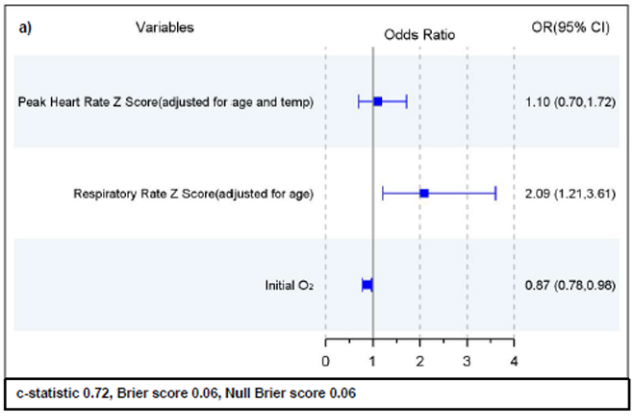
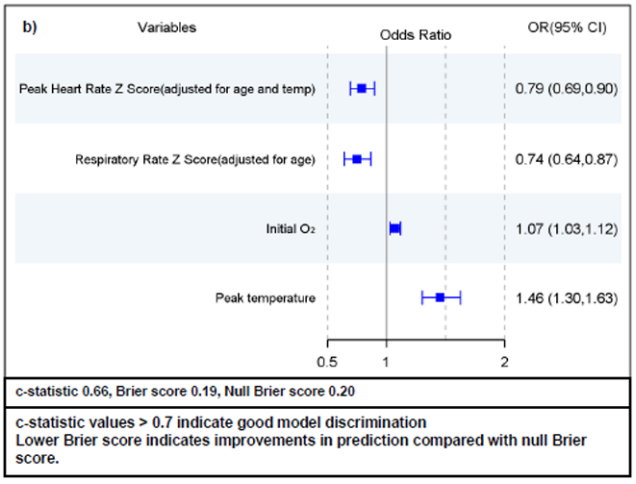
1.46, 95% CI 1.30–1.63, $P < 0.0001$), lower adjusted peak heart rate (OR 0.79, 95% CI 0.69–0.90, $P = 0.0005$), higher initial oxygen saturation (OR 1.07, 95% CI 1.03–1.12 $P = 0.002$) and lower adjusted respiratory rate (OR 0.74, 95% CI 0.64–0.87, $P = 0.0002$) were significant predictors for having PCR-confirmed influenza. However, this model had poor calibration and discriminatory ability.

***Conclusion.*** Higher respiratory rate adjusted for age and lower initial oxygen saturation were significant predictors of hospitalization among young children with PCR-confirmed influenza, but were not reliable discriminators of having influenza infection.

**Figure 1 - Predictive value of vital sign data and a) having PCR-confirmed influenza infection and b) hospitalization with PCR-confirmed influenza infection**




***Disclosures.*** **All authors:** No reported disclosures.

### 2320. The Role of Ultraviolet Light, Atmospheric Ozone, and Humidity in Influenza Activity

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**Session:** 247. Clinical Virology/Viral Epidemiology
*Saturday, October 5, 2019: 12:15 PM*

***Background.*** The interaction between influenza activity and environemental factor such as ultraviolet light index (UVI), atmospheric ozone (AO), and other related meteorological variables remains poorly understood. In the midst of climate change and increasingly poor performance of influenza vaccination, more information on influenza activity and its interaction with meteorological variables is critically needed.

***Methods.*** Influenza A and B tests results by PCR from respiratory sources were collected from two large hospitals in Phoenix, AZ and Jacksonville, FL from January 1, 2014 to December 31, 2017. Publicly available meteorological data for each location was obtained from the National Oceanic and Atmospheric Administration. We excluded cases residing beyond 0.5° of longitude and latitude radius of the given meteorological data. A weekly index activity and maximum weekly values of meteorological variables were matched, and performed a correlation and regression analysis.

***Results.*** A total of 5,238 influenza tests were performed during the study period. The influenza index showed an statistically significant weakly positive correlation with maximum CSUVI ($r = 0.14$; $P = 0.0227$) and mean zenith ($r = 0.17$; $P = 0.0047$). An statistically significant, positive correlation was observed between influenza index and atmospheric ozone ($r = 0.23$; $P = 0.0001$). Significant negative correlations were also observed with DBT, DPT, RH and HI ($r = -0.27$, $r = -0.39$, $r = -0.13$, $r = -0.33$, respectively; $P < 0.04$). The influenza index showed significant interactions in a univariate linear regression (Table 1). A relationship between influenza index and dew point temperature was observed in a multivariate model (OR = 0.66; CI95% 0.44–0.97).

***Conclusion.*** To the best of our knowledge, this is the first report showing a significant interactions between influenza index, UVI and atmospheric ozone in two geographically distant locations. Further studies are needed to define the role of complex climatological patterns and influenza.

**Table 1. Univariate linear regression of weekly influenza index and maximum weekly meteorological variables.**

| Variables | OR | CI95% | | | p-value |
|---|---|---|---|---|---|
| Mean Zenith | 1.18 | 1.05 | to | 1.32 | 0.0047 |
| Clear sky UVI | 2.12 | 1.11 | to | 4.03 | 0.0227 |
| Cloudy sky UVI | 0.78 | 0.40 | to | 1.52 | 0.4636 |
| Cloud transmission | 0.30 | 0.06 | to | 1.61 | 0.1605 |
| Aerosol transmission | 1.07 | 0.31 | to | 3.70 | 0.9112 |
| Atmospheric ozone | 1.11 | 1.05 | to | 1.17 | 0.0001 |
| Hourly dry bulb temperature | 0.72 | 0.62 | to | 0.82 | <0.0001 |
| Dew point temperature | 0.64 | 0.56 | to | 0.73 | <0.0001 |
| Relative humidity | 0.91 | 0.84 | to | 0.99 | 0.0362 |
| Heat Index | 0.67 | 0.58 | to | 0.77 | <0.0001 |

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### 2321. FluMex: A New Clinical Severity Index in Mexican Hospitalized Patients with Influenza

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**Session:** 247. Clinical Virology/Viral Epidemiology
*Saturday, October 5, 2019: 12:15 PM*

***Background.*** Influenza virus infection is frequently characterized by a complex clinical behavior and outcomes can be fatal. There are many published scoring methods aimed for pulmonary infections and sepsis severity nevertheless they lack adequate sensitivity and specificity in patients with Influenza.

***Methods.*** From 2013 to 2018, hospitalized patients from five hospitals from the Christus Muguerza health group from Monterrey, Mexico who had a positive rapid influenza-test and/or positive PCR for Influenza virus were enrolled. Risk factors for severity and mortality were evaluated calculating odds ratio with a binary logistic regression model and were adjusted for other factors. The new index was then compared with pneumonia severity scores by assessing area under the curve(AUC), sensitivity and specificity.

***Results.*** We analyzed data from 125 patients hospitalized with confirmed Influenza infection. Less than 1% had received the corresponding seasonal influenza vaccine. Type 2 diabetes (T2D) and hypertension (HT) were the most prevalent comorbidities. Odds ratios were significant for age > 65 years, body mass index (BMI) > 30, T2D, HT, pulsoximetry < 90%, respiratory rate > 22 per minute, altered mental status, blood urea nitrogen (BUN) > 19 mg/dL, elevated lactate dehydrogenase (LDH), and an abnormal chest X-ray. The FluMex score was applied to a control group of 125 admitted patients with confirmed Influenza infection. AUC was 0.63 (CI 95%, 0.52–0.74; $P < 0.05$) for severity and 0.90 (IC 95%, 0.83–0.97; $P < 0.05$) for mortality, showing better predictive performance than other pneumonia and sepsis scores such as CURB-65, PSI, CROMI, SIRS, SOFA, qSOFA and ILI (Table 1).

***Conclusion.*** The FluMex scoring system can be a useful tool for patients with suspected Influenza infection in predicting severity and mortality, helping to improve care and resource management.

**Table 1. Predictive performance of pneumonia and sepsis scores for severity and mortality in Influenza**

| Severity Score | Sensitivity | Specificity | PPV | NPV | Accuracy | AUC | p value | CI 95% |
|---|---|---|---|---|---|---|---|---|
| FluMex | 40.4 (25.6-56.7) | 86.7 (77.5-93.1) | 60.7 (44.3-74.9) | 74.2 (68.8-78.9) | 71.2 (62.4-78.9) | 0.63 | 0.01 | 0.52-0.74 |
| CURB-65 | 11.9 (3.9-25.6) | 97.5 (91.5-99.7) | 71.4 (33.6-92.5) | 68.6 (66.0-71.0) | 68.8 (59.9-76.7) | 0.55 | 0.38 | 0.43-0.66 |
| PSI | 9.5 (2.6-22.6) | 100 (95.6-100) | 100 | 68.6 (66.4-70.6) | 69.6 (60.7-77.5) | 0.45 | 0.38 | 0.34-0.56 |
| CROMI | 46.3 (30.6-62.5) | 51.2 (39.9-62.4) | 32.2 (24.2-41.4) | 65.6 (57.2-73.1) | 49.5 (40.4-58.7) | 0.49 | 0.83 | 0.38-0.60 |
| SIRS | 71.4 (55.4-84.2) | 39.5 (28.8-50.9) | 37.9 (32.0-44.2) | 72.7 (60.6-82.2) | 50.4 (41.2-59.5) | 0.55 | 0.39 | 0.44-0.65 |
| qSOFA | 14.2 (5.4-28.5) | 91.5 (83.3-96.5) | 46.1 (23.5-70.5) | 67.8 (64.7-70.8) | 65.6 (56.5-73.8) | 0.53 | 0.60 | 0.42-0.64 |
| SOFA | 43.9 (28.4-60.2) | 57.8 (46.4-68.6) | 33.9 (25.1-44.1) | 67.6 (60.0-74.3) | 53.2 (44.0-62.2) | 0.51 | 0.81 | 0.40-0.62 |
| ILI | 18.9 (10.7-29.7) | 55.1 (40.2-69.3) | 38.8 (26.5-52.8) | 31.0 (25.4-37.2) | 33.3 (25.0-42.4) | 0.53 | 0.57 | 0.42-0.64 |
| **Mortality Score** | **Sensitivity** | **Specificity** | **PPV** | **NPV** | **Accuracy** | **AUC** | **p value** | **CI 95%** |
| FluMex | 100 (39.7-100) | 80.1 (71.9-96.9) | 14.2 (10.4-19.2) | 100 | 80.8 (72.7-87.2) | 0.90 | 0.006 | 0.83-0.97 |
| CURB-65 | 75 (19.4-99.3) | 96.6 (91.7-99.1) | 42.8 (19.7-69.6) | 99.1 (95.5-99.8) | 96 (90.9-98.6) | 0.86 | 0.01 | 0.60-1.00 |
| PSI | 50 (6.7-93.2) | 98.3 (94.1-99.8) | 50 (15.6-84.4) | 98.3 (95.7-99.3) | 96.8 (92-99.1) | 0.30 | 0.10 | 0.00-0.56 |
| CROMI | 50 (6.7-93.2) | 52.1 (42.7-61.3) | 3.3 (1.2-8.6) | 96.8 (91.9-98.8) | 52.0 (42.8-61.1) | 0.51 | 0.94 | 0.22-0.80 |
| SIRS | 100 (39.7-100) | 36.9 (28.3-46.3) | 5.0 (4.4-5.7) | 100 | 39.0 (30.3-48.2) | 0.68 | 0.21 | 0.49-0.87 |
| qSOFA | 50 (6.7-93.2) | 90.9 (84.3-95.3) | 15.3 (5.5-36.0) | 98.2 (95.3-99.3) | 89.6 (82.8-94.3) | 0.70 | 0.17 | 0.39-1.00 |
| SOFA | 0 (0-60.2) | 55.8 (46.4-64.8) | 0 | 94.3 (93.4-95.1) | 54.0 (44.8-63.0) | 0.28 | 0.14 | 0.10-0.45 |
| ILI | 50 (6.7-93.2) | 71.4 (62.4-79.3) | 5.5 (2.0-14.0) | 97.7 (94.0-99.1) | 70.7 (61.8-78.5) | 0.62 | 0.40 | 0.35-0.90 |

AUC: area under the curve; CURB-65: Confusion, Urea, Respiratory rate, Blood pressure, age > 65 years; PSI: pneumonia severity index; CROMI: C: Comorbidities, Respiratory rate, Oxygen saturation, Mental status change, Infiltrates at chest radiograph; CI: confidence interval; ILI: Influenza-Like Illness; NPV: negative predictive value; PPV: positive predictive value; SIRS: Systemic Inflammatory Response Syndrome; qSOFA: quick Sequential Organ Failure Assessment score; SOFA: Sequential Organ Failure Assessment score.

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## 2322. Etiology, Severity of Illness, and Risk Factors for Patients Hospitalized with Acute Gastroenteritis from Multi-Site Veteran's Affairs (VA) Surveillance, 2016–2018: Results from SUPERNOVA

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**Session:** 247. Clinical Virology/Viral Epidemiology
*Saturday, October 5, 2019: 12:15 PM*

***Background.*** The severity of acute gastroenteritis (AGE) in adult populations and the relative contribution of specific pathogens is not well characterized. In 2016, we implemented a multisite AGE surveillance platform in 4 VA hospitals (Atlanta, Bronx, Houston and Los Angeles), collectively serving > 320,000 patients annually.

***Methods.*** Inpatient AGE cases and age- and time-matched non-AGE controls were identified through prospective screening of admissions using standardized case definitions. Stool samples were tested for 22 pathogens using the FilmArray® Gastrointestinal Panel. Medical conditions were analyzed as risk factors for AGE by multivariate logistic regression.

***Results.*** From July 2016 to June 2018, 731 cases and 399 controls were enrolled. Risk factors for AGE cases included HIV-positive status (adjusted odds ratio [aOR] 4.6; 95% confidence interval [CI] 1.6–12.9; $P < 0.01$), severe kidney disease (aOR 4.5; 95% CI 2.0–9.8; $P < 0.01$), and immunosuppressive therapy (aOR 4.0; 95% CI 1.2–13.3]; $P = 0.02$). *Clostridioides difficile* and norovirus were the most commonly detected pathogens in cases (18% and 5%, respectively); detection of these pathogens in cases was significantly higher than detection in controls (8% and 2%, respectively; $P < 0.01$ for both). The median duration of hospital stay was longer for *C. difficile* compared with norovirus cases (5 vs. 3 days; $P < 0.01$), and cases with both pathogens had intensive care unit (ICU) stays (*C. difficile*: 18%; norovirus: 8%; $P = 0.2$). Fourteen deaths occurred among AGE cases; 2 were associated with *C. difficile* and 1 with norovirus; the remainder did not have a clear etiology or pathogen detected. *C. difficile* and norovirus were detected year-round with a fall and winter predominance; *C. difficile* prevalence was highest in October, while norovirus prevalence was six times higher in December than in summer months.

***Conclusion.*** This surveillance platform captured cases of severe AGE, including ICU stays and deaths, among hospitalized US Veterans. *C. difficile* and norovirus were leading pathogens in AGE cases. These findings can help guide appropriate clinical management of AGE patients and inform public health efforts to quantify and address the associated burden of disease through targeted interventions.

***Disclosures.*** **All authors:** No reported disclosures.

## 2323. Clinical Characteristics and Disease Burden of Epstein–Barr Virus and Four β-Herpes Viruses Infections in Children Visiting Emergency Room

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**Session:** 247. Clinical Virology/Viral Epidemiology
*Saturday, October 5, 2019: 12:15 PM*

***Background.*** It is well known that most of infants and young children with primary EBV and CMV infection are inapparent, and primary HHV-6B and HHV-7 infection cause exanthema subitum (ES). However, the precise incidence of apparent infection of these viruses remains unclear. Therefore, we sought to elucidate clinical features and disease burdens of these viral infections in febrile children visiting emergency room (ER).

***Methods.*** Between June 2015 and December 2017, febrile children under 5 years old, who visited ER and received hematological examination, were enrolled in this study. Detection of serum viral DNAs using real-time PCR and measurement of antibody titers in acute-phase serum were carried out. Clinical information was collected from the medical records.

***Results.*** In total of the 905 cases, EBV, CMV, HHV-6B and HHV-7 were detected in 18 cases (2%), 12 cases (1.3%), 104 cases (11.5%) and 23 cases (2.5%), respectively. No HHV-6A DNA was detected. Primary infection rates among EBV, CMV, HHV-6B and HHV-7-infected patients accounted for 44%, 25%, 91% and 57%, respectively. Admission rates of the primary-infected patients were 88% of EBV, 68% of CMV, 66% of HHV-6B and 42% of HHV-7, respectively. Five of the 8 cases (62.5%) of primary EBV-infected patients demonstrated typical clinical course of infectious mononucleosis (IM); however, no IM patient was seen in 9 patients with viral reactivation. No IM case was observed in CMV-infected patients, regardless of primary infection or reactivation. Clinical characteristics were compared between patients with primary HHV-6B and HHV-7 infections because of similarity of clinical features. Average age (1.5 vs. 2.8 years old; $P < 0.001$), duration of fever (4.5 vs. 2.9 days; $P < 0.001$), the highest body temperature (40.2 vs. 39.6°C; $P < 0.001$), and the frequency of typical skin rash (ES) (87% vs. 54%; $P < 0.001$) were statistically different between the two viral infections. The main reason for admission due to primary HHV-6B and HHV-7 infection was complex-type febrile seizure (58.7 vs. 66.7%; $P = 0.705$).

***Conclusion.*** The clinical features and disease burden of the 5 human herpesviruses infections were elucidated in the febrile children visiting ER.

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## 2324. Respiratory Viral Coinfection in a Birth Cohort of Infants in Rural Nepal

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**Session:** 247. Clinical Virology/Viral Epidemiology
*Saturday, October 5, 2019: 12:15 PM*

***Background.*** Acute respiratory illnesses are a leading cause of global morbidity and mortality in children. Coinfection with multiple respiratory viruses is common. Although the effects of each virus have been studied individually, the effects of coinfection on disease severity or healthcare seeking are less well-understood.

***Methods.*** A secondary analysis was performed of a maternal influenza vaccine trial conducted between 2011 and 2014 in rural southern Nepal. Prospective weekly active household-based surveillance of infants was conducted from birth to 180 days of age. Mid-nasal swabs were collected and tested for respiratory syncytial virus (RSV), rhinovirus, influenza, human metapneumovirus (HMPV), coronavirus, parainfluenza (HPIV), and bocavirus by RT–PCR. Coinfection was defined as the presence of two or more respiratory viruses simultaneously detected as part of the same illness episode. Maternal vaccination status, infant age, prematurity, and number of children under 5 in the household were adjusted for with multivariate logistic regression.

***Results.*** Of 1,730 infants with a respiratory illness, 327 (19%) had at least two respiratory viruses detected on their primary illness episode. Coinfection status did not differ by maternal vaccination status, infant age, premature birth, and number of children under 5 in the household. Of 113 infants with influenza, 23 (20%) had coinfection. Of 214 infants with RSV, 87 (41%) had coinfection. Overall, infants with coinfection had increased occurrence of fever lasting 4 or more days overall (OR 1.4, 95% CI: 1.1, 2.0), and in the subset of infants with influenza (OR 5.8, 95% CI: 1.8, 18.7). Coinfection was not associated with seeking further care (OR 1.1, 95% CI: 0.8, 1.5) or pneumonia (OR 1.2, 95% CI: 1.0, 1.6).

***Conclusion.*** A high proportion of infants experiencing their first respiratory illness had multiple viruses detected. Coinfection with influenza was associated with longer duration of fever compared with children with influenza alone, but was not associated with increased illness severity by other measures.

**Figure 1. Frequency of monoinfections and coinfections by viral type among infants who tested positive for a respiratory virus (n=1730). RSV=Respiratory Syncytial Virus, HMPV=Human Metapneumovirus, HPIV=Human Parainfluenza Virus.**