Annual Meeting

Toronto, Ontario

November 20-21, 2019

Meeting Contributors

CIRN Management Committee

Dr. Scott Halperin, NPI
Dr. Julie Bettinger
Dr. Joanne Langley
Dr. Shelly McNeil
Dr. Melissa Andrew
Dr. Karina Top
Dr. Eve Dubé
Dr. Natasha Crowcroft
Dr. Jeff Kwong
Dr. Shelly Bolotin
Dr. Todd Hatchette
Dr. Marc Brisson
Dr. David Scheifele
Dr. Mark Loeb
Dr. Philippe De Wals
Dr. Shelley Deeks
Dr. Gaston De Serres
Ms. Emily Adkins-Taylor and Ms. Erin Schock, representing the Public Health Agency of Canada
Ms. Suzete Dos Santos representing the Canadian Institutes of Health Research

Management Support

Allison Young
Penny Peng

Table of Contents

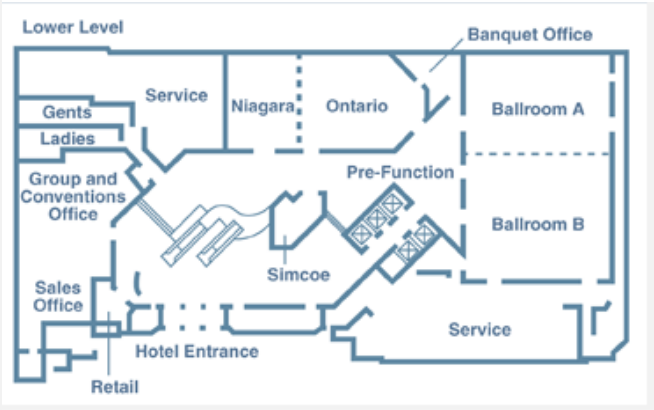
Agenda

TUESDAY NOV 19			
Time	**Activity or Presentation**	**Presenter**	**Place**
08:00-14:00	*iCARE Seroepidemiology Workshop (Invite only)*	Shelly Bolotin	Caledon Room
13:00-16:00	*CAIRE RSA Board Meeting (Invite only)*	Karen Simmons	Humber Room
16:00-20:00	*CIRN AGM Registration* ***All presenters must provide a USB stick with their final slide presentation in PPT format upon registration***	Allison Young	Hotel Lobby
18:00-20:00	***3MT Prep and Practice Session***	Joanne Langley/Ann Burchell/Shelley Bolotin/Natalie Giorgis	Caledon Room

WEDNESDAY NOV 20			
07:00-08:30	Final Registration	Allison Young/Michelle Gurrola-Gal	Ontario/Niagara Foyer
08:00-09:00	***Breakfast***		***Ontario/Niagara Foyer***
09:00-09:05	Welcome	Scott Halperin	Ontario/Niagara Ballroom
09:05-09:25	Canadian National Vaccine Safety (CANVAS) Network Seasonal Influenza Safety Surveillance in Pregnant Women	Julie Bettinger	
09:25-09:45	A Prospective, Controlled Community Pharmacy Embedded Study to Evaluate Pharmacists as Immunizers: Interim Results from Year One of the Two-Year Intervention	Jennifer Isenor	
09:45 – 10:05	Age stratified burden of pneumococcal community acquired pneumonia in hospitalized Canadian adults, and proportional contribution of PCV13 serotypes	Jason LeBlanc	
10:05-10:25	***Break – Light Refreshment***		***Ontario/Niagara Foyer***
10:25-10:45	Waning Immunity and Responses to Revaccination in Children Treated for Acute Lymphoblastic Leukemia: A Canadian Immunization Research Network Study	Karina Top	Ontario/Niagara Ballroom
10:45-11:05	Anal HPV Prevalence Soon After Implementation of Publicly Funded Vaccine for Gay, Bisexual and Other Men Who Have Sex with Men: A CIRN Study	Ann Burchell	
11:05-12:20	3MT Trainee Competition	CIRN Trainees	
12:20-13:30	Poster Presentation Session	CIRN Trainees	
12:30-13:30	***Lunch Buffet***		***Ontario/Niagara Foyer***
12:30-13:30	CTN Network meeting	Joanne Langley/Michelle Gurrola-Gal	Conquest Room
13:30-14:05	Keynote Address: From Imperfect Immunity to Vaccine Hesitancy: Maximizing the Impact of Vaccines & Vaccination Programs	Nicole Basta (Introduction by Karina Top)	Ontario/Niagara Ballroom
14:05-14:25	Vaccine Coverage Among Children with Epilepsy in Two Canadian Provinces	Christiaan Righolt	
14:25-14:45	***Break – Light Refreshment***		
14:45-16:00	CIRN Network Updates	CIRN Network Leads	Ontario/Niagara Ballroom
16:00-18:00	Reference Laboratory Network meeting	Shelly Bolotin/Selma Osman	Grenadier Room
16:00-18:00	Special Immunization Clinics Network meeting	Karina Top/Natalie Giorgis	Simcoe Room
16:30 – 18:30	Advisory Committee meeting	Alexander Doroshenko	Conquest Room
18:30 – 20:30	***CIRN Social Hour (Cash Bar)***		***Upper Azure Lounge***

THURSDAY NOV 21			
Time	**Activity or Presentation**	**Presenter**	**Place**
08:00-09:10	***Breakfast***		**Ontario/Niagara Foyer**
09:10-09:20	Day 2 Welcome and Overview	Scott Halperin	Ontario/Niagara Ballroom
09:20-10:20	Panel Presentation and Discussion: Conducting Research During Outbreaks: Key Challenges and Considerations	Monika Naus Meena Dawar Nicola Klein	
10:20-10:40	CIHR Update	Suzete Dos Santos	
10:40-11:00	Promoting Vaccination at Birth with Motivational Interviewing Session Improves vaccination Intention and Reduces Vaccination Hesitancy	Arnaud Gagneur	
11:00-11:30	***Break – Light Refreshment***		***Ontario/Niagara Foyer***
11:30-12:30	Plenary Talk: Challenges and Opportunities in Knowledge Translation	Sharon Straus (Introduction by Joanne Langley)	Ontario/Niagara Ballroom
12:30-12:50	CAIRE Update	Manish Sadarangani Natasha Crowcroft	
12:50-12:55	Closing Remarks	Scott Halperin	
12:55-13:30	***Lunch Buffet***		***Ontario/Niagara Foyer***
13:00-15:00	CANVAS Network Meeting	Julie Bettinger	Grenadier Room

Floor Map: InterContinental Toronto Centre Hotel



Dr. Nicole Basta

As an epidemiologist and vaccinologist, Dr. Basta specializes in designing, implementing, and analyzing biological/clinical and behavioral research to 1) evaluate the impact of vaccines and immunization programs, 2) increase vaccine awareness, acceptance, and uptake, and 3) advance our understanding of infectious diseases epidemiology in various contexts. Her research has focused on meningococcal disease, HPV, measles, and influenza with the goal of providing evidence to optimize disease prevention and control strategies. She is currently an Assistant Professor in the Division of Epidemiology and Community Health at the University of Minnesota, and will join the faculty in the Department of Epidemiology, Biostatistics and Occupational Health at McGill University as an Associate Professor in January 2020.

Dr. Sharon Straus

Sharon E. Straus is a geriatrician and clinical epidemiologist who trained at the University of Toronto and the University of Oxford. She is the Director of the Knowledge Translation Program and Physician-in-Chief, St. Michael's Hospital and Professor in Department of Medicine, University of Toronto. She holds a Tier 1 Canada Research Chair in Knowledge Translation and Quality of Care and has authored more than 400 peer-reviewed publications and 3 textbooks in evidence-based medicine, knowledge translation and mentorship. Since 2015, she has consistently been in the top 1% of highly cited clinical researchers as per Web of Science and has an H-index of 86. She holds more than $57 million in peer-reviewed research grants as a principal investigator. She has received national awards for mentorship, research and education.

Dr. Monika Naus

Monika Naus is the Medical Director of the Communicable Diseases & Immunization Service, and the Head of Vaccine Preventable Diseases & Immunization Programs at the British Columbia Centre for Disease Control.

Dr. Naus obtained her medical training at the University of Alberta and her training in Public Health and Preventive Medicine at the University of Toronto. She then served as a federal field epidemiologist with the Laboratory Centre for Disease Control prior to starting her career in public health, with a focus on communicable disease prevention and control. Before joining BCCDC in July 2001, she was the provincial epidemiologist in Ontario from 1997 to 2001, and a senior medical consultant in vaccine preventable diseases and TB control for the Ontario Ministry of Health and Long-Term Care from 1990 to 1997.

She has been active in immunization at the national level, including on the Canadian National Advisory Committee on Immunization, which she chaired from 2003 to 2007 after being a member for eight years, and is a member of several NACI expert groups and liaison representative from the Canadian Immunization Committee. She currently co-chairs the Canadian Immunization Committee, and is a member of the Canadian Immunization Registries and Coverage Network, co-chair of the Automated Identification of Vaccine Products Working Group, member of the Canadian Immunization Research Network and involved in other national and provincial committees. She is a Fellow of the Royal College of Physicians of Canada and of the American College of Preventive Medicine.

Dr. Meena Dawar

Dr. Meena Dawar is a Medical Health Officer with Vancouver Coastal Health Authority and is responsible for the immunization, tobacco and Healthy Schools programs at a regional level. She is also a Clinical Professor with the School of Population and Public Health at UBC.

Meena received her MD from Dalhousie University; completed her Family Medicine training at Queen's University and her Master's in Health Sciences and Public Health Residency Training at UBC. Dr. Dawar has worked in rural and urban areas in Ontario and British Columbia and with Health Canada's First Nations and Inuit Health Branch.

Dr. Nicola Klein

Nicola Klein, MD, PhD is a board-certified Pediatrician, Director of the Kaiser Permanente Vaccine Study Center since 2006 and a Research Scientist III (rank equivalent to Professor) at the Kaiser Permanente Northern California Division of Research. She received her medical degree and her doctorate in Biochemistry as part of the NIH-funded Medical Scientist Training Program at New York University School of Medicine, completed her residency in Pediatrics at the Lucile Salter Packard Children's Hospital at Stanford University School of Medicine and a Center for Disease Control (CDC)-sponsored Clinical Immunization Safety Assessment (CISA) Network Vaccine Safety Fellowship at Stanford.

Her research has focused on vaccine safety and effectiveness, genetics of vaccine responses, vaccine safety among special populations and the epidemiology of vaccine preventable diseases. She is principal investigator (PI) for the CDC-sponsored Vaccine Safety Datalink Project and CISA Network and has led many vaccine safety studies, including describing the risk for febrile seizures following the combined measles-mumps-rubella-varicella vaccine separately among 1-2 year old and among 4-6 year olds, and an FDA-sponsored case-control genome wide association study examining genes associated with an increased risk of febrile seizures in children following measles-containing vaccines. She also led a NVPO-sponsored study identifying genetic, immunologic and clinical factors predisposing children to fever after measles-containing vaccines. She is also PI on numerous vaccine clinical trials enrolling infants, children, adolescents and adults. For the past 9 years, she has led observational studies investigating the effectiveness of acellular pertussis vaccines. She is currently investigating the effectiveness of the recombinant zoster vaccine, 13-valent pneumococcal vaccine and influenza vaccines.

Panel Discussion and Interactive Session

Panel Discussion – Thursday, November 21, 9:20am – 10:20am

Conducting Research During Outbreaks: Key Challenges and Considerations

Panel Participants:

Monika Naus

Meena Dawar

Nicola Klein

Moderator: Scott Halperin

Bettinger, Julie
Associate Professor, University of British Columbia

CANADIAN NATIONAL VACCINE SAFETY (CANVAS) NETWORK SEASONAL INFLUENZA SAFETY SURVEILLANCE IN PREGNANT WOMEN

AUTHORS: Julie Bettinger[1], Louis Valiquette[2], Gaston De Serres[3], Otto G. Vanderkooi[4], Brenda Coleman[5], Karina Top[6], Jennifer Isenor[6], James D. Kellner[4], Anne McCarthy[8]

AFFILIATION: [1]Vaccine Evaluation Center, University of British Columbia; [2]Centre Hospitalier Universitaire de Sherbrooke; [3]Centre Hospitalier Universitaire de Québec; [4]Alberta Children's Hospital, University of Calgary; [5]Mount Sinai Hospital; [6]IWK Health Centre and Canadian Center for Vaccinology; [8]Ottawa Hospital

INTRODUCTION: The Canadian National Vaccine Safety (CANVAS) network, a sentinel network, was established in 2009 and now provides annual influenza vaccine safety information from >30,000 adults and children across Canada. To improve influenza vaccine safety monitoring during pregnancy, questions about pregnancy status and outcomes were added in 2016. Information on health events in pregnant women who are vaccinated during the seasonal influenza vaccination campaign and unvaccinated pregnant controls is now captured.

METHODS: In 2016, 2017 and 2018 pregnant vaccinated participants completed an online survey at day 8 following vaccination. Unvaccinated pregnant controls completed an online survey on health events occurring over the past 7 days during the same years. Telephone follow up occurred for those who reported a medically attended event, both in the control and vaccinated groups.

RESULTS: A total of 937 vaccinated and 473 unvaccinated pregnant women aged 15 to 49 years responded. Over the 3 years, 10.5% of vaccinated pregnant women and 13.4% of unvaccinated pregnant women reported a health event in the previous 7 days. The health event was severe enough to prevent work and/or require health care consultation for 4.1% of vaccinated and 4.6% of unvaccinated pregnant women. This compares to 5.0% of vaccinated women 15-49 years of age and 3.4% of unvaccinated non-pregnant women 15-49 years of age over the same time period. Among vaccinated pregnant women, malaise/myalgia/feeling unwell, respiratory and gastrointestinal symptoms were the most frequently reported symptoms with vaccinated pregnant women reporting slightly higher rates in all categories when compared with unvaccinated pregnant women. There were no pregnancy related adverse events in vaccinated women while one control reported miscarriage.

CONCLUSIONS: Severe event rates following influenza vaccination were lower among vaccinated pregnant women than unvaccinated pregnant women and non-pregnant vaccinated women. This suggested events in vaccinated pregnant women may be unrelated to influenza vaccination.

Isenor, Jennifer
Associate Professor,
Dalhousie University

A PROSPECTIVE, CONTROLLED COMMUNITY PHARMACY EMBEDDED STUDY TO EVALUATE PHARMACISTS AS IMMUNIZERS: INTERIM RESULTS FROM YEAR ONE OF THE TWO-YEAR INTERVENTION

Authors: Jennifer Isenor[1,2], Melissa Kervin[1], Donna Halperin[1,3], Joanne Langley[1,4,5], Karina Top[1,4,5], Julie Bettinger[6], Kathryn Slayter[1,7], Susan Bowles[1,2], Nancy Waite[8], Scott Halperin[1,4,9], on behalf of *The Improve ACCESS Study Team*

Affiliation: [1]Canadian Center for Vaccinology, Dalhousie University; [2]College of Pharmacy, Dalhousie University; [3]Rankin School of Nursing, St. Francis Xavier University; [4]Department of Pediatrics, Dalhousie University; [5]Department of Community Health and Epidemiology, Dalhousie University; [6]Vaccine Evaluation Center, British Columbia Children's Hospital, University of British Columbia; [7]Department of Medicine, Division of Infectious Diseases, Dalhousie University; [8]School of Pharmacy, University of Waterloo; [9]Department of Microbiology & Immunology, Dalhousie University

Introduction: The addition of pharmacists as immunizers has been found to improve influenza vaccination rates; however, few studies have explored the impact of pharmacist immunizers on the uptake of other vaccines for adults. This study aims to assess the effectiveness of a pharmacist-delivery strategy on adult vaccine coverage.

Methods: A two-year intervention study comparing an enhanced pharmacist-delivered immunization strategy to standard care was implemented in New Brunswick and Nova Scotia. Pharmacists in intervention communities implemented various strategies (e.g., combining vaccinations with other services, targeted patient outreach, immunization weeks, and provided vaccine at no cost (simulated public funding)), specifically designed for each of the study vaccines (tetanus-diphtheria-acellular pertussis vaccine, high-dose trivalent inactivated influenza vaccine, quadrivalent conjugate meningococcal vaccine, meningococcal B vaccine). Interim vaccine uptake was measured by pharmacy database reports of the number of study vaccine doses administered.

Interim Results: During the first year, a total of 17 intervention pharmacies and 25 non-intervention pharmacies participated in the study. A total of 212 study vaccines were administered in intervention pharmacies compared to 45 vaccines in the non-intervention pharmacies. The simulated publicly funded Tdap vaccine resulted in the largest uptake, with 196 doses being administered in the intervention pharmacies compared to 33 doses in the non-intervention sites.

Conclusions: Based on preliminary results, this study suggests that providing and administering a vaccine at no-cost through pharmacies increases uptake of that vaccine (Tdap) and may apply to other publicly funded vaccines for adults. This ongoing study will continue to provide critical insights into the effectiveness of pharmacist delivered strategies to promote adult immunizations.

LeBlanc, Jason
Associate Professor,
Dalhousie University

AGE STRATIFIED BURDEN OF PNEUMOCOCCAL COMMUNITY ACQUIRED PNEUMONIA IN HOSPITALIZED CANADIAN ADULTS, AND PROPORTIONAL CONTRIBUTION OF PCV13 SEROTYPES

AUTHORS: LeBlanc JJ[1]*, ElSherif M[1], Ye L[1], MacKinnon-Cameron D[1], Ambrose A[1], Hatchette TF[1], Lang ALS[1], Gillis HD[1], Martin I[2], Demczuk W[2], Andrew MK[1], Boivin G[3], Bowie W[4], Green K[5], Johnstone J[6], Loeb M[7], McCarthy AE[8], McGeer A[5], Semret M[9], Trottier S[3], Valiquette L[10], Webster D[11], and McNeil SA[1]

AFFILIATION: [1]Canadian Center for Vaccinology (CCfV), IWK Health Centre, Nova Scotia Health Authority (NSHA), and Dalhousie University; [2]National Microbiology Laboratory (NML); [3]Centre Hospitalier Universitaire de Québec; [4]Vancouver General Hospital, and University of British Columbia; [5]Mount Sinai Hospital; [6]Public Health Ontario and University of Toronto; [7]McMaster University; [8]Ottawa Hospital General Campus and University of Ottawa; [9]McGill University Health Centre; [10]Centre Intégré Universitaire de Santé et de Services Sociaux de l'Estrie – Centre Hospitalier Universitaire de Sherbrooke; [11]Saint John Regional Hospital

INTRODUCTION: In Canada, the 13-valent pneumococcal conjugate vaccine (PCV13) is recommended in childhood immunization, individuals at high risk of invasive pneumococcal disease (IPD), and in healthy adults aged ≥65 years, for the protection against vaccine-type IPD and pneumococcal community acquired pneumonia (pCAP). Since vaccine recommendations are based on age and disease burden, this study aimed to describe burden of pCAP in hospitalized adults by age, and characterize the proportion attributed to PCV13 serotypes.

METHODS: Active surveillance for CAP and IPD was performed from 2010 to 2015 in across five Canadian provinces. CAP was radiologically confirmed and ≥2 compatible symptoms, and pCAP was identified using culture and urine antigen testing. Patient demographics and outcomes were stratified by age.

RESULTS: Of 6687 CAP cases tested, 835 were pCAP, and of these, 418 were attributed to a PCV13 serotype. Of PCV13 pCAP, 41% and 74% were in adults ≥65 and ≥50 years, respectively. Compared to test-negative controls, pCAP cases in all age groups were more likely to be admitted to ICU and require mechanical ventilation, and mortality was high. Older adults with pCAP were less likely to be admitted to ICU or require mechanical ventilation than younger adults, likely due to the high mortality. Of pCAP deaths, 67.1% and 90.0% were in the ≥65 and ≥50 age cohorts, respectively.

CONCLUSIONS: Adults hospitalized with pCAP in the 50-64 age cohort add significantly to the burden of illness, suggesting an expansion of PCV13 recommendations to ≥50 years of age should be considered.

Top, Karina
Assistant Professor,
Dalhousie University

WANING IMMUNITY AND RESPONSES TO REVACCINATION IN CHILDREN TREATED FOR ACUTE LYMPHOBLASTIC LEUKEMIA: A CANADIAN IMMUNIZATION RESEARCH NETWORK STUDY

AUTHORS: Karina A. Top[1], Wendy Vaudry[2], Shaun K. Morris[3], Bruce Tapiéro[4], Anne Pham-Huy[5], Jeffrey M. Pernica[6], Victoria Price[1], S. Rod Rassekh[7], Lillian Sung[3], Soren Gantt[7], Athena McConnell[8], Earl Rubin[9], Rupesh Chawla[10], Scott A. Halperin[1]

AFFILIATION: [1]Dalhousie University and IWK Health Centre, [2]Stollery Children's Hospital, [3]Hospital for Sick Children, [4]CHU Sainte-Justine, [5]Children's Hospital of Eastern Ontario, [6]McMaster's Children's Hospital, [7]BC Children's and Women's Hospital, [8]Royal University Hospital, [9]Montreal Children's Hospital, [10]Alberta Children's Hospital

INTRODUCTION: Treatment for acute lymphoblastic leukemia (ALL) may affect immunity to previously received vaccinations. There is no standard of care for immunization post-chemotherapy in Canada. We evaluated waning immunity to vaccine antigens, and immunogenicity of post-chemotherapy immunization among previously vaccinated children treated for ALL.

METHODS: Multi-center trial of children with ALL 4-12 months post-chemotherapy completion. Exclusion criteria: infant ALL, relapsed ALL, and stem cell transplant recipients. Age-matched immunocompetent chidren were recruited as controls. IgG levels to 10 *S. pneumoniae* serotypes, pertussis toxin (PT), and tetanus toxoid (TT) were measured at baseline in both groups. Leukemia participants received DTaP-IPV-Hib and 13-valent pneumococcal conjugate vaccine (PCV13) concurrently and 23-valent pneumococcal polysaccharide vaccine 2 months later. Serology was measured 2 and 12 months post-vaccination. Geometric mean concentrations (GMCs) were compared between leukemia participants and controls using log-linear regression models. Post-vaccination titers were compared to baseline by calculating geometric mean ratios (GMR).

RESULTS: Seventy-four leukemia participants and 78 controls were included in the analysis (mean age 9.3, SD 3.9). At enrollment, leukemia participants were less likely to be age-appropriately immunized against DTaP ($p<0.001$) and PCV ($p=0.008$) than controls. Leukemia participants had significantly lower GMCs to PCV serotypes, PT and TT than controls in models adjusted for previous vaccine doses ($p<0.001$ for all antigens). Thirty percent of leukemia participants had TT IgG <0.1 IU/ml. Two months post-vaccination, TT and PT antibody titers rose significantly with GMRs 24.5 (95% CI: 16.8, 35.8) and 7.6 (5.5, 10.5), respectively. GMRs for PCV serotypes ranged from 4.6 (3.5, 6.2) for serotype 3 to 13.0 (9.3, 18.0) for serotype 14. Titers remained above baseline levels to 12 months post-vaccination for all antigens.

CONCLUSIONS: Children who completed chemotherapy for ALL had lower antibody levels against *S. pneumoniae*, pertussis and tetanus than immunocompetent children but demonstrated good responses to booster immunization. Children with ALL would benefit from systematic booster immunizations after chemotherapy.

Burchell, Ann
Assistant Professor,
University of Toronto

ANAL HPV PREVALENCE SOON AFTER IMPLEMENTATION OF PUBLICLY FUNDED VACCINE FOR GAY, BISEXUAL AND OTHER MEN WHO HAVE SEX WITH MEN: A CIRN STUDY

AUTHORS: Ann N. Burchell[1,2], Catharine Chambers[1,2], Ramandip Grewal[1,2], Ashley Mah[1,2], Trevor A. Hart[2,3], Joseph Cox[6], Gilles Lambert[16], David Moore[7,14], Troy Grennan[5,14], Alexandra De Pokomandy[6], Marc Brisson[4], Shelley L. Deeks[2,9], Eduardo Franco[6], Sandra Gardner[2,10], Daniel Grace[2], Dane Griffiths[11], Wanrudee Isaranuwatchai[1], Jody Jollimore[12], Gina Ogilvie[14], Chantal Sauvageau[15], Darrell H.S. Tan[1,2], Anna Yeung[1], Francois Coutlee[8].

AFFILIATION: [1]St. Michael's Hospital; [2]University of Toronto; [3]Ryerson University; [4]Université Laval; [5]BC Centre for Disease Control; [6]McGill University; [7]BC Centre for Excellence in HIV/AIDS; [8]Centre hospitalier de l'Université de Montréal; [9]Public Health Ontario; [10]Baycrest Health Sciences; [11]Gay Men's Sexual Health Alliance; [12]Community-Based Research Centre; [13]Ontario Ministry of Health and Long-Term Care; [14]University of British Columbia; [15]Institut national de santé publique du Québec; [16]Direction régionale de santé publique – Montréal; [17]University of West Indies – Cave Hill.

INTRODUCTION: Since 2015/16 in some provinces, HPV vaccine is publicly funded for gay, bisexual, and other men who have sex with men (gbMSM) aged ≤26 years. We describe vaccine uptake and compare anal HPV prevalence between vaccinated and unvaccinated men soon after the implementation of these programs.

METHODS: Self-identified gbMSM were recruited for the Engage Cohort Study using respondent-driven sampling (RDS) in Montreal, Toronto, and Vancouver. At enrollment, men aged 16-30 years self-complete a questionnaire and self-collect anal specimens for type-specific HPV-DNA testing. Outcomes: (1) any HPV type; (2) quadrivalent vaccine-preventable types (HPV6/11/16/18); (3) non-vaccine preventable types. RDS-unadjusted prevalence estimates were compared using Fisher's Exact test.

RESULTS: Between 02/2017 and 02/2019, 485 men provided valid anal specimens for HPV-DNA testing. Vaccine uptake (at least 1 dose) was 39.6% overall (50.0% in 16-26-year-olds and 27.0% in 27-30-year-olds). Among vaccinated men, 60.6% received all 3 doses. Vaccinated men reported more sexual partners in the past 6 months (median=8) than non-vaccinated men (median=5; p=0.002 Wilcoxon signed-rank test). For quadrivalent vaccine-preventable types, prevalence was lower in vaccinated compared to unvaccinated men (21.1% vs. 27.7%; standardized difference [SD]=−15.5%; p=0.122). Conversely, non-vaccine-preventable types were more common in vaccinated than unvaccinated men (65.6% vs. 58.4%; SD=14.8%; p=0.140) as was any HPV type (71.1% vs. 67.2%; SD=8.6; p=0.408).

CONCLUSIONS: In the largest cities in Canada, many gbMSM have initiated HPV vaccination but coverage remains suboptimal. Although maximum vaccine efficacy is achieved when received prior to any sexual exposure, our findings suggest that existing programs are having success in reaching men who would benefit from protection the most. Ongoing monitoring of effectiveness against clinically-relevant endpoints is needed in this high-risk population.

Righolt, Christiaan
Assistant Professor,
University of Manitoba

VACCINE COVERAGE AMONG CHILDREN WITH EPILEPSY IN TWO CANADIAN PROVINCES

AUTHORS: Christiaan H. Righolt[1], Steven Hawken[2,3,4], Gurpreet Pabla[1], Jessy Donelle[3,4], Paula Brna[5], Shelley L. Deeks[6,7], Bruce Smith[8], Kumanan Wilson[4], Salaheddin M. Mahmud[1], Karina A. Top[5,9]

AFFILIATION: [1]Vaccine and Drug Evaluation Centre, Department of Community Health Sciences, University of Manitoba; [2]School of Epidemiology, Public Health and Preventive Medicine, University of Ottawa; [3]Institute for Clinical Evaluative Sciences; [4]Clinical Epidemiology Program, Ottawa Hospital Research Institute; [5]Department of Pediatrics, Dalhousie University; [6]Dalla Lana School of Public Health, University of Toronto; [7]Public Health Ontario; [8]Department of Mathematics and Statistics, Dalhousie University; [9]Department of Community Health & Epidemiology, Dalhousie University

INTRODUCTION: Children with epilepsy are at increased risk of complications from vaccine-preventable infections, yet information on vaccine uptake in these children is scarce. We aimed to estimate vaccine completeness and timeliness in this population.

METHODS: We conducted a retrospective cohort study including all births during 2005-2013 in Manitoba and Ontario, Canada, creating two cohorts: infants (until age 2) and preschoolers (until age 7). We split each cohort into an epilepsy and non-epilepsy subcohort. We assessed general and vaccine-specific vaccination status for both cohorts based on provincial schedules and determined timeliness of MMR dose 1 (due at 12 months) and DTaP dose 4 (due at 18 months). We used logistic regression to calculate adjusted odds ratios (ORs) of the association between epilepsy and vaccination, and combined estimates from both provinces using random effects meta-analysis.

RESULTS: We included 16,558 infants (Manitoba, 653; Ontario, 15,905) and 13,004 preschoolers (Manitoba, 483; Ontario, 12,521) with epilepsy. The OR for vaccine completeness among children with versus without epilepsy was 0.9 (95% confidence interval 0.8-1.1) at age 2 and 1.0 (0.9-1.1) at age 7, with lower coverage for Manitoba infant girls with epilepsy born 2005-2008 (0.5; 0.3-0.7). Vaccine timeliness was similar between groups for MMR dose 1 and DTaP dose 4. Infants diagnosed before 6 months of age were less likely to be up-to-date at age 2 (0.9; 0.8-0.9).

CONCLUSIONS: Children with epilepsy had similar vaccine coverage to children without epilepsy, although vaccine uptake was slightly lower for infants diagnosed early in life. We could not explain the lower coverage for Manitoba infant girls with epilepsy born 2005-2008.

Gagneur, Arnaud
Professor,
Université de Sherbrooke

PROMOTING VACCINATION AT BIRTH WITH MOTIVATIONNAL INTERVIEWING SESSION IMPROVES VACCINATION INTENTION AND REDUCES VACCINATION HESITANCY. A CANADIAN RCT

AUTHORS: A Gagneur[1], J Bettinger[2], N MacDonald[3], K Katz[4], V Gosselin[1], M Ouakki[5], E Dubé[6]

AFFILIATION: [1]Université de Sherbrooke; [2]Vaccine Evaluation Center, University of British Columbia; [3]Dalhousie University; [4]North York General Hospital; [5]Institut national de santé publique du Québec; [6]Université Laval

INTRODUCTION: Many countries are dealing with growing numbers of individuals who are delaying or refusing recommended vaccinations for themselves or their children. The PromoVac strategy, a parental educational session using motivational interviewing techniques in maternity wards, demonstrated its effectiveness to enhance vaccination intention and reduce vaccine hesitancy in parents as well as increasing vaccine coverage in infants. The aim of this study is to test this strategy in different contexts across Canada.

METHODS: A randomized controlled trial was conducted in 4 provinces in Canada (QC, BC, ON, NS). Between May 2017 and March 2019, an individual educational intervention on infants' immunization was delivered to parents (intervention group) or a flyer on vaccination was distributed (control group). A questionnaire based on the Health Belief Model and Opel's tool to measure vaccine hesitancy was administered to all participants before and after the intervention or flyer. Parents' intention to have their infant vaccinated and parents' vaccine hesitancy score, based on a 100-point scale (100 indicating high vaccine hesitancy), were calculated.

RESULTS: Among the 667 families enrolled in the study, 611 (91.6%) received the intervention or the flyer. Of these 611 families, 494 (80.9%) completed both questionnaires and were included in the analysis. Before receiving the intervention or the flyer, 73.9% of participants certainly intended to vaccinate their infant. This proportion was different between maternity wards (72.4%, 72.9%, 69.0%, 89.2%, p=0.013). After the intervention, vaccination intention increased by 16.7% (70.7% vs 87.4%, p<0.0001) in the intervention group while it increased by 6.9% (77.0 vs 83.9%, p=0.0065) in the control group. The increase in vaccination intention was significantly higher in the intervention group compared to control group (p=0.006). Similarly, vaccine hesitancy score decreased by 33.3% (25.5 vs 17.0, p<0.0001) in the intervention group after the intervention and by 20.9% (25.3 vs 20.0, p<0.0001) in the control group. The decrease was significantly higher in the intervention group (p=0.004).

CONCLUSIONS: An educational intervention based on motivational interviewing technique delivered at birth increased vaccination intention and decreased vaccine hesitancy compared to the use of a single information flyer.

1. **Catherine Byrne:** IMPERFECT CMV VACCINES CAN REDUCE THE OCCURRENCE OF CMV-CAUSED CONGENITAL ABNORMALITIES
2. **Catharine Chambers:** VACCINE PROTECTION AGAINST PREVALENT ANAL HPV INFECTION AMONG YOUNG MEN WHO HAVE SEX WITH MEN: A CANADIAN IMMUNIZATION RESEARCH NETWORK-FUNDED STUDY
3. **Robine Donken**: NATURAL BOOSTING OCCURS IN HPV VACCINATED GIRLS: EXPOSURE, IMMUNE RESPONSE OR BOTH?
4. **Tiffany Fitzpatrick**: ESTIMATING THE UNDERLYING BURDEN OF RESPIRATORY SYNCYTIAL VIRUS INFECTION AMONG CHILDREN AND ADULTS IN ONTARIO, CANADA: A MODELLING STUDY
5. **Ramandip Grewal**: HPV VACCINATION ACROSS A CASCADE OF KNOWLEDGE, WILLINGNESS, AND UPTAKE IN GAY, BISEXUAL, AND OTHER MEN WHO HAVE SEX WITH MEN (GBMSM) IN CANADA: A CIRN STUDY
6. **Hina Hakim**: A WEB-BASED VISUALIZATION OF HERD IMMUNITY
7. **Karsten Hempel**: EVALUATION OF THE EFFECTIVENESS OF MATERNAL IMMUNIZATION IN ALBERTA USING AGENT-BASED MODELING
8. **Jimmy Lopez**: CANADIAN NATIONAL VACCINE SAFETY (CANVAS) NETWORK SEASONAL INFLUENZA SAFETY SURVEILLANCE, 2018 AND 2019
9. **Ashley Mah**: FACTORS ASSOCIATED WITH VALID SELF-COLLECTED ANAL SWABS FOR HPV GENOTYPING IN URBAN GAY, BISEXUAL AND OTHER MEN WHO HAVE SEX WITH MEN: A CIRN STUDY
10. **Ashleigh McGirr:** AN EARLY LOOK AT THE SECOND DOSE COMPLETION OF THE RECOMBINANT ZOSTER VACCINE (RZV) IN CANADIAN ADULTS – A RETROSPECTIVE ANALYSIS
11. **Hana Mijovic**: THE IMPACT OF CANADA'S FRAGMENTED HEALTHCARE MODEL ON PERTUSSIS VACCINATION IN PREGNANCY: A QUALITATIVE STUDY OF PERINATAL HEALTHCARE PROVIDERS
12. **Hana Mijovic:** SHOULD CONVERSATIONS ABOUT INFANT VACCINES BEGIN IN PREGNANCY? FINDINGS FROM A QUALITATIVE STUDY AMONG CANADIAN PRIMARY HEALTHCARE PROVIDERS
13. **Caroline Munoz**: REIMMUNIZATION AMONG PATIENTS WITH PREVIOUS ADVERSE EVENTS FOLLOWING IMMUNIZATION IN THE SPECIAL IMMUNIZATION CLINICS NETWORK
14. **Wendy Pringle**: CHALLENGES AND OPPORTUNITIES IN PROMOTING VACCINE CONFIDENCE AMONG REGISTERED MIDWIVES AND CLIENTS
15. **Melissa Andrew:** DEMENTIA, DELIRIUM AND OUTCOMES OF HOSPITALIZATION WITH ACUTE RESPIRATORY ILLNESS
16. **Melissa Andrew:** INFLUENZA BURDEN OF DISEASE AND 2018/19 END-OF-SEASON INFLUENZA VACCINE EFFECTIVENESS ESTIMATES FOR PREVENTING INFLUENZA-ASSOCIATED HOSPITALIZATION AMONG CANADIAN ADULTS: AN UPDATE FROM THE CIRN SERIOUS OUTCOMES SURVEILLANCE (SOS) NETWORK
17. **Jason LeBlanc:** STREPTOCOCCUS PNEUMONIAE NASOPHARYNGEAL CARRIAGE IN CANADIAN ADULTS HOSPITALIZED WITH COMMUNITY-ACQUIRED PNEUMONIA FROM 2010 TO 2017
18. **Jason LeBlanc:** IMPACT OF FRAILTY ON PNEUMOCOCCAL COMMUNITY ACQUIRED PNEUMONIA
19. **May ElSherif:** POLIOVIRUS 1 SEROPREVALENCE IN NOVA SCOTIA, CANADA

Byrne, Catherine
Graduate Student,
University of British Columbia

IMPERFECT CMV VACCINES CAN REDUCE THE OCCURRENCE OF CMV-CAUSED CONGENITAL ABNORMALITIES

AUTHORS: Catherine Byrne, Daniel Coombs, Soren Gantt

AFFILIATION: University of British Columbia

INTRODUCTION: Congenital cytomegalovirus (CMV) infection is a major cause of permanent neurodevelopmental damage; thus, the development of a CMV vaccine is a top public health priority. Despite CMV's high prevalence, CMV has been shown to be inefficient at establishing infection, with the probability of transmission likely driven by the frequency and viral load of exposures. A vaccine that can even modestly reduce the viral load of shedding in the donor and/or viral spread in the recipient should greatly reduce transmission and disease burden. Using mathematical modelling, we aimed to determine what vaccination strategies may effectively reduce the occurrence of congenital CMV.

Methods: We developed a mathematical model to accurately describe the current CMV transmission dynamics within the population. Parameters governing the major routes of CMV transmission, namely transmission between mothers and babies and transmission among children in daycare, were informed by pre-existing data on the prevalence and dynamics of CMV infection. Using our model, we next analyzed the effects of vaccines when given to different age groups and to different proportions of the population.

Results: We found that vaccines that provide sterilizing immunity were not essential for reducing the incidence of congenital CMV. Rather, imperfect vaccines that sufficiently decrease susceptibility, reactivation and/or viral shedding in an individual, and are given to a high enough proportion of the population were sufficient. Vaccines targeting young children, who are the largest spreaders of CMV, are most effective.

Conclusions: Up until now, invoking sterilizing immunity against CMV has been thought to be the only way of effectively reducing the burden of CMV on the population. Our results, however, suggest that imperfect vaccines, perhaps even ones which have already been developed, should be re-evaluated and may prove equally effective.

Chambers, Catharine
Graduate Student
Unity Health Toronto

VACCINE PROTECTION AGAINST PREVALENT ANAL HPV INFECTION AMONG YOUNG MEN WHO HAVE SEX WITH MEN: A CANADIAN IMMUNIZATION RESEARCH NETWORK-FUNDED STUDY

AUTHORS: Catharine Chambers,[1] Ramandip Grewal,[1] Ashley Mah,[2] Troy Grennan,[3] Alexandra de Pokomandy,[4] Joseph Cox,[4] Gilles Lambert,[5] David Moore,[6] Trevor Hart,[7] Shelley Deeks,[8] Chantal Sauvageau,[9] Gina Ogilvie,[10] Anna Yeung,[1] Darrell Tan,[1] Eduardo Franco,[4] Marc Brisson,[11] Nathan Lachowsky,[12] Daniel Grace,[2] Rosane Nisenbaum,[1] Jody Jollimore,[13] Francois Coutlee,[14] Ann Burchell[1]

AFFILIATION: [1]St. Michael's Hospital; [2]University of Toronto; [3]British Columbia Centre for Disease Control; [4]McGill University; [5]Direction régionale de santé publique; [6]British Columbia Centre for Excellence in HIV/AIDS; [7]Ryerson University; [8]Public Health Ontario; [9]Institut national de santé publique du Québec; [10]University of British Columbia; [11]Research Centre of the CHU de Québec; [12]University of Victoria; [13]Community-base Research Centre; [14]Centre hospitalier de l'Université de Montréal

Introduction: Based on clinical trials, vaccine efficacy against anal detection of vaccine-preventable HPV types is >80% for gay, bisexual, and other men who have sex with men (gbMSM) with no prior HPV infection. Since 2015/16 in some Canadian provinces, HPV vaccine has been publicly-funded for gbMSM ≤26-years-old. We hypothesized that anal HPV prevalence would be lower among vaccinated compared to unvaccinated gbMSM soon after implementation of these programs.

Methods: Self-identified gbMSM were recruited into the Engage Cohort Study using respondent-driven sampling (RDS) in Canada's 3 largest cities (Montreal, Toronto, Vancouver) starting in 02/2017. At baseline, men 16-30-years-old self-reported HPV vaccination (≥1 dose) and self-collected anal specimens for type-specific HPV-DNA testing. We compared the prevalence of quadrivalent (HPV6/11/16/18) vaccine-preventable types between vaccinated and unvaccinated gbMSM using logistic regression.

Results: Preliminary results as of 02/2019 are based on 454 gbMSM (median age=26 years; median age at first anal sex=18 years; 4.2% HIV-positive). RDS-unadjusted vaccine uptake was 39.6% overall (50.0% in 16-26-year-olds and 27.0% in 27-30-year-olds). Among vaccinated men, 60.6% had received 3 doses. HPV6/11/16/18 prevalence was lower in vaccinated vs. unvaccinated men (21.1% vs. 27.8%). After adjustment for potential confounders (age, city, number of recent male sex partners, and lifetime history of STI diagnosis), aOR against prevalent infection was 0.69 (95%CI=0.42-1.12). Vaccination was protective in 27-30-year-olds (aOR=0.34, 95%CI=0.15-0.80) who had a longer median time since vaccination (2 vs. 1 years) and were more likely to receive 3 doses (68.1% vs. 57.5%) compared to 16-26-year-olds in whom vaccine was not protective (aOR=1.04, 95%CI=0.56-1.92).

Conclusions: Findings suggest lower anal prevalence of HPV6/11/16/18 in vaccinated compared to unvaccinated gbMSM, with better protection in 27-30-year-olds, but the timing of vaccination relative to acquisition of HPV infection was unknown. Vaccine effectiveness estimates against clinically-relevant endpoints such as persistent infection are needed for gbMSM in real-world settings.

.

Donken, Robine
Post-Doctoral Fellow
BCCHR

NATURAL BOOSTING OCCURS IN HPV VACCINATED GIRLS: EXPOSURE, IMMUNE RESPONSE OR BOTH?

AUTHORS: Robine Donken[1,2,3], Gina Ogilvie[2,3], Mel Krajden[4,5], Darrel Cook[4], Arianne Albert[2], Margaret Stanley[6], Kim Marty[1], Jennifer Mark[1], Elisabeth McClymont[2,3], Simon Dobson[7], Manish Sadarangani[1,8]

AFFILIATION: [1]Vaccine Evaluation Center, BC Children's Hospital Research Institute, University of British Columbia; [2]Women's Health Research Institute, BC Women's Hospital and Health Service; [3]School of Population and Public Health, University of British Columbia; [4]BC Centre for Disease Control; [5]Department of Pathology, University of British Columbia; [6]Department of Pathology, University of Cambridge; [7]Infection Prevention and Control Unit, Sidra Medicine, Doha, Quatar; [8]Department of Pediatrics, University of British Columbia

INTRODUCTION: After natural HPV exposure in vaccinated individuals, HPV immune responses may be enhanced ('boosted'). We aimed to evaluate whether natural boosting occurs and the associated factors up to 10 years postvaccination in young women who received the quadrivalent HPV vaccine (QHPV).

METHODS: Girls aged 9-13 years were randomized to receive 2 or 3 doses of QHPV. Blood samples were collected before and at 7, 24, 60 and 120 months post-first dose and surveys were taken at baseline and each year between 60 and 120 months. Antibodies were measured by the competitive Luminex (cLIA) and total IgG (tIgG) immunoassays. A boosting event was defined as an increase in antibodies above the assay variability threshold without interval immunization. A generalized estimating equations model with unstructured correlation matrix was used to examine an association between antibody titers, socio-demographics, sexual behavior and HPV exposure.

RESULTS: Of 73 participants who completed blood sampling at all time points, 17 (23.3%) showed at least one boosting event by cLIA for HPV6,11,16 or 18 during follow-up. Those with higher antibody titres during follow-up had significantly lower odds for an increase in antibodies in the period thereafter (ORs & 95%CIs: HPV6 0.06 (0.02-0.16), HPV11 0.41 (0.33-0.53), HPV16 0.24 (0.09-0.66) and HPV18 0.24 (0.09-0.66)). Geometric mean titres between two and three dose recipients were not significantly different, but two-dose recipients were more likely to show a boosting event during follow-up OR 3.44 (95%CI 1.07-11.11). Eight participants (11%) showed a boosting event measured by tIgG.

CONCLUSIONS: This study showed increasing antibody titres in 23% of adolescents vaccinated with QHPV during 10 years of follow-up. An association with boosting was found for those with lower antibody titres and for participants who received two-doses. The increase in antibody titres could reflect a response to natural exposure or maturation of the immune response.

Fitzpatrick, Tiffany
Graduate Student,
University of Toronto

ESTIMATING THE UNDERLYING BURDEN OF RESPIRATORY SYNCYTIAL VIRUS INFECTION AMONG CHILDREN AND ADULTS IN ONTARIO, CANADA: A MODELLING STUDY

AUTHORS: Tiffany Fitzpatrick, David Fisman, Ashleigh Tuite

AFFILIATION: Dalla Lana School of Public Health, University of Toronto

INTRODUCTION: Respiratory syncytial virus (RSV) is the leading cause of lower respiratory infections among children globally. Mathematical models can be used to characterize annual RSV seasonal epidemics and are valuable tools to assess the impact of future vaccines. Currently, validated RSV transmission models are scarce, and none have been developed for a Canadian population.

METHODS: We developed a seasonally forced compartmental age-structured Susceptible-Exposed-Infectious-Recovered (SEIR) mathematical model, including additional compartments to capture maternally derived immunity and subsequent re-infections, to realistically capture the natural history of RSV infection. The model was fit to monthly, population-based estimates of RSV-related hospitalizations occurring among all Ontario children under 2 years of age for the period Apr 2002 – Dec 2014. Best-fitting parameter sets were identified based on literature-derived estimates and Latin hypercube sampling.

RESULTS: Over the nearly 13-year study period, 19,655 RSV-related admissions were identified in this cohort of Ontario infants. Our model accurately reproduced observed patterns in seasonal RSV epidemic peaks (approximately 500-600 monthly hospitalizations) occurring annually around February. Based on this model, we estimate a large, likely under-diagnosed, burden of RSV admissions among adults (aged 20+), particularly those aged 65+; however, reliable population-based data on RSV burden among older populations is currently limited.

CONCLUSIONS: Our age-structured model based on routinely collected health data accurately captured the observed seasonal RSV epidemic curves among infants. Ranges for best-fit parameter values were consistent with the literature and the model replicated the observed data patterns. This calibrated model suggests that the burden of RSV disease is underappreciated in Ontario. Notably, this base model serves as a platform for future evaluations of emerging RSV vaccines in Ontario.

Grewal, Ramandip
Graduate Student,
Unity Health Toronto

HPV VACCINATION ACROSS A CASCADE OF KNOWLEDGE, WILLINGNESS, AND UPTAKE IN GAY, BISEXUAL, AND OTHER MEN WHO HAVE SEX WITH MEN (GBMSM) IN CANADA: A CIRN STUDY

AUTHORS: Ramandip Grewal[1,2], Anna Yeung[1], Marc Brisson[4], Troy Grennan[5,14], Alexandra De Pokomandy[6], Joseph Cox[6], Gilles Lambert[16], David Moore[7,14], Francois Coutlee[8], Shelley L. Deeks[2,9], Sandra Gardner[2,10], Dane Griffiths[11], Wanrudee Isaranuwatchai[1], Jody Jollimore[12], James Murray[13], Gina Ogilvie[14], Chantal Sauvageau[15], Darrell H.S. Tan[1,2], Mark Gaspar[2], Clemon George[17], Daniel Grace[2], Trevor A. Hart[2,3], Ann N. Burchell[1,2].

AFFILIATION: [1]St. Michael's Hospital; [2]University of Toronto; [3]Ryerson University; [4]Université Laval; [5]BC Centre for Disease Control; [6]McGill University; [7]BC Centre for Excellence in HIV/AIDS; [8]Centre hospitalier de l'Université de Montréal; [9]Public Health Ontario; [10]Baycrest Health Sciences; [11]Gay Men's Sexual Health Alliance; [12]Community-Based Research Centre; [13]Ontario Ministry of Health and Long-Term Care; [14]University of British Columbia; [15]Institut national de santé publique du Québec; [16]Direction régionale de santé publique – Montréal; [17]University of West Indies – Cave Hill

INTRODUCTION: In 2015-2016, Canada began offering publicly-funded HPV vaccination to gay, bisexual, and other men who have sex with men (gbMSM) aged ≤26 years in some jurisdictions. We developed a novel cascade approach to characterize HPV vaccine uptake among gbMSM in three Canadian cities soon after the implementation of the public programs.

METHODS: Engage is a sexual health study of gbMSM aged 16+ in Vancouver, Toronto, and Montreal recruited via respondent driven sampling (RDS) starting in 01/2017. We defined the stages of the HPV vaccination cascade as: 1) unaware of HPV vaccine; 2) aware and undecided/unwilling to get vaccinated; 3) willing to get vaccinated; and 4) vaccinated (referent). We used multinomial logistic regression to identify correlates of stage 4 and report results as adjusted odds ratios (aOR) with 95% confidence intervals. Our results are adjusted for city and stratified by eligibility for free vaccine (eligible: age ≤26; ineligible: age >26) but unadjusted for the RDS design.

RESULTS: Results are based on 2185 men enrolled as of 02/2019. Among 494 men aged ≤26, 18.2% were unaware of the HPV vaccine; 13.8% were aware and undecided/unwilling to get vaccinated; 22.9% were willing to get vaccinated; and 45.1% were vaccinated. Corresponding proportions among 1691 men aged >26 were 27.2%, 10.5%, 45.6%, and 16.7%. Men in stage 1/2 were less likely to have received sexual health information in the past 6 months [age ≤26: Stage 1 vs. 4 aOR=0.27 (0.11-0.67), Stage 2 vs. 4 aOR=0.22 (0.09-0.53); age>26 Stage 1 vs. 4 aOR=0.31 (0.17-0.56), Stage 2 vs. 4 aOR=0.41 (0.21, 0.81)], accessed healthcare [age ≤26: Stage 1 vs. 4 aOR=0.24 (0.12-0.51), Stage 2 vs. 4 aOR=0.37 (0.17-0.85)], disclosed their sexual orientation to their provider [age >26: Stage 1 vs. 4 aOR=0.25 (0.11-0.57), Stage 2 vs. 4 aOR=0.25 (0.10-0.64)] or have a history of routine vaccination [age >26: Stage 1 vs. 4 aOR=0.27 (0.13-0.54), Stage 2 vs. 4 aOR=0.35 (0.16, 0.77)]. Men ≤26 years in stage 1/2/3 were less likely to have a history of routine vaccination [Stage 1 vs. 4 aOR=0.11 (0.05-0.23), Stage 2 vs. 4 aOR=0.15 (0.07-0.34), Stage 3 vs. 4 aOR=0.24 (0.11-0.52)].

CONCLUSIONS: Characterizing vaccine cascades may help to strategize efforts to increase vaccine uptake by identifying barriers to overcome (e.g., awareness of HPV vaccine versus willingness) and subpopulations to target for promotion.

Hakim, Hina
Graduate Student,
Université Laval

A WEB-BASED VISUALIZATION OF HERD IMMUNITY

AUTHORS: Hina Hakim[1], Christine T. Chambers[2], Eve Dubé[3], S. Michelle Driedger[4], Teresa Gavaruzzi[5], Anik M. C. Giguere[1], Noah M. Ivers[7], Éric Kavanagh[1], Shannon MacDonald[7], Rita Orji[2], Elizabeth Parent[8], Jean-Sébastien Paquette[1], Jacynthe Roberge[1], Beate Sander[6], Aaron Scherer[9], Martin Tremblay-Breault[1], Bryna Warshawsky[10], Kumanan Wilson[11], Daniel Reinharz[1], Holly O. Witteman[1]

AFFILIATION: [1]Laval University; [2]Dalhousie University; [3]Institut national de santé publique du Québec; [4]University of Manitoba; [5]University of Padova, Italy; [6]University of Toronto; [7]University of Alberta; [8]University Health Network, Toronto General Hospital; [9]University of Iowa; [10]Public Health Ontario; [11]University of Ottawa

INTRODUCTION: Recent studies suggest that improving understanding of herd immunity may increase intentions to be vaccinated. We aimed to design a dynamic visualization about herd immunity and optimize viewers' cognitive and emotional responses.

METHODS: Our multidisciplinary team developed a web-based visualization (a short animated video) about herd immunity based on epidemiological evidence. The visualization shows how different parameters (e.g., vaccine coverage, intra-community contact) influence herd immunity. We predefined communication goals, created visualizations accordingly, and tested iterative versions in a university-based human-computer interaction laboratory and community-based settings (a cafeteria, two shopping malls, a public library) across three iterative cycles. Data included psychophysiological measures (e.g., eye tracking, EEG) to assess people's interaction with the visualization and qualitative data to assess their interpretations of the visualization content.

RESULTS: Participants (n=102) were 59% women, 37% men (4% not reported), with mean age 41 years (SD 16) and various levels of education. Many responses aligned with our communication goals. For example, when the visualization showed an infection moving from person to person, this drew participants' attention. Participants demonstrated higher emotional arousal, indicating potential stress or fear, when the visualization showed an infection infecting a baby or older person. However, details such as images of different viruses proved confusing and were subsequently removed. Overall, after viewing the visualization, participants' verbal reports suggested they understood how herd immunity safeguards vulnerable community members when sufficient community members are vaccinated.

CONCLUSIONS: Better understanding of herd immunity and its impact on others may help improve vaccine acceptance and uptake. Our visualization helped people understand the concept of community immunity.

Hempel, Karsten
Post-Doctoral Fellow,
University of Alberta

EVALUATION OF THE EFFECTIVENESS OF MATERNAL IMMUNIZATION IN ALBERTA USING AGENT-BASED MODELING

AUTHORS: Hempel K[1], McDonald W[2], Osgood ND[2], Doroshenko A[1]

AFFILIATIONS: [1]Division of Preventive Medicine, University of Alberta, [2]Department of Computer Science, University of Saskatchewan

INTRODUCTION: Pertussis has exhibited a recent resurgence in Canada. The highest morbidity and mortality are seen among infants. Public health authorities now recommend immunizing pregnant women to reduce the burden of pertussis in infants.

METHODS: We developed an agent-based model to depict pertussis epidemiology in Alberta and measure the effectiveness of pertussis vaccination during pregnancy. Population demography, vital statistics, disease biology, and vaccination schedules and coverage were parameterized from government statistics and published literature. Age-specific background, household, school, and exogenous transmission rates were calibrated with Alberta longitudinal notifiable disease data and school outbreak reports. We validated model simulations by comparing model output to average and age-specific annual pertussis incidence in Alberta, and the relative risk (RR) of pertussis since last vaccination reported in literature. Maternal immunization in the third trimester conferred an incremental increase in protection in mothers and a transfer of passive protection to infants that subsequently waned. Blunting was included in the model with the reduction in protection in infants based on reported decline in antibody levels. We ran the model sets of 10 simulations, each for 30 years on 500,000 population and computed preventable fraction in population and vaccine effectiveness.

RESULTS: Average yearly incidence over the course of simulations ranged from 2 to 30 cases per 100,000 for all ages. The average RR of contracting pertussis per year since last vaccine was 1.45. At the population level, the reduction in pertussis cases attributable to maternal vaccination in simulations with 50% and 75% maternal vaccination coverage ranged from 50% to 74%; 39% to 64%; 45% to 67%; and 38% to 64%, in 0-2, 2-4, 4-6 and 7-12 months age-groups respectively. The effect of blunting resulted in diminishing the magnitude of the reduction in infants under 12 months between 8 and 22% depending on the degree of blunting.

CONCLUSIONS: Our model predicts significant reduction in future pertussis cases in infants due to maternal vaccination with immunological blunting moderating its effectiveness assuming observed serological blunting translates into lower vaccine protection. The model is sensitive to maternal vaccination coverage. The effect of maternal immunization on population other than infants remains to be elucidated.

Lopez, Jimmy
Graduate Student,
VEC British Columbia

CANADIAN NATIONAL VACCINE SAFETY (CANVAS) NETWORK SEASONAL INFLUENZA SAFETY SURVEILLANCE, 2018 AND 2019

AUTHORS: Jimmy Lopez[1], Julie Bettinger[1], Louis Valiquette[2], Gaston De Serres[3], Otto G. Vanderkooi[4], Brenda Coleman[5], Karina Top[6], Jennifer Isenor[6], James D. Kellner[4], Anne McCarthy[7], Matthew Muller[8]

AFFILIATION: [1]Vaccine Evaluation Center, University of British Columbia; [2]Centre Hospitalier Universitaire de Sherbrooke; [3]Centre Hospitalier Universitaire de Québec; [4]Alberta Children's Hospital, University of Calgary; [5]Mount Sinai Hospital; [6]IWK Health Centre and Canadian Center for Vaccinology; [7]Ottawa Hospital; [8]St. Michael's Hospital

INTRODUCTION: The Canadian National Vaccine Safety (CANVAS) network provides influenza vaccine safety information from over 20,000 adults and children across Canada each year. The network is able to quickly detect signals for potential adverse events after receiving the annual influenza vaccine using active surveillance monitoring.

METHODS: Individuals who received the annual influenza vaccine in the fall of 2018 were invited to complete an online survey 7 days after vaccination. Participants enrolled from previous years served as the control group and they received an online questionnaire 2-3 weeks prior to the start of the 2018 influenza campaign to determine the background rate of health events. Participants who received the influenza vaccine in 2018 will serve as the control group for the 2019 influenza campaign. Questionnaires for the control and vaccinated groups provide information on participant demographics, influenza vaccination history, health status and events of interest over the past 7 days. Analyses were conducted to detect health events preventing participation in daily activities or requiring medical consultation in children and adults, and to determine if rates of adverse events are higher in the vaccinated group compared to the control group.

RESULTS: In 2018, 25,799 (61.4% female) participants completed the online survey a week after receiving the seasonal influenza vaccine. During this time-period, 857 participants (3.3%) reported having developed or experienced a severe health event, which primarily resulted in prevention of daily activities and/or need to seek medical care. Adverse events were mostly associated with systemic symptoms and gastrointestinal symptoms. A higher rate of events was reported when compared to the control group (2.5%). We anticipate a similar trend of low rate of events in the upcoming 2019 campaign based on previous years' data. Recruitment for the 2019 influenza campaign will begin this fall.

CONCLUSIONS: The annual influenza vaccine demonstrates a low rate of adverse events. However, vaccinated groups tend to report a higher rate of events compared to the control group.

Mah, Ashley
Graduate Student,
University of Toronto

FACTORS ASSOCIATED WITH VALID SELF-COLLECTED ANAL SWABS FOR HPV GENOTYPING IN URBAN GAY, BISEXUAL AND OTHER MEN WHO HAVE SEX WITH MEN: A CIRN STUDY

AUTHORS: Ashley Mah,[1] Catharine Chambers,[2] Anna Yeung,[2] Ramandip Grewal,[2] Troy Grennan,[3] Alexandra de Pokomandy,[4] Joseph Cox,[4] Gilles Lambert,[5] David Moore,[6] Trevor Hart,[7] Shelley Deeks,[1,8] Chantal Sauvageau,[9] Gina Ogilvie,[10] Darrell Tan,[2] Marc Brisson,[11] Nathan Lachowsky,[12] Daniel Grace,[1] Rosane Nisenbaum,[2] Jody Jollimore,[13] Francois Coutlee,[14] Ann Burchell[2]

AFFILIATIONS: [1]University of Toronto; [2]St. Michael's Hospital; [3]British Columbia Centre for Disease Control; [4]McGill University; [5]Direction régionale de santé publique; [6]British Columbia Centre for Excellence in HIV/AIDS; [7]Ryerson University; [8]Public Health Ontario; [9]Institut national de santé publique du Québec; [10]University of British Columbia; [11]Research Centre of the CHU de Québec; [12]University of Victoria; [13]Community-based Research Centre; [14]Centre hospitalier de l'Université de Montréal

INTRODUCTION: Human papillomavirus (HPV) testing is useful to monitor the underlying epidemiology in at-risk populations and the impact of vaccination. Self-collected specimens minimize participant burden and improve study efficiency, but may result in invalid specimens. We identified characteristics associated with having a valid anal specimen for HPV testing as part of an ongoing study among urban gay, bisexual and other men who have sex with men.

METHODS: Starting in 02/2017, men were recruited into the Engage Cohort Study from Vancouver, Toronto, and Montreal using respondent-driven sampling (RDS). Men aged 16-30 years were invited to self-collect anal specimens on site for HPV DNA testing with verbal and visual instructions provided. Specimens were considered valid if either of the following were detected: (1) human DNA β-globin; or (2) HPV DNA by the Linear Array HPV Genotyping Test. We used univariable logistic regression to identify correlates of having a valid anal specimen. Analyses were not RDS-adjusted.

RESULTS: Preliminary results as of 02/2019 are available from 657 men; of these, 74.0% (n=486) had valid anal specimens. Characteristics associated with providing valid samples included past diagnosis with anogenital warts (odds ratio, OR=2.2; 95% confidence interval, CI: 1.2, 4.0), recent (i.e., in the past 6 months) receptive anal sex (OR=2.1; 95% CI: 1.4, 3.1), recent receipt of sexual health information from a health care provider(OR=1.5; 95% CI: 1.1, 2.1), recent STI diagnosis (OR=1.9; 95% CI: 1.1, 3.3), and older age (OR=1.1 per year; 95% CI: 1.0, 1.1).

CONCLUSIONS: Men who had histories of receptive anal sex, an STI, and increased awareness of sexual health information were more likely to have valid anal specimens for HPV testing. Thus, anal HPV prevalence estimates may be biased as they are necessarily limited to men with valid specimens, who in turn tend to have increased risk for HPV exposure.

McGirr, Ashleigh
Technologist,
GSK

AN EARLY LOOK AT THE SECOND DOSE COMPLETION OF THE RECOMBINANT ZOSTER VACCINE (RZV) IN CANADIAN ADULTS – A RETROSPECTIVE ANALYSIS

AUTHORS: McGirr Ashleigh[1], Bourgoin Tara Ada[2], Wortzman Michael[1], Millson Brad[2], McNeil Shelly[3]

AFFILIATION: [1]GSK, Mississauga; [2]IQVIA; [3]Dalhousie University & Nova Scotia Health Authority

INTRODUCTION: In October 2017, the recombinant zoster vaccine (RZV) was authorized for use in Canada for the prevention of herpes zoster (HZ) in adults 50 years of age or older. The indicated vaccination schedule consists of two doses administered intramuscularly, 2-6 months apart. Based on an acceptable safety profile and robust immune response, the Canadian National Advisory Committee on Immunization (NACI) has stated that a 0, 12-month schedule may be considered if flexibility in the timing of the second dose is needed. The objective of this study is to evaluate the second-dose completion of RZV in Canada from January 2018 to May 2019.

METHODS: Data were obtained from the IQVIA LRx Longitudinal Prescription Database which tracks retail prescriptions of anonymized patients and covers approximately 6,000 pharmacies in Canada, representing almost 70% of Canadians. Patients were followed for 6 months (according to the indicated RZV dosing schedule) or 12 months (according to the pragmatic guidance to improve coverage from NACI) to create two distinct but not mutually exclusive cohorts. The time from first to second dose and the proportion of patients who receive the second dose in each of these cohorts were primary outcomes.

RESULTS: During the 2018-2019 timeframe, there were 155,747 patients with 6 months of follow-up time and 55,524 patients with 12 months of follow-up time. In the 6-month cohort, 65.0% received the second dose of RZV within the indicated 2-6 months. In the 12-month cohort, 74.9% received the second dose within 2-12 months after the first dose. The mean time from first dose to second dose of RZV was 97.8 days (standard deviation (SD) = 35.0 days) for those with 6 months of follow up time and 109.8 days (SD=52.9 days) for those with 12 months of follow up time.

CONCLUSIONS: Early results suggest second dose completion of RZV in Canada is high but inadequate. To achieve high and sustained efficacy from RZV, receipt of the second dose is critical. Further research to understand why patients receiving the first dose of RZV do not go on to receive the second dose within the indicated time frame will be an important next step in an effort to improve series completion.

Mijovic, Hana
Post-Doctoral Fellow, BCCHR

THE IMPACT OF CANADA'S FRAGMENTED HEALTHCARE MODEL ON PERTUSSIS VACCINATION IN PREGNANCY: A QUALITATIVE STUDY OF PERINATAL HEALTHCARE PROVIDERS

AUTHORS: Hana Mijović[1,2], Devon Greyson[3], Emily Gemmell[1], Marie-Eve Trottier[4], Maryline Vivion[4], Janice E. Graham[5], Ève Dubé[4,6], Julie A. Bettinger[1,2]

AFFILIATIONS: [1]Vaccine Evaluation Center, BC Children's Hospital Research Institute**;** [2]Division of Pediatric Infectious Diseases, Faculty of Medicine, University of British Columbia**;** [3]University of Massachusetts**;** [4]Québec National Institute of Public Health; [5]Department of Pediatrics (Infectious Diseases), Faculty of Medicine, Dalhousie University; [6]Department of Anthropology, Université Laval

INTRODUCTION: Vaccination against pertussis during pregnancy has the potential to substantially reduce disease in infants. In 2018, the Canadian National Advisory Committee on Immunization recommended pertussis vaccine for every pregnancy. Since recommendation by a healthcare provider (HCP) is a key influencer of maternal vaccine acceptance, it is important to understand what factors influence HCPs' ability to consistently recommend and provide pertussis vaccine.

METHODS: We conducted semi-structured, individual phone interviews with 44 purposively sampled perinatal HCPs (12 midwives, 9 nurses, 13 family physicians, 10 obstetricians) from 5 provinces, representing diverse educational experiences, practice settings, and models of care. We interpreted these data using qualitative thematic analysis, informed by Interpretive Description.

RESULTS: HCPs' ability to recommend and provide pertussis vaccine was strongly influenced by structural constraints in the fractured healthcare system. Clinical training of HCPs varied depending on their practice settings resulting in different knowledge and practices. HCPs felt hindered by a lack of appropriate-level information resources for their pregnant clients/patients. In the midst of these challenges, consistent and convenient vaccine access was perceived to be key to promoting confidence and encouraging uptake.

CONCLUSIONS: Our findings suggest that Canada's fragmented healthcare model has a detrimental effect on HCPs' ability to recommend and ensure universal access to pertussis vaccine. Lessons from this pertussis vaccine program are pertinent to the implementation of successful future pregnancy vaccination programs.

Mijovic, Hana
Post-Doctoral Fellow, BCCHR

SHOULD CONVERSATIONS ABOUT INFANT VACCINES BEGIN IN PREGNANCY? FINDINGS FROM A QUALITATIVE STUDY AMONG CANADIAN PRIMARY HEALTHCARE PROVIDERS

AUTHORS: Jordan Lively[1], Hana Mijović[1,2], Devon Greyson[3], Emily Gemmell[1], Ève Dubé[4,5] Shannon MacDonald[6], Margaret L. Russell[7], Janice E. Graham[8], Julie A. Bettinger[1,2]

AFFILIATIONS: [1]Vaccine Evaluation Center, BC Children's Hospital Research Institute; [2]Division of Pediatric Infectious Diseases, Faculty of Medicine, University of British Columbia**;** [3]University of Massachusetts**;** [4]Québec National Institute of Public Health**;** [5]Department of Anthropology, Université Laval**;** [6]Faculty of Nursing, University of Alberta**;** [7]Department of Community Health Sciences, University of Calgary; [8]Department of Pediatrics (Infectious Diseases), Faculty of Medicine, Dalhousie University

INTRODUCTION: Confident recommendation by a trusted healthcare provider is an important determinant of childhood vaccine uptake. Many parents start making decisions about vaccines during pregnancy. We conducted a qualitative study to understand whether and how primary healthcare providers of pregnant women discuss infant vaccines with patients and their families.

METHODS: Semi-structured telephone interviews were conducted with a purposive sample of 12 family physicians and 7 nurses from Alberta, British Columbia, Manitoba, Nova Scotia and Ontario, all of whom provided perinatal care. Data were analyzed through thematic analysis.

RESULTS: 9 participants initiated infant vaccine conversations during pregnancy and 10 did not. Those who did described the importance of understanding parental vaccine attitudes and allowing enough time for parents to review information and revisit concerns at subsequent visits. They commonly introduced infant vaccination by emphasizing the health of the whole family, including discussion around pregnancy vaccines and immune status of other family members. Initiating infant vaccine conversations during pregnancy was thought to be particularly important for vaccine-concerned parents. Providers who did not address infant vaccines felt that prioritizing other topics during pregnancy did not leave them with enough time to discuss infant vaccines.

CONCLUSIONS: Primary healthcare providers of pregnant women are well-positioned to introduce the topic of infant vaccines but may lack time to address the issue. For providers of vaccine-concerned patients, there may be a benefit to introducing infant vaccination during pregnancy. Longitudinal research is needed to elicit whether and how discussing infant vaccines during pregnancy affects parental vaccine confidence after birth.

Munoz, Caroline
Graduate Student,
Dalhousie University

REIMMUNIZATION AMONG PATIENTS WITH PREVIOUS ADVERSE EVENTS FOLLOWING IMMUNIZATION IN THE SPECIAL IMMUNIZATION CLINIC NETWORK

AUTHORS: Caroline Munoz[1], Anne Pham-Huy[2], Wendy Vaudry[3], Jeffrey Pernica[4], François Boucher,[5] Cora Constantinescu,[6] Manish Sadarangani, [7] Bruce Tapiéro, [8] Shelley Deeks[9], Shaun Morris[10], Athena McConnell,[11] Francisco Noya,[12] Shelly McNeil,[1] Gaston De Serres,[13] Scott Halperin[1], Karina Top [1], for the SIC Investigators.

AFFILIATIONS: [1]Dalhousie University, [2]Children's Hospital of Eastern Ontario, [3]Stollery Children's Hospital, [4]McMaster's Children's Hospital, [5]CHU Laval, [6]Alberta Children's Hospital, [7]BC Children's and Women's Hospital, [8]CHU Sainte-Justine, [9]Public Health Ontario, [10]Hospital for Sick Children, [11]Royal University Hospital, [12]Montreal Children's Hospital, [13]Institut nationale de santé publique

INTRODUCTION: After an adverse event following immunization (AEFI), physicians and patients may be concerned about the risks of revaccination with one or more of the same antigens as the vaccine associated with the initial AEFI. Our objective was to estimate the frequencies of physician recommendation for revaccination, patients' intention to be revaccinated, revaccination uptake and AEFI recurrence among patients assessed in the Special Immunization Clinic (SIC) Network for a previous AEFI.

METHODS: Our analysis included patients requiring revaccination who were assessed at the multi-centre SIC Network from 2013-2018 for a prior AEFI including fever ≥40.5˚C, local reaction ≥10cm, allergic symptoms <24hours after vaccination, neurologic or other systemic symptoms. Following standardized clinical assessment, patients recommended for revaccination were followed up to capture revaccination details and AEFI recurrences. Non-nominal data were extracted from the SIC Network's electronic database and analyzed using SAS V.9.4.

RESULTS: From 2013-2018, the SIC Network enrolled 657 patients with a history of AEFI; 91% were children <18 years of age, 48% were male and 9% experienced a serious AEFI (resulting in hospitalization >24 hours, permanent disability). Seventy-nine percent of patients were recommended for revaccination including 75% of those with injection site reactions, 82% of those with allergic-like events, 67% of those with neurologic AEFIs and 84% of those with other systemic AEFIs. Of the 516 patients, 457 (86%) intended to be revaccinated, 333 (65%) completed revaccination of as September 2019 and 39 (9%) were not yet due for revaccination. AEFI recurrence was reported in 33 (10%) revaccinated patients of which 29 (88%) recurrences were less severe or of similar severity to the initial AEFI.

CONCLUSIONS: Most patients assessed in the SIC Network for a prior AEFI were recommended for revaccination and AEFI recurrences were uncommon, 10% of patients. Patients' intention to be revaccinated was high; however revaccination uptake was lower than stated intention. Future analysis will assess patient characteristics associated with receiving a recommendation for revaccination and stated intent to be revaccinated.

Pringle, Wendy
Post-Doctoral Fellow,
University of British Columbia

CHALLENGES AND OPPORTUNITIES IN PROMOTING VACCINE CONFIDENCE AMONG REGISTERED MIDWIVES AND CLIENTS

AUTHORS: Wendy Pringle[1], Devon Greyson[2], Hana Mijović[1], Ève Dubé[3], Marie-Ève Trottier[3], Janice Graham[4], Margaret Russell[5], Shannon E. MacDonald[6], Julie A Bettinger[1]

AFFILIATION: [1]Vaccine Evaluation Centre, University of British Columbia; [2]University of Massachusetts Amherst; [3]Quebec National Institute of Public Health; [4]Dalhousie University; [5]University of Calgary; [6]University of Alberta

INTRODUCTION: Pregnancy, a time of active information seeking, is an especially formative time for thinking about vaccination. Previous research indicates that many mothers are forming their vaccine intentions during pregnancy, and desire recommendations from their maternity care providers. Increasingly in Canada, these maternity care providers are Registered Midwives (RMs). This study explores challenges Canadian RMs face in recommending or administering vaccines to their clients in pregnancy and postpartum.

METHODS: We conducted semi-structured, individual phone interviews with 10 Canadian RMs with diverse experience and practice settings. Interview guides covered participants' attitudes about prenatal and infant vaccinations, clinical practice related to vaccination and vaccine information, and experiences with vaccine-promotion interventions. Data were analyzed using inductive qualitative content analysis to identify themes.

RESULTS: While midwives generally expressed confidence in the safety and effectiveness of vaccines, most reported barriers to promoting vaccination to their clients. These barriers could be characterized as issues of vaccine logistics, scope of practice, and philosophy. Participants identified logistical challenges in administering and documenting vaccination and suggested that the nature of vaccine discussions with pregnant and postpartum clients can be fraught or complex. Some RMs saw immunization as beyond the scope of midwifery care, which typically ends at six weeks postpartum, before the infant vaccine schedule begins, instead deferring clients to public health. Additionally, the varying interpretations of "informed choice" (as opposed to "informed consent") led some RMs to feel that they should not make a strong pro-vaccine recommendation.

CONCLUSIONS: Despite vaccine confidence, Canadian RMs experience barriers to strongly recommending or administering vaccines to clients. External support for vaccine logistics, including further vaccine communication training, may resolve some barriers. Others, such as reaching consensus regarding the relation of vaccination to issues of philosophy and scope, likely require internal consensus-building within the profession.

Andrew, Melissa
Associate Professor,
Dalhousie University

INFLUENZA BURDEN OF DIESEASE AND 2018/19 END-OF-SEASON INFLUENZA VACCINE EFFECTIVENESS ESTIMATES FOR PREVENTING INFLUENZA-ASSOCIATED HOSPITALIZATION AMONG CANADIAN ADULTS: AN UPDATE FROM THE CIRN SERIOUS OUTCOMES SURVEILLANCE (SOS) NETWORK

AUTHORS: Shelly A McNeil[1], Todd Hatchette[1], Lingyun Ye[1], Ardith Ambrose[1], May ElSherif[1], Jason Leblanc[1], Donna Mackinnon-Cameron[1], Guy Boivin[2], Kevin Katz[3], Mark Loeb[4], Anne E McCarthy[5], Janet E McElhaney[6], Allison McGeer[7], Sylvie Trottier[2], Louis Valiquette[8], Melissa K Andrew[1] On behalf of the CIRN SOS Network Investigators and the Toronto Invasive Bacterial Diseases Network (TIBDN) Investigators

AFFILIATION: [1]Dalhousie University; [2]Laval; [3]North York General Hospital; [4]McMaster University; [5]University of Ottawa; [6]Health Sciences North; [7]Mount Sinai Hospital; [8]Université de Sherbrooke

INTRODUCTION: Influenza surveillance is important in order to understand patterns of disease burden and vaccine effectiveness (VE). In Canada, the Serious Outcomes Surveillance (SOS) Network conducts active surveillance for influenza hospitalizations at 8 adult and community hospitals in four provinces (Ontario, Quebec and Nova Scotia). We contribute these Canadian data to the Public Health Agency of Canada's FluWatch and also to the Global Influenza Hospital Surveillance Network (GIHSN).

METHODS: Active surveillance for influenza infection in adults (≥16 years of age) was conducted between November 1st 2018 to June 1st 2019. For laboratory confirmation, all patients with acute respiratory illness or unexplained sepsis had nasopharyngeal swab PCR testing for influenza A & B. Clinical and demographic data included age, vaccination status and frailty. Comparing influenza cases with test-negative controls, VE was calculated as VE = 1-OR x 100%.

RESULTS: 946 lab-confirmed influenza cases were enrolled in the SOS Network during the 2018-19 influenza season. Influenza A was the predominant strain (92%) though there was some circulation of influenza B throughout the season. Influenza A/H1N1 and A/H3N2 co-circulated: of the 838 A viruses that were subtyped, 439 (52%) were A/H1N1. 40% of patients were younger than 65 years of age, while 22% were aged 65-74 and 38% were aged 75+. Of those with known frailty status, 21% were frail. Overall, 137 (14%) were admitted to ICU and 65 (6.9%) died. 75% of deaths occurred in patients aged 65 and over. Length of stay and 30-day mortality increased with frailty, though ICU admission did not. The overall VE estimate was 42.9% (95% CI:27.8-54.8%). VE was higher for Influenza A (57.6%, 43.0-68.5) than for Influenza B (-12.1%, -131.8-45.8). VE was 50.2% (21.1-68.6) for ages 16-64 and 30.6% (6.9-48.3) for ages 65+.

CONCLUSIONS: The SOS Network contributes to influenza surveillance (informing understanding of burden of disease and vaccine effectiveness) in Canada, and also contributes to global surveillance efforts through the GIHSN. The SOS Network's continued focus on outcomes and health measures relevant to older adults contributes to our understanding of influenza in this important and vulnerable population.

Andrew, Melissa
Associate Professor,
Dalhousie University

DEMENTIA, DELIRIUM AND OUTCOMES OF HOSPITALIZATION WITH ACUTE RESPIRATORY ILLNESS

AUTHORS: Judith Godin[1], Shelly A. McNeil[1], Janet E. McElhaney[2], Melissa K. Andrew[1]

AFFILIATION: [1]Dalhousie University; [2]Health Sciences North

INTRODUCTION: Dementia and delirium have important associations with acute care health service use and outcomes, yet they are often incompletely considered in studies of other health conditions. We aimed to study the prevalence of dementia, cognitive impairment not dementia (CIND), and delirium and their association with outcomes in the context of older adults admitted to acute care hospitals as part of active influenza surveillance in the Canadian Immunization Research Network (CIRN) Serious Outcomes Surveillance (SOS) Network.

METHODS: The SOS Network Conducts active surveillance for influenza in hospitals across Canada. During each influenza season since 2010/11, patients admitted to SOS hospitals with broadly defined acute respiratory illness have been enrolled and tested for influenza using standard protocols. Given the important burden of influenza in older adults, frailty and function are important considerations, and data collection includes multiple domains based on the principles of Comprehensive Geriatric Assessment for all patients aged 65+, as well as completion of the Clinical Frailty Scale (CFS). Here we pooled data across three influenza seasons (2011/12, 2012/13, and 2013/14). Baseline cognition was classified based on the best available clinical data (chart notes, interview with patient and/or caregivers) as normal cognition, CIND, or dementia. Clinical diagnosis of delirium was also identified using chart documentation and interview. Outcomes included length of stay (LOS), 30-day post discharge survival, and admission to a Long-Term Care Facility (LTCF).

RESULTS: 7,524 enrolled patients were aged 65+, of whom 6,298 patients had data for cognitive status. Among these 3,319 (52.7%) were women and 2,427 (38.5%) had laboratory-confirmed influenza. Baseline cognition was normal in 71.6%, while 12.8 % were documented as having dementia, and 7.0% as having CIND; 10.9% had delirium. After controlling for sex, age, frailty and LTC residency, neither dementia nor delirium was associated with odds of death. CIND (OR = 1.81, 95% CI = 1.20-1.69) and dementia (1.71, 1.27-2.31), but not delirium, were associated with higher odds of discharge to a LTCF. Delirium, but not CIND or dementia, was associated with 2.1 days longer lengths of stay (95%CI = 1.1-3.1). Dementia (1.56, 1.31-1.85) and delirium (1.56, 1.31-1.85) were associated with higher odds of having laboratory-confirmed influenza.

CONCLUSIONS: Dementia and delirium were common among older inpatients admitted to hospital with acute respiratory illness, but likely remain under-recognized in acute care populations. Both dementia and delirium were associated with increased frailty and poor outcomes. In particular, dementia and delirium were associated with higher risk of hospitalization with influenza, independent of age, sex, frailty and LTCF residence.

LeBlanc, Jason
Associate Professor,
Dalhousie University

STREPTOCOCCUS PNEUMONIAE NASOPHARYNGEAL CARRIAGE IN CANADIAN ADULTS HOSPITALIZED WITH COMMUNITY-ACQUIRED PNEUMONIA FROM 2010 TO 2017

AUTHORS: LeBlanc JJ[1]*, ElSherif M[1], Ye L[1], MacKinnon-Cameron D[1], Ambrose A[1], Hatchette TF[1], Lang ALS[1], Gillis HD[1], Martin I[2], Demczuk W[2], Andrew MK[1], Boivin G[3], Bowie W[4], Green K[5], Johnstone J[6], Loeb M[7], McCarthy AE[8], McGeer A[5], Semret M[9], Trottier S[3], Valiquette L[10], Webster D[11], and McNeil SA[1]

AFFILIATION: [1]Canadian Center for Vaccinology (CCfV), IWK Health Centre, Nova Scotia Health Authority (NSHA), and Dalhousie University; [2]National Microbiology Laboratory (NML); [3]Centre Hospitalier Universitaire de Québec; [4]Vancouver General Hospital, and University of British Columbia; [5]Mount Sinai Hospital; [6]Public Health Ontario and University of Toronto; [7]McMaster University; [8]Ottawa Hospital General Campus and University of Ottawa; [9]McGill University Health Centre;; [10]Centre Intégré Universitaire de Santé et de Services Sociaux de l'Estrie – Centre Hospitalier Universitaire de Sherbrooke; [11]Saint John Regional Hospital

INTRODUCTION: *Streptococcus pneumoniae* (Spn) can colonizes the human nasopharynx, and can cause life-threatening infections like community acquired pneumonia (CAP) and invasive pneumococcal diseases (IPD). In Canada, the 13-valent conjugate vaccine (PCV13) was introduced in childhood immunization since 2010, with hopes that it would not only protect the vaccinated, but also confer protection to adults through herd immunity. This study reports on Spn-positivity and serotype distribution in adult carriage from years 2010 to 2017.

METHODS: Active surveillance was performed in adults hospitalized with for CAP or IPD from December 2010 to 2017. For assessment of Spn carriage, NP swabs were tested using *lytA* and *cpsA* real-time PCR. Spn-positive NPs were subjected to serotyping using multiplex PCRs.

RESULTS: Overall, 6472 NP swabs were tested, and Spn was identified in 366 (5.7%). Of the 366 Spn-positive NP swabs, 355 (97.0%) were serotypeable. From years 2010 to 2017, the proportion of Spn-positive NP swabs declined from 8.9% to 4.3%, as did the proportion PCV13 serotypes (76.9% to 42.2%). The decline was primarily attributed to PCV13 serotypes 7F and 19A. PCV13 serotype 3 remained predominant throughout the study, as did non-PCV13 serotypes like 22F, 33F, and 11A. On the other hand, a proportional rise over time was noted for non-vaccine serotypes (from 15.4% to 31.1%). This was primarily attributed to serotypes 23A, 15A, and 35B.

CONCLUSIONS: Monitoring serotype trends is important to assess the impact of pneumococcal vaccines. While herd immunity from PCV13 childhood immunization was anticipated, few studies have assessed its impact on adult carriage. This study demonstrated not only a reduction of PCV13 serotypes over time, but a proportional rise in non-vaccine serotypes. Ongoing serotype surveillance will be needed to compare Spn carriage to serotypes associated with pneumococcal CAP and IPD.

LeBlanc, Jason
Associate Professor,
Dalhousie University

IMPACT OF FRAILTY ON PNEUMOCOCCAL COMMUNITY ACQUIRED PNEUMONIA

AUTHORS: Gillis HD[3], LeBlanc JJ[1-3], McNeil SA[1-3], and Andrew MK[1-3], on behalf of the Serious Outcomes Surveillance Network of the Canadian Immunization Research Network (CIRN SOS)

AFFILIATION: [1]Canadian Center for Vaccinology (CCfV), [2]IWK Health Centre, Nova Scotia Health Authority (NSHA), and [3]Dalhousie University

INTRODUCTION: Pneumococcal community acquired pneumonia (pCAP) causes significant morbidity and mortality worldwide. As adult vaccine recommendations are based on age, and older adults often have multiple co-morbidities, this study described the demographics and outcomes of adults ≥65 years hospitalized with pCAP, when categorized by age and by frailty.

METHODS: This study represents a secondary analyses of data collected by the CIRN SOS Network. Active surveillance for CAP in hospitalized adults was performed in hospitals across five Canadian provinces from December 2010 to 2015. Patient demographics, vaccination history, and outcomes were collected from all CAP cases, and a validated frailty index (FI) was used to measure frailty. Patients with were categorized by age (i.e. 65-74, 75-84, and 85+) or frailty (i.e. non-frail, pre-frail, more frail, and most frail), and the demographics and outcomes of pCAP cases in each category were compared to test-negative CAP case controls.

RESULTS: A total of 3460 CAP cases were identified for whom frailty data had been collected. Of these, 322 tested positive for pCAP. Across all categories of age and frailty, pCAP cases were more likely than test-negative controls to be admitted to ICU, require mechanical ventilation, and were less likely to have received pneumococcal vaccine. In both pCAP cases and controls, the proportion admitted to ICU and who received mechanical ventilation decreased with age and frailty, while vaccine uptake increased. Risk of death increased with age and frailty in both CAP and pCAP groups, though not all differences achieved statistical significance.

CONCLUSIONS: This study shows that a large proportion of frail adults aged ≥65 years in whom vaccination is recommended had not received pneumococcal vaccine, despite the high burden of illness across the spectrum of frailty. Data from this study suggest that ongoing efforts to promote the use of pneumococcal vaccines in older adults is warranted.

ElSherif, May
Research Associate,
Dalhousie University

POLIOVIRUS 1 SEROPREVALENCE IN NOVA SCOTIA, CANADA

AUTHORS: May S ElSherif[1,2], Jason J LeBlanc[1,2], Lisa Barrett[1,2], Shelly A McNeil[1,2], Brian Ward[3], Todd F Hatchette[1,2]

AFFILIATION: [1]Nova Scotia Health Authority, [2]Canadian Center for Vaccinology, Dalhousie University; [3]Research Institute of the McGill University Health Centre; on behalf of the Canadian Immunization Research Network (CIRN) Investigators

INTRODUCTION: Thanks to the efforts of the Global Polio Eradication Initiative, the world has never been closer to eradicating polio as it is today. Without complete eradication from the remaining strongholds, all countries remain at risk. It is the responsibility of polio-free countries to ensure vaccination rates are kept high enough to maintain levels of immunity among the population that prevent reintroduction of poliovirus. Since Nova Scotia (NS) has been exclusively using IPV for prevention and control of polio from the time it was licensed in 1955, immunity among adults and seniors may be declining as a result of waning immunity. The risk of virus reintroduction can be assessed by determining the seroprevalence of neutralizing antibodies in the population.

METHODS: We validated the poliovirus standardized microneutralization (MN) assay and developed an immunoadsorption (IA) technique to generate poliovirus non-immune serum to use as a negative control. Using the MN assay, we examined the prevalence and levels of neutralizing antibodies against poliovirus 1 (PV1) in Nova Scotia by testing residual sera from three age groups (10 – 29, 30 – 49, and 50 – 64 years old).

RESULTS: 648 anonymized sera from health zones across NS were tested for anti-PV1 titers. Overall, PV1 seroprevalence in NS (89.2%) was above the herd immunity threshold range required for protection from poliomyelitis. Across NS, PV1 seroprevalence by age groups 10 – 29, 30 – 49, and 50 – 64 years, was 81%, 94%, and 92.6%, respectively (p <0.001). Using multivariate regression, age was a predictor for seropositivity; the middle and older age groups were likely to be seropositive, with odds ratio ≥3.0 (p <0.0001). IA successfully removes PV1 antibodies from immune serum.

CONCLUSIONS: Although we hypothesized that older adults would have lower levels of antibodies due to waning immunity, seroprevalence rates and geometric mean titers were found to be higher for these age groups. Seroprevalence rates in the younger age group can be increased by enhancing vaccine uptake and schedule completion. We demonstrated the importance and value of seroepidemiological surveys, and have shown that they provide a more accurate determination of population-based protection than vaccination coverage rates alone. Based on our findings, there is no imminent risk to NS from PV1.