Background: Norovirus can cause chronic infections with serious morbidity and mortality in immunocompromised patients. While there are no FDA-approved medications for these infections, nitazoxanide, ribavirin, and enterally administered pooled immunoglobulin (IVIG) are used off-label on the basis of expert opinion. Nitazoxanide and ribavirin show antiviral activity in a murine norovirus infection model and an *in vitro* replicon model of genotype GI.I human norovirus RNA expression, respectively. However, these drugs have not been evaluated in *in vitro* infections with GII.4 human noroviruses, responsible for most human norovirus disease. We used the stem cell-derived nontransformed human intestinal enteroid (HIE) system, which supports GII.4 human norovirus replication, to evaluate the antiviral activities of nitazoxanide, ribavirin, and IVIG.

Methods: We inoculated HIEs with GII.4 human norovirus in the presence of half-log dilutions of nitazoxanide (3 μM to 100 μM), ribavirin (10 μM to 10 mM), or IVIG (1:100 to 1:3,000) and a media control. One and 48 hours after inoculation, we extracted and quantified GII.4 norovirus RNA from the HIEs. To demonstrate that replication inhibition was not due to cytotoxicity, we performed quantitative lactate dehydrogenase release assays on the HIEs across the therapeutic range of each compound.

Results: Nitazoxanide reduced GII.4 replication at 48 hours in a dose-dependent manner, achieving a >90% reduction in viral replication at 10 μM without cytotoxicity. These findings were confirmed in multiple HIE lines representing different intestinal segments and established from different donors. IVIG completely inhibited GII.4 replication at up to a 1:1,000 dilution and was not cytotoxic at therapeutic concentrations. Ribavirin did not reduce GII.4 replication at concentrations up to 10 mMμM, well in excess of levels achieved in human sera with standard doses.

Conclusion: Nitazoxanide and IVIG, but not ribavirin, potently inhibit GII.4 human norovirus replication in a biologically relevant in vitro model of human norovirus infection. These data highlight the use of HIEs as a new pre-clinical model for developing therapeutics for human norovirus disease.

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

2651. Protection Against Human Cytomegalovirus Acquisition Is Associated with IgG Binding to Cell-Associated CMV glycoprotein B in Two Historical gB/MF59 Vaccine Cohorts

Jennifer A. Jenks, BS[1]; Cody S. Nelson, PhD[1]; Robert F. Pass, MD[2];
David I. Bernstein, MD MA[3]; Hunter K. Roark, BS[4]; Cliburn Chan, PhD[1];
Sallie R. Permar, MD, PhD[1]; [1]Duke University, DURHAM, North Carolina;
[2]University of Alabama Birmingham, Birmingham, Alabama; [3]Cincinnati Children's Hospital Medical Center, University of Cincinnati, Cincinnati, Ohio; [4]Duke Human Vaccine Institute, Durham, North Carolina

Session: 272. Studies of Treatment and Prevention of Viral Disease
Saturday, October 5, 2019: 12:15 PM

Background: Human cytomegalovirus (CMV) is the most common congenital infection worldwide. A CMV glycoprotein B (gB) subunit vaccine with MF59 adjuvant achieved ~50% protection in phase II clinical trials in postpartum and adolescent women. Interestingly, postpartum vaccinees showed poor virus neutralization but robust antibody-dependent cellular phagocytosis (ADCP). In this study, we performed a combined humoral immune correlate of risk analysis in vaccinees to define vaccine-elicited immune responses associated with protection and targets for vaccine candidate immunogenicity.

Methods: gB/MF59 vaccinees who became infected and those who remained uninfected were 2:1 matched on race and number of vaccine doses. This study included 42 women from the adolescent (14 infected, 28 uninfected) and 33 from the postpartum cohorts (11 infected, 22 uninfected). IgG binding to whole gB, gB-neutralizing epitopes, F_CRs, and whole virions were assessed by standard or multiplex ELISA. IgG binding to gB mRNA-transfected HEK293Ts was measured by flow cytometry. Neutralization of Towne, TB40/E, and AD169-repaired-GFP strains were measured in MRC-5, BJ5Ta, and/or ARPE-19 cells. Phagocytosis was assessed by THP-1 uptake of fluorescently conjugated TB40/E and AD169-repaired-GFP virions. Multiple linear regression controlling for cohort was performed for the combined log-transformed group data (apriori significance cut-off of $P < 0.05$, Benjamin–Hochberg FDR < 0.2).

Results: Vaccine-elicited antibodies in adolescent and postpartum cohorts exhibited similar magnitude IgG binding to soluble HCMV gB protein, gB-neutralizing domains, and gB-transfected cells. Autologous Towne strain neutralization was observed in both cohorts, but heterologous strain neutralization was observed only in adolescent vaccinees ($P = 0.001$). Both cohorts exhibited robust phagocytosis of HCMV virions. Regression analyses revealed that risk of HCMV acquisition in vaccinees was associated with magnitude IgG binding to gB-transfected cells ($P = 0.006$, FDR = 0.15), not neutralization or phagocytosis responses.

Conclusion: Protection against primary HCMV infection was significantly associated with vaccine-elicited IgG binding to gB-transfected cells, suggesting the importance of a native, cell-associated gB conformation in future vaccine candidates.

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

2652. Cytomegalovirus Meningoencephalitis: A Comparison to Other Viral CNS Infections

Stephanie Pankow, DO[1]; Nigo Masayuki, MD[1]; Rodrigo Hasbun, MD, MPH[2];
[1]University of Texas at Houston, Houston, Texas; [2]The University of Texas Health Science Center at Houston, Houston, Texas

Session: 272. Studies of Treatment and Prevention of Viral Disease
Saturday, October 5, 2019: 12:15 PM

Background: Cytomegalovirus (CMV) is a rare cause of meningoencephalitis (ME) with clinical data limited to case reports.

Methods: Retrospective observational study of all viral central nervous system (CNS) infections identified in 17 hospitals in the Greater Houston area from 2000 to 2017. CMV, herpes simplex virus (HSV), varicella zoster virus (VZV), and enterovirus were all identified by a positive cerebrospinal fluid (CSF) polymerase chain reaction (PCR) and all arboviruses were identified by serology.

Results: A total of 361 patients with viral CNS infections were identified: CMV ($n = 33$), enterovirus ($n = 147$), herpes simplex virus ($n = 83$), varicella zoster virus ($n = 28$), and arbovirus ($n = 70$). CMV ME occurred more frequently in immunosuppressed patients [e.g., Acquired Immune Deficiency Syndrome (AIDS)], had more hypoglycorrhachia (59%), and had worse clinical outcomes (61%) as compared with those with HSV, enterovirus, VZV and arboviruses. Furthermore, CMV ME had more altered mental status than enterovirus and HSV and had lower CSF pleocytosis compared with HSV. Additionally, CMV ME had higher CSF protein levels than enteroviral infections and had less CSF lymphocytosis than HSV and VZV.

Conclusion: CMV meningoencephalitis is seen more frequently in immunosuppressed patients (e.g., AIDS), is associated with more hypoglycorrhachia and have worse clinical outcomes compared with other viral CNS pathogens.

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

2653. Epidemiology and Risk Factors for Healthcare-Associated Viral Infections in Children

Samantha E. Hanley, BS[1]; Folasade Odeniyi, MPH[1];
Kristen Feemster, MD, MPH MSHP[2]; Susan E. Coffin, MD, MPH[1];
Julia S. Sammons, MD, MSCE[1]; [1]Children's Hospital of Philadelphia, Philadelphia, Pennsylvania; [2]Philadelphia Department of Public Health, Children's Hospital of Philadelphia, Philadelphia, Pennsylvania

Session: 272. Studies of Treatment and Prevention of Viral Disease
Saturday, October 5, 2019: 12:15 PM

Background: Healthcare-associated viral infections (HA-VI) are common in hospitalized children and are increasingly recognized as a cause of preventable harm. Yet, epidemiology and modifiable risk factors related to pediatric HA-VI are currently poorly understood.

Methods: We performed a prospective case–control study to identify the risk factors and outcomes associated with pediatric HA-VI at a quaternary care children's hospital between November 2016 and August 2018. Prospective surveillance for HA-VI was performed hospital-wide by certified infection preventionists using NHSN definitions. Cases were matched 1:1 to controls by age, duration of hospitalization, and hospital unit. We abstracted data from the electronic medical record and conducted semi-structured interviews with patient caregivers to identify potential exposures beginning 4 days prior to HA-VI identification date. We also measured length of antibacterial therapy (LOT) in the 7 days following enrollment.

Results: During the study period, we identified 143 eligible patients with HA-VI and enrolled 64 matched case–control pairs. In total, 79 viruses were identified among 64 case patients, of which 53 (67.1%) were respiratory viruses and 26 (32.9%) were GI. Case patients were more frequently exposed to a sick visitor, specifically either caregiver or sibling, compared with controls (18.8% vs. 9.4%; $P = 0.20$, Fisher exact test). During the exposure period, case patients also had a significantly higher number of hospital procedures performed when compared with controls ($n = 320$ vs. 232; $X^2 = 58.43$, $P < 0.001$). Case, when compared with control, patients had a greater average LOT (2.89 vs. 1.08).

Conclusion: Results of study show that exposure to a sick visitor is a potentially modifiable risk factor for pediatric HA-VI. In addition, hospitalized children with HA-VI have increased exposure to antibacterial antibiotics when compared with matched controls. Prevention of pediatric HA-VI may have implications for antibiotic stewardship. Our findings suggest that hospital policies may need to be revised, with emphasis on visitor screening and partnership with families, to reduce the incidence of pediatric HA-VI during hospitalization.

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

2654. Myocarditis in Dengue: A Prospective Observational Study

Manish Soneja, MD Medicine; Manasvini Bhatt, MBBS;
Faraz A Farooqui, MD Medicine; Naval K Vikram, MD Medicine;
Ashutosh Biswas, MD Medicine; Ambuj Roy, MD Medicine, DM Cardiology;
Naveet Wig, MD Medicine; All India Institute of Medical Sciences, New Delhi, India

Session: 272. Studies of Treatment and Prevention of Viral Disease
Saturday, October 5, 2019: 12:15 PM

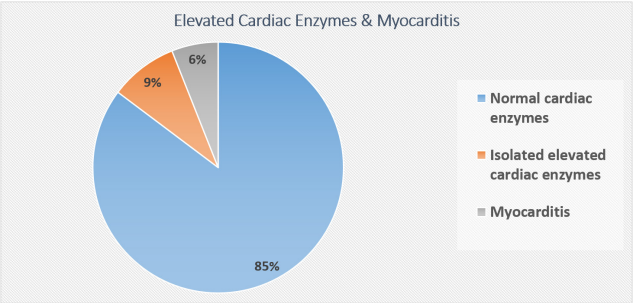
Background: Cardiac involvement in dengue fever is underdiagnosed due to low index of suspicion and overlapping clinical manifestations of capillary leak associated with dengue. The frequency of subclinical dengue myocarditis and its relative contribution to the hemodynamic instability in severe dengue needs to be explored. We studied the prevalence of myocarditis and clinical outcomes among admitted patients with dengue.

Methods: A prospective observational study was carried out in admitted patients with age between 18 and 65 years having confirmed dengue (NS1/IgM ELISA). Patients with electrolyte abnormalities or on medications affecting heat rhythm/ rate,

pre-existing heart disease were excluded. The baseline demographic, clinical and laboratory parameters were collected. A baseline ECG was done and repeated every second day. Trop-I and NT-proBNP were done at baseline and repeated only if elevated at baseline or there were ECG changes. The cardiac enzymes were measured using enzyme-linked fluorescent assay (VIDAS, bioMérieux, France). Patients with elevated enzymes underwent 2-dimensional echocardiography. Diagnosis of myocarditis was as per ESC 2013 criteria. Fluid management was as per WHO guidelines (2009).

Results: A total of 183 patients were recruited with median age of 29 years (IQR 21, 37) and 31% were females. Dengue with warning signs was present in 80 (44%) and severe dengue in 45 (25%) patients. Cardiac enzymes were elevated in 27 (15%) patients (cTnI in 25, NT-proBNP in 22). Among these 27 patients, 11 [6% (2.6–9.4, 95% CI)] had echo evidence and diagnosed as having myocarditis according to ESC 2013 criteria (Figure 1). Clinical features of fluid overload were more common in myocarditis group [8 (73%) vs 4 (2%), P = Overall, 5 (2.7%) patients expired, all of them had myocarditis (5/11 = 45%). These patients had severe dengue, 2 patients developed hospital-acquired pneumonia and 1 had malaria co-infection. Among patients with raised enzymes and normal echo (n = 16), 3 patients developed clinical signs of fluid overload compared with only 1 out of 156 patients without raised enzymes (P < 0.01).

Conclusion: Myocarditis in admitted patients with dengue is not uncommon [6% (2.6–9.4, 95% CI)] and may lead to a complicated disease course.



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

2655. A Prospective Study of Cytomegalovirus Infection in Active Systemic Lupus Erythematosus Patients with Intense Immunosuppressive Therapy: Epidemiology, Associated Risk Factors, Pathogenesis, and Clinical Outcomes

Asalaysa Bushyakanist, MD[1]; Porpon Rotjanapan, MD[2]; Pintip Ngamjanyaporn, MD[2]; Tanitta Suangtamai, MS[2]; Jackrapong Bruminhent, MD[2]; Prapaporn Pisitkun, MD[2]; [1]Faculty of Medicine Ramathibodi Hospital, Bangkok, Krung Thep, Thailand; [2]Faculty of Medicine Ramathibodi Hospital, Mahidol University, Bangkok, Krung Thep, Thailand

Session: 272. Studies of Treatment and Prevention of Viral Disease
Saturday, October 5, 2019: 12:15 PM

Background: Systemic lupus erythematosus (SLE) patients with intense immunosuppressive therapy (IT) are at higher risk for cytomegalovirus (CMV) reactivation and may develop the end-organ disease. However, the real epidemiology, associated risk factors, pathogenesis, and clinical outcomes have not been fully elucidated.

Objectives: To investigate the associated risk factors, possible predictors in the aspect of immunology of CMV infection and to study epidemiology, and clinical outcomes prospectively in active SLE patients within 3 months after intense IT.

Methods: A prospective cohort study of active SLE patients required intense IT from November 2017 to March 2019 was conducted. We collected patients' demographics, potential risk factors, onset and presentations of CMV infection after intense IT, data on IT, cytokine panels, and flow cytometry at weeks 0, 2, 4, 8, and 12 after enrollment. Intense IT was defined as an induction therapy of active SLE disease with either the National Institute of Health or Euro-Lupus Nephritis Trial protocol regimens.

Results: A total of 24 patients have enrolled with a median age of 32 years old and 22/24 patients were female. Renal involvement was the most common and found in 79.2% of the patients. Median SLE disease activity index at enrollment was 14 (25%-75% interquartile range (IQR) = 8–19). At week 0, no CMV infection was documented, 91.7% of the patients had positive CMV IgG, and the median absolute lymphocyte count was 938 cells/mm^3. At week 12, the median cumulative corticosteroid dose was 0.74 mg/kg/day (25%-75%IQR = 0.34–1.20) and the prevalence of CMV infection was 12.5%. Elevated interleukin-23 and tumor necrotic factor-α levels were associated with protective effect (hazard ratio (HR) 0.12, 95% confidence interval (CI) 0.02–0.58, p = 0.009 and HR 0.55, 95% CI 0.31–0.99, p = 0.049, respectively). Neurologic involvement was the independent factor that increased the risk of CMV infection (HR 0.26; 95% CI 0.08–0.79, p = 0.018). No mortality was detected.

Conclusion: CMV infection is common when IT is used, but only some SLE patients with intense IT develop CMV infection. Certain characteristics of the patients may assist predict future CMV infection following IT. However, further study on a larger scale is encouraged.

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

2656. Eliciting Preferences for Zoster Vaccination in US Adults Aged 50 Years and Older

Brandon J. Patterson, PharmD, PhD[1]; Kelley Meyers, PhD[2]; Alexandra Stewart, JD[3]; Brennan Mange, BA[2]; Eric M. Hillson, BSPharm, MSEd, MBA, MSc, PhD[1]; Sonya Cyr, PhD[1]; Christine Poulos, PhD[2]; [1]GSK, Philadelphia, Pennsylvania; [2]RTI-Health Solutions, Research Triangle Park, North Carolina; [3]Self, Hyattsville, Maryland

Session: 272. Studies of Treatment and Prevention of Viral Disease
Saturday, October 5, 2019: 12:15 PM

Background: In October 2017, the Centers for Disease Control and Prevention (CDC) recommended the adjuvanted Recombinant Zoster Vaccine (RZV) for all adults aged ≥ 50 years, regardless of previous vaccination. Understanding patient preferences for herpes zoster (HZ) vaccination can inform providers, payers, and policymakers about barriers, hesitancies, and utilization of available vaccines.

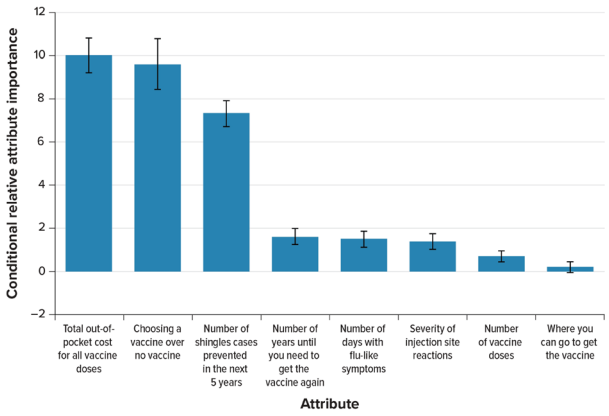
Methods: A discrete choice experiment survey was completed by 1,454 US adults aged ≥50 years in January 2019, with targeted sampling quotas of African Americans (25%), recent influenza vaccine recipients (50%), and individuals with autoimmune disease or chronic comorbidities (37%), to enable subgroup analyses. HZ vaccine profiles were characterized using seven attributes: vaccine efficacy (VE), duration of protection, location of service, number of doses, injection-site reaction severity, systemic reactions duration, and out-of-pocket (OOP) costs. In a series of choice questions, respondents chose between a pair of hypothetical HZ vaccine profiles, determined by an efficient experimental design, and a no vaccination option. In a second series, respondents stated intentions to complete a 2-dose vaccination series, conditioned on varying levels of side effects experienced with a first dose and expected OOP costs. Differences across subgroups were explored.

Results: Respondents placed the greatest weight on OOP costs and VE when choosing among HZ vaccination options (Figure 1). African American respondents were more sensitive to increases in OOP costs than non-African American respondents (Figure 2). ~75% of respondents indicated they would complete the series of a two-dose HZ vaccine if the cost of completing the series was $8-$13. Second-dose compliance drops about 25% when OOP costs increase to $140–150.

Conclusion: OOP cost had the greatest influence on respondents' intention to select and complete HZ vaccination. Efforts to remove financial barriers to improve implementation of the CDC recommendations for HZ vaccination should be considered.

GlaxoSmithKline Biologicals SA, GSK study identifiers: 208677/HO-17-18066.

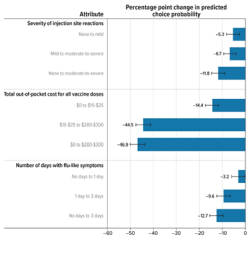
Figure 1. Conditional Relative Importance Weights of Attributes of Herpes Zoster Vaccines for the Full Sample (N = 1,454)



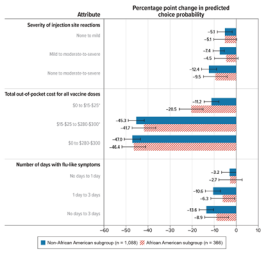
Note: The vertical bars surrounding each mean preference weight denote the 95% confidence interval about the point estimate. With the exception of where you can go to get the vaccine, the conditional relative importance weights for all other vaccine attributes were statistically significantly different from zero. In addition, the differences between the conditional relative importance weights for each attribute were statistically significantly different from one another, with the exception of the following: duration of effectiveness and influenza-like symptoms, duration of effectiveness and severity of injection-site reactions, and duration of influenza-like symptoms and severity of injection-site reactions.

Figure 2. Changes in the Probability of Choosing a RZV-Like Vaccine (Marginal Predicted Choice Probabilities)

2A. Full Sample (N = 1,454)



2B. African Americans (N = 366) and Non-African Americans (N = 1,088)



RZV = adjuvanted Recombinant Zoster Vaccine

Note: The baseline profile for RZV was based on the following attribute levels: 97% vaccine effectiveness, duration of vaccine effectiveness of 20 years, can get the vaccine at the doctor's office or pharmacy, 2 doses, no days with influenza-like symptoms, no injection-site reaction, and $0 out-of-pocket cost for all doses. The asterisks in the label for a given change in an attribute level indicates that the change in marginal predicted choice probability was statistically significantly different between subgroups at the 95% level of confidence.

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