute respiratory infections among children and adults, posing significant health and economic burden annually. Despite this, little is known about their epidemiological dynamics, including the role of asymptomatic shedding in transmission; the durations of virus incubation and shedding; and the effect of immune responses on risk for re-infection during the same season. We studied respiratory virus shedding in military recruits, and used mathematical models to measure pathogen-specific transmission rates and durations of incubation, shedding, and immune protection.

Methods. We tested for shedding of HCoVs, rhinoviruses, and NPEVs in nasal samples collected from 78 military recruits entering basic training and then at staggered, biweekly visits over 65 days during winter 2017. We developed a continu-ous-time Markov chain model for virus acquisition and clearance, and used Bayesian methods to estimate model parameters for each of HCoV-229E, HCoV-OC43, rhinoviruses, and NPEVs.

Results. We observed widespread transmission of HCoV-229E, rhinoviruses, and NPEVs within the first week after entry into basic training, and a subsequent phase of transmission predominantly involving HCoV-OC43 during the second month (Figure). An estimated pre-epidemic reproductive numbers ranging from 1.97 (95% credible interval: 1.49, 2.60) for HCoV-OC43 to 5.69 (3.92, 7.98) for HCoV-229E (Table). Subjects re-acquired HCoV-229E, rhinoviruses, and NPEVs despite previous exposure; for these pathogens, we estimated reversion to pre-infection susceptibility to occur, on average, 28.5 (15.8, 49.7) days, 52.2 (22.3, 151.1), and 144.7 (61.3, 812.5) days, respectively, following clearance of viral shedding.

Conclusion. Asymptomatic shedding is a source of transmission of common respiratory viruses in the close-contact basic training environment. Protection against re-acquisition is short-lived, and may be inadequate to prevent re-infection by rhinoviruses and NPEVs within a season. Estimated durations of shedding and incubation periods provide a basis for modeling pathway spread and informing isolation protocols.

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