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 vaccine model of genotype G1 human norovirus RNA expression, respectively. However, these drugs have not been evaluated in *in vivo* infections with G1 human noroviruses, responsible for most human norovirus disease. We used the stem cell-derived nontransformed human intestinal enteroid (HIE) system, which supports G1 human norovirus replication, to evaluate the antiviral activities of nitazoxanide, ribavirin, and IVIG.

Methods: We inoculated HIEs with G1 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 1:13,000) and a media control. One and 48 hours after inoculation, we extracted and quantified G1 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 G1 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 formed groups established from different donors. IVIG completely inhibited G1 replication at up to a 1:1,000 dilution and was not cytotoxic at therapeutic concentrations. Ribavirin did not reduce G1 replication at concentrations up to 10 mM, with levels achieved in human sera with standard doses.

Conclusion: Nitazoxanide and IVIG, but not ribavirin, potently inhibit G1 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.

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

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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 for HA-VIs 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 semistructured interviews with caregivers to identify potential exposures beginning 4 days prior to HA-VI identification date. We also measured length of antibiotic 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 norovirus.

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 antibiotic infections 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.

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2654. Myocarditis in Dengue: A Prospective Observational Study

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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,
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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

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Background: Systemic lupus erythematosus (SLE) patients with intense immunosuppressive therapy (ITT) 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.

Objective: 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 ITT.

Methods: A prospective cohort study of active SLE patients required intense ITT from November 2017 to March 2019 was conducted. We collected patients’ demographic, medical history, and laboratory data at baseline and during the study period.

Result: A total of 143 patients were recruited with median age of 29 years (IQR 23–36), and 82% were females. Dengue with warning signs was present in 60 (42%) and severe dengue in 45 (25%) patients. Cardiac enzymes were elevated in 27 (15%) patients (CtIa in 52, 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 [5%]), 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 I 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.

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

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Background: In October 2017, the Centers for Disease Control and Prevention (CDC) recommended the adjuvanted Recombinant Zoster Vaccine (RZV) for all adults ≥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 conducted 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 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 ≤813. 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.

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