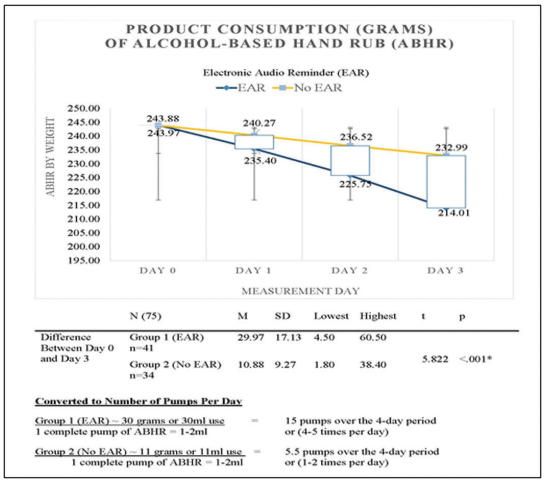
Conclusion. This study demonstrated that a short educational intervention that included a video, a handout, and a verbal audio reminder has the potential to increase patient-centered infection prevention in the acute care settings without increasing the workload of healthcare workers. Findings can be used for future infection prevention studies in institutionalized patients to improve self-managed care.

Figure 1 Product Consumption Per Group



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

1334. Hand hygiene: Knowledge and Practices of Clinical Teachers in Selected Teaching Hospitals in Kenya

Linus Ndegwa, MPHE[1] and Champion Nyoni, Msc[2]; [1]Infection Control, KEMRI, Nairobi, Kenya [2]Nursing, Paray School of Nursing, Thaba-Tseka, Lesotho

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Background. Healthcare-associated infections lead to substantial morbidity and mortality worldwide, and adequate hand hygiene (HH) in the clinical setting is essential for prevention. Clinical teachers are central to the training of healthcare workers (HCW) as they teach and model safe practices in the clinical environment. However, there is limited research on the knowledge and practices of clinical teachers related to HH in teaching hospitals, particularly in African settings. We describe the knowledge and practices of HH amongst clinical teachers in selected teaching hospitals in Kenya.

Methods. Data were collected through self-administered standardized questionnaires with basic demographic, knowledge and practices about HH from clinical teachers employed at two teaching hospitals. Participating clinical teachers were anonymously audited for HH practices using an adapted World Health Organization tool. The audits consisted of 20–30 minutes observations in each ward

Results. Among 57 participants overall, 42 (73.7%) were nurses, 8 (14.0%) clinicians, and 5 (8.8%) therapists. Twenty-one (36.8%) of the participants had knowledge regarding the minimum time needed to practice HH using alcohol based hand rub, 14 (24.6%) knew that hand washing and hand rubbing should be performed in sequence. The combined knowledge score for each individual ranged from 0% to 94.1% with a mean of 50.1% (SD=20.1, Cl 95% 44.7- 55.4%). Hand hygiene compliance significantly varied by clinical instructor's type; nurses (42.7%) and therapists (38.0%) had the highest adherence and clinicians had the lowest 33.7% ($P = 0.0001$).

Conclusion. Clinical teachers in this study demonstrated knowledge gaps and poor practices related to HH. Since they serve as role models for future generations of healthcare workers, clinical teachers must recognize the importance of HH in preventing hospital-acquired infections, including when and how HH should be performed while following recommended practices.

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

1335. Painting the Gown Red: Using a Colored Paint Quality Improvement Process to Evaluate Healthcare Worker Personal Protective Equipment for Highly Pathogenic Infections

Daniel Eiras, MD, MPH; Andrea Echeverri, BS; Kieran Toale, MSc; Patricia Tennill, BS and Laura Evans, MD, MSc; New York City Health + Hospitals / Bellevue, New York, NY

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Background. Personal protective equipment (PPE) and strict infection control techniques are the primary methods by which healthcare workers (HCW) can avoid exposure during the treatment of patients with highly pathogenic infections such as Ebola Virus Disease (EVD) or the Middle East Respiratory Syndrome coronavirus (MERS-CoV). There is currently no consensus for the types of PPE that are recommended to be worn by HCWs, nor is there a universal process for the donning and doffing of PPE.

Methods. HCWs from Bellevue Hospital participate in quarterly PPE trainings as part of the Special Pathogens Program (SPP), which consist of didactic sessions as well as an evaluation of donning and doffing techniques. A total of 50 HCWs completed the training curriculum in 2017. During the doffing process, PPE trainers applied corn start powder paint (Chameleon Colors; American Fork, UT) to the participants' gloved hands between multiple steps of PPE removal. At the end of the process, the areas where paint was found on was documented including the outer surgical gown, the powered air purifying respirator (PAPR) helmet and shroud, the inner impermeable suit, the knee-high boots and boot covers, and the extended-cuff gloves.

Results. The areas of PPE that were most marked with paint were the lower shoulders and upper arms of the surgical gowns, the top sides of the PAPR shroud, the front upper chest area, and the center back of the inner impermeable suits. In a majority of cases no powder paint was noted on the knee-high boots. In a minority of cases, paint was observed on the inside upper chest area of the surgical gown. These paint markings were used to discuss potential breaches in PPE doffing technique in real-time, as well as identify areas to target in future PPE trainings.

Conclusion. The powdered paint quality improvement process for donning and doffing PPE is a method to evaluate the complex PPE dressing procedure. It is particularly useful given the fact that it is incumbent on each hospital or healthcare system to develop its own processes and procedures for PPE, as well as maintain readiness through periodic trainings. Powdered paint can identify vulnerabilities in their process as well as areas that require further education.

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1336. Patients' Family Empowering to Increase Hand Hygiene (HH) Compliance in Health-Care Workers (HCW) from a Hematology-Oncology Ward in Mexico City

Aaron Molina-Jaimes, MD; Fuensanta Guerrero Del Cueto, MD; Cristina Roman-Lopez, MD; Silvia Sandoval-Hernández, RN; Bertha Garcia-Pineda, RN and Diana Vilar Compte, MD, MSc; Infectious Diseases, Instituto Nacional de Cancerologia, Mexico City, Mexico

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Background. HH is a key component to decrease infections in hospitals, but compliance in HCW remains low. We present a six-month strategy to empower patients' caregivers on HCW HH compliance.

Methods. HH compliance in HCWs was evaluated between June 1 and August 31, 2017 as recommended by WHO. Between September 1, 2016 and March 31, 2017 we undertook the empowering in the hematology-oncology ward (50 beds) from Instituto Nacional de Cancerologia, a cancer referral, teaching hospital in Mexico. To empower patients and their caregivers, a member of the team visited the patient and their relatives during the first 24h of hospital admission. Standarized information on HH and the importance of HCW compliance was given, along with a printed cartoon on HH opportunities (5 moments from WHO). Patients and their caregivers were trained to observe and record HH opportunties, an were invited to remind HCWs if HH omissions were observed. Data on HH compliance was collected monthly during the empowerment and 1 month after. Data was compared with the HH compliance from the 6 previous. We compared overall compliance and for each 5 HH moments before and after the empowering (chi ^{2} test).

Results. We empowered 82 caregivers (M: 25.6%) and F: 74.4%), mean age 44 years. 24.4% had completed primary education, and 13.1% had higher education. Mothers and spouses were the primary caregivers (28.1% and 36.6%). HH compliance increased in all 5 moments: Before touching a patient (M1) (B: 9.5%, A: 57.6%, $P = 0.005$); before a clean or aseptic procedure (M2) (B: 7.9%, A: 48%, $P = 0.002$); after body fluid exposure (M3) (B: 10%, A: 59%, $P = 0.0005$), after touching a patient (M4) (B: 7.4%, A: 57.9%, $P = 0.0005$), and after touching patient surroundings (M5) (B: 2.4%, A: 77.4%, $P = 0.0008$). Nurses achieved a higher increase on compliance compared with physicians. Caregivers recognition on HH increased for each opporunity, being more notorious for M2 (B:31.7%, A: 61.5%); M3 (B: 7.3%, A: 31.5%), and M4, (B: 36.5%, A: 68.7%). Perception on the importance of preventing health-care-related infections increased from 80.5% to 90.3%.

Conclusion. Empowering patients' primary caregivers was an effective intervention to increase HCWs HH compliance at a hematology-oncology ward. The effect of this intervention remains to be evaluated on the long-term basis, but demonstrate the importance of involving patients and their relatives on health-care delivery.

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

1337. Performance of Zoster Vaccine Live (Zostavax): A Systematic Review of 12 years of Experimental and Observational Evidence

Kathleen Dooling, MD, MPH[1]; Angela Guo, MPH[1]; Jessica Leung, MPH[1]; Edward Belongia, MD[2] and Rafael Harpaz, MD[1]; [1]DVD, Centers for Disease Control and Prevention, Atlanta, Georgia, [2]Marshfield Clinic Research Institute, Marshfield, Wisconsin

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Background. One in three people in the U.S. will develop herpes zoster during their life. Zoster Vaccine Live (ZVL or Zostavax™), has been licensed in the U.S. since 2006 to prevent herpes zoster. ZVL protection has been shown to wane with time and estimates of effect can be imprecise. We performed a systematic review of the duration of efficacy and effectiveness of ZVL against herpes zoster (HZ).

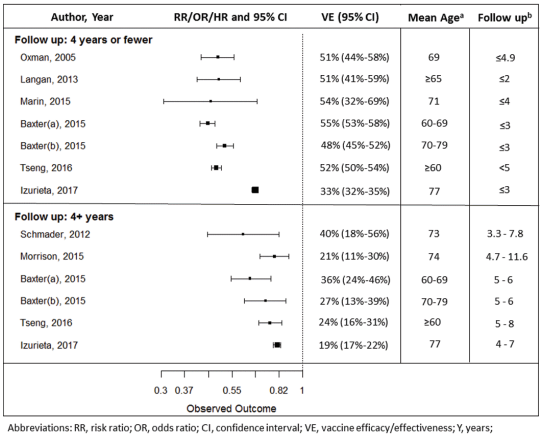
Methods. We systematically searched PubMed, Embase, Cochrane, and clinicaltrials.gov for vaccine efficacy or effectiveness (VE) studies of ZVL. Two authors independently screened each title and abstract, and potential VE studies were reviewed in-depth. Eligibility criteria included original data on ZVL prevention of HZ in a general population of

immunocompetent recipients ≤ 60 years old. Selected articles were abstracted, independently reviewed, and discrepancies adjudicated. We attempted to locate relevant unpublished work and contacted authors for additional data, where necessary. Measures of association were illustrated on a forest plot and converted to VE (1-hazard ratio or risk ratio or odds ratio).

Results. We screened 1302 articles; 17 underwent full text review and 8 met inclusion criteria and were abstracted for this review. Selected studies included 1 phase III randomized controlled trial, 2 quasi experimental and 5 observational studies. One experimental and 5 observational studies estimated VE during the period from vaccination up to 4 years following vaccination; estimates across studies ranged from 33%-55%. Two quasi experimental and 3 observational studies estimated VE for ≥ 4 years following vaccination; estimates ranged from 19%-40%; the median estimate was 24% (Figure). Pooled VE was not calculated due to heterogeneity in length of follow up, age distribution of study subjects, as well as adjustment for factors such as underlying medical conditions.

Conclusion. Most experimental and observational studies estimate VE just above 50% during the 3 years following receipt of ZVL. Beyond 3 years, ZVL protection wanes, with most studies estimating a VE of ≤24% after 4 years. Information on overall efficacy and duration of protection from ZVL will guide policy decisions regarding its use.

Figure. Comparative VE of ZVL (Zostavax) for the prevention of herpes zoster, by length of follow-up time post-vaccination



Abbreviations: RR, risk ratio; OR, odds ratio; CI, confidence interval; VE, vaccine efficacy/effectiveness; Y, years;
[a]Mean age reported in years. If mean age was not available, age range for study participants was reported.
[b]Length of study follow-up period post ZVL vaccination in years.

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1338. Assessment of the Potential Herpes Zoster and Post Herpetic Neuralgia Case Avoidance with Vaccination in the United States

Brandon J. Patterson, PharmD, PhD[1]; Philip O. Buck, PhD, MPH[1]; Justin Carrico, BS[2]; Katherine A. Hicks, MS[2]; Desmond Curran, PhD[3]; Desiree Van Oorschot, MSc[3]; John E. Pawlowski, PhD[1]; Bruce Y. Lee, MD, MBA[4] and Barbara P. Yawn, MD, MSc, MSPH, FAAFP[5]; [1]GSK, Philadelphia, Pennsylvania, [2]RTI Health Solutions, Research Triangle Park, North Carolina, [3]GSK Vaccines, Wavre, Belgium, [4]Johns Hopkins Bloomberg School of Public Health, Baltimore, MD, [5]University of Minnesota, Minneapolis, Minnesota

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Background. Herpes zoster (HZ), commonly referred to as shingles, is a reactivation of latent varicella zoster virus in patients previously infected. Clinical characteristics of HZ include painful rash with potential complications, including post herpetic neuralgia (PHN). Care for HZ and PHN incurs significant costs and vaccination is beneficial. The aim of this study was to compare the impact on HZ and PHN case avoidance of two HZ vaccines, an available live-attenuated zoster vaccine (zoster vaccine live [ZVL]) vs. a candidate non-live adjuvanted HZ subunit vaccine (HZ/su), in the US population.

Methods. A Markov model called ZONA (ZOster ecoNomic Analyses) was developed following two age cohorts (≥60 years to represent the current ACIP recommendation and ≥65 years to represent the Medicare population) over their lifetimes from the year of vaccination. Demographic data were obtained from the US Census, whereas HZ incidence and the proportion of HZ individuals developing PHN were derived from published US-specific sources. Age-specific vaccine efficacy and waning rates were based on published clinical trial data. Vaccine coverage for both vaccines was assumed to be 30.6% and 34.2% in the two age cohorts, respectively, based on CDC data; compliance of the second dose of the HZ/su vaccine was 69%, based on data from clinical trials and Hepatitis B seconddose completion. Sensitivity analyses demonstrated robustness of the base analysis findings.

Results. In the US, for cohorts of 66.83 million (M) persons aged 60+ and 47.76M aged 65+ it was estimated that the HZ/su vaccine would reduce the number of HZ cases by 2.12M and 1.55M in the two age cohorts, respectively, compared with 0.65M and 0.45M using the ZVL. Furthermore, the HZ/su vaccine would reduce the number of PHN cases by 0.23M and 0.18M in the two age cohorts, respectively, compared with 0.10M and 0.09 using the ZVL. The number needed to vaccinate to prevent one HZ case were 10 and 11, in the respective cohorts, using the HZ/su vaccine compared with 31 and 37, in the respective cohorts, using the ZVL.

Conclusion. Due to higher and sustained vaccine efficacy, the candidate HZ/su vaccine demonstrated superior public health impact in the US compared with the currently available ZVL.

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1339. Effectiveness of Live Zoster Vaccine in Preventing Herpes Zoster Ophthalmicus (HZO)

Laurie Aukes, RN[1]; Joan Bartlett, MPH, MPP[1]; Bruce Fireman, MA[1]; John Hansen, MPH[1]; Edwin Lewis, MPH[1]; Elizabeth Earley, MPH[2]; Morgan Marks, PhD[2]; Patricia Saddier, MD, PhD[2] and Nicola P. Klein, MD, PhD[1]; [1]Kaiser Permanente Vaccine Study Center, Oakland, California, [2]Merck & Co., Inc. Pharmacoepidemiology Department, Kenilworth, New Jersey

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Background. Herpes zoster ophthalmicus (HZO), caused by reactivation of varicella-zoster virus in or around the eye, can be severe and often results in care-seeking that may be less discretionary than for uncomplicated herpes zoster (HZ). We compared the vaccine effectiveness (VE) of live zoster vaccine against HZO with the VE against HZ overall.

Methods. Kaiser Permanente Northern California (KPNC) members enter the ongoing cohort study when age-eligible for zoster vaccine starting in 2007. Incident HZ was defined as a new diagnosis of HZ with an antiviral prescription or a positive varicella viral test. Among those, an HZO case was defined as having an HZO diagnosis during an ophthalmology visit within 30 days of the initial HZ diagnosis. VE by age at vaccination and time since vaccination was estimated using Cox regression adjusted for age, race, sex and time-varying measures of healthcare use, comorbidities and immunocompromise status. Average VE over the first 5 years following vaccination was calculated as a weighted average of annual VE estimates.

Results. During 2007–2014, ~1.3 million individuals ≥50 years of age entered the study population and 29% were vaccinated. Among 48,889 incident HZ cases, 2,858 (6%) had HZO, 87% of whom were unvaccinated. For all ages combined, VE against HZO was 72% (95% CI, 64%-79%) in year 1, similar to 68% (95% CI, 65%-70%) against HZ. VE fell in years 2, 3, 4, and 5 to 47%, 45%, 42% and 27% for HZO and to 47%, 39%, 41% and 37% for HZ. For age groups 60 – 69 and 70 – 79, where we have the most data, initial VE and waning were similar for HZO and HZ. Numbers of HZO cases for 50–59 year olds were too small to evaluate at this time. Average VE against HZO over the first 5 years following vaccination was 52% (95% CI, 42%–60%) for ages 60–69, 51% (95% CI, 39%–61%) for ages 70-79, and 39% (95% CI, 14%-57%) for ages 80+; similarly, 5-year average VE against HZ was 49%, 46%, and 44% for these 3 age groups.

Conclusion. VE against HZO was similar to VE against HZ regardless of age at vaccination or time since vaccination. Effectiveness of live zoster vaccine in preventing HZO was highest in year one with subsequent waning.

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1340. Immune Senescence Factors Associated with the Immunogenicity of a Live Attenuated Zoster Vaccine (ZV) in Older Adults

Adriana Weinberg, MD, FIDSA[1]; Kenneth Schamder, MD[2]; Michael Johnson, BS[3]; Zoran Popmihajlov, MD, MS[4]; Adriana Tovar-Salazar, MS[3]; Yupanqui Caldas, PhD[3]; Lei Pang, PhD[4]; Alice Cho, BS[3] and Myron Levin, MD, FIDSA[5]; [1]University of Colorado Denver School of Medicine, Aurora, Colorado, [2]Duke University, raleigh durham, North Carolina, [3]University of Colorado Denver Anschutz Medical Campus, Aurora, Colorado, [4]Merck & Co., Inc., Kenilworth, New Jersey, [5]Pediatrics & Medicine, University of Colorado Denver, Aurora, Colorado

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Background. ZV confers protection against herpes zoster by increasing the cell-mediated immunity (CMI) to varicella-zoster virus (VZV). ZV immunogenicity and protection decrease with increasing age. We investigated effects of age and immune senescence on ZV immunogenicity.

Methods. 399 adults ≥50 years had VZV T-cell helper 1 (Th1) CMI measured by ex vivo VZV-stimulated IL2/IFNg ELISPOT and blood T-cell nonspecific immune senescence by flow cytometric characterization of FOXP3, CD25, IL10, TGFb, PD1, CD28, CD57 and CD31 expression before and at 1, 6 and 52 weeks after ZV. In a subset of 95 vaccinees, VZV-stimulated T cell expression of CD107, Granzyme B, FOXP3, CD25, IL10, TGFb, CD39 and PD1 were also measured. Multivariate regression analysis was used to identify independent effects of age and immune senescence on VZV Th1 CMI ($P < 0.025$).

Results. IL2+ and IL2+IFNg+ Th1 *memory* VZV CMI peaked at 6 weeks after ZV and remained elevated at 1 year. *Effectors*, including VZV-specific IFNg+ Th1, and CD8+CD107+% and CD4+/CD8+Granzyme B+% cytotoxic T lymphocytes (CTL), peaked at 1 week, but only the IFNg+ Th1 effectors remained elevated at 1 year. There was also a transient increase in blood CD8+PD1+% exhausted T cells 1