

2015 Results

CANADIAN PAEDIATRIC SURVEILLANCE PROGRAM





Mission

To contribute to the improvement of the health of children and youth in Canada by national surveillance and research into childhood disorders that are high in disability, morbidity, mortality, and economic costs to society, despite their low frequency.

Canadian Paediatric Surveillance Program



An established paediatric surveillance network that responds quickly to emerging child health issues and actively monitors persisting paediatric health concerns

By undertaking new multi-year studies and high-profile one-time surveys, the Canadian Paediatric Surveillance Program (CPSP) generates valuable new knowledge to inform clinical research, practice, and policy related to important rare conditions and evolving child health threats. By developing knowledge dissemination tools, including monthly tips on adverse drug reactions (ADR Tips), CPSP Highlights, and Resource articles, the CPSP is able to provide timely information to scientists, clinicians, and decision-makers on both emerging and persisting paediatric conditions.

EMERGING		
One-time surveys	Studies	ADR Tips
Inhalation of e-cigarettes and ingestion of e-liquids	Childhood Lyme disease	Risk of medication errors due to language barriers for newcomers to Canada
Exposure to liquid detergent capsules	Severe alcohol intoxication in 11–15 year olds	Nosodes: No alternative to vaccination

PERSISTING		
One-time surveys	Studies	ADR Tips
Adrenal suppression	Childhood tuberculosis	Liver injury with acetaminophen use
Vitamin D deficiency rickets	Serious adverse drug reactions	Hazards associated with using multiple drugs that prolong QT

NEW AND UPCOMING STUDIES AND SURVEYS

- Medical cannabis use in children and youth
- Medically serious self-harm leading to ICU care
- Non-type 1 diabetes mellitus – A repeat study one decade later
- Physician-assisted dying
- Severe microcephaly
- Severe obesity and global developmental delay in preschool children
- Syrian refugee child and youth health

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Acknowledgements

The key strength of the Canadian Paediatric Surveillance Program (CPSP) is its commitment to improve the health of children and youth in Canada and around the world. This focus would not be possible without the participation of Canadian paediatricians, subspecialists, and other health care providers in the monthly collection of information on rare paediatric conditions, the principal investigators who design studies and analyse the data to provide knowledge and educational solutions, or the guidance of the Steering Committee members. We thank them all.

We also thank IMPACT (Immunization Monitoring Program ACTive) centres for their role in verifying the acute flaccid paralysis study data and for their support of the CPSP.

The strong partnership between the Canadian Paediatric Society and the Public Health Agency of Canada allows the program to grow in Canada and to take a leadership role on the international scene.

Funding

Funding for the CPSP is required to support program management. The surveillance program is funded through a combination of government support and unrestricted grants from Canadian charities, research institutions, hospitals, and corporations. All funding is provided to maintain and expand the program.

We gratefully acknowledge the financial support received in 2015 from the Public Health Agency of Canada's Centre for Chronic Disease Prevention, Health Canada's Therapeutic Effectiveness and Policy Bureau, and the following non-governmental sources:

- Queen's Pediatrics Departmental Development and Innovation Fund
- SUDEP Aware

Foreword

Federal Minister of Health

The Honourable Jane Philpott

As Minister of Health, I am pleased to introduce the *Canadian Paediatric Surveillance Program 2015 Results*. This information will be instrumental in improving the health and well-being of children and youth in Canada by reporting on rare diseases and conditions affecting our young people today.

As a clinician, I've had the opportunity to experience first-hand the role good data plays in health care and how vital it is to informing our practices and health policies. Thanks to the collaboration of over 2500 paediatricians across Canada, the *CPSP 2015 Results* will provide our physicians with insight into how rare diseases affect children and youth, how well treatments are working, and how to identify risk factors and prevention practices.

The success of the CPSP Results is due to a strong partnership between the Canadian Paediatric Society, the Public Health Agency of Canada, and the paediatricians across Canada who give their time to provide information and ongoing support.

The Government of Canada is proud to work with the Canadian Paediatric Society and its members to provide a healthier future for Canadian children and youth.



Chief Public Health Officer of Canada

Dr. Gregory Taylor

Each year, the Canadian Paediatric Surveillance Program Results provides valuable data to researchers and health professionals, contributing importantly to the work this community does to treat and prevent disease in our children.

The promotion and protection of public health relies heavily on the availability of accurate and up-to-date data. The information in these pages serves to direct and support decisions that allow us to take action where it is needed most.

By collecting and monitoring data from thousands of front line community health providers, the Canadian Paediatric Surveillance Program constructs a clear view of the diseases and conditions afflicting Canada's children. Using this comprehensive picture, researchers can work to better understand these diseases, providers can improve patient care, and communities can build better programs, bringing them to the right people in the right place.

I commend the Canadian Paediatric Surveillance Program for this important report and the vital contribution it has made to public health in Canada.



President of the Canadian Paediatric Society

Dr. Robin C. Williams

As President of the Canadian Paediatric Society (CPS), I strongly believe that Canada can, and should, do better for all our children and youth. By participating in an active paediatric surveillance network, we, as paediatricians and subspecialists, have a unique opportunity to contribute valuable data on rare diseases and emerging health conditions that affect our patients and their families.



As a national organization, the CPS has the ability to translate the results of CPSP studies into better clinical care, evidence-based health policies, and stronger laws that protect children and youth from products that are harmful to them. I am proud that the CPSP has undertaken a number of full studies and high-profile one-time surveys that have not only detailed the scope of important paediatric health conditions, but have also provided the data necessary to stimulate constructive system-level change.

In 2015, the CPSP concluded studies on severe alcohol intoxication in adolescents and sudden unexpected death in patients with epilepsy, and conducted one-time surveys on minor injuries in non-ambulatory children, inhalation of e-cigarettes and ingestion of e-liquids, vaccine hesitancy, and vitamin D deficiency rickets.

I would like to take this opportunity to sincerely thank all of you, my fellow colleagues, who diligently report to the CPSP on a monthly basis. Your continued participation and support of the program allows us to gather the information we need to make Canada a better place for all children and youth.

CPSP Chair

Dr. Kimberly Dow

After serving for six years as the Chair of the CPSP Steering Committee, November 2015 marked my final CPSP meeting. As I look back on these last six years, it is very rewarding to reflect on the variety of subjects the CPSP has pursued—from classic surveillance topics, including serious infectious diseases, genetic conditions, and rare neurologic illnesses—to innovative studies not traditionally tackled by surveillance systems, such as child and youth mental health.



Over the years, I have been fortunate to witness the impressive dedication of the research teams who passionately present study proposals to the Steering Committee members and rigorously examine their study results.

As I prepare to pass the torch, I would like to take this opportunity to thank the dedicated CPSP Steering Committee members. The paediatric and public health knowledge and expertise that these individuals bring to the CPSP table is remarkable. I would particularly like to thank Dr. Jonathon Maguire, who will be taking over the role of Chair, and welcome Dr. Charlotte Moore Hepburn, who joined the program in late 2015 as the CPS Medical Affairs Director. I am also grateful for the tremendous support provided by the CPSP staff, led by Melanie Laffin Thibodeau.

Finally, I wish to thank all of the CPSP participants. They have proven, time and time again, that we can count on their faithful monthly reporting.

CPS Medical Affairs Director

Dr. Charlotte Moore Hepburn

I am both delighted and proud to have joined the CPS as the new Medical Affairs Director. The CPSP is a unique and valuable research platform, with an impressive history and a very exciting future.

I am struck, not only by the breadth and sheer number of studies and surveys that the CPSP has led over the last two decades, but also by how directly the results have influenced new practices and policies. It is so very rewarding to be a part of knowledge creation that does not simply sit idle, but rather directly translates into meaningful action.

One of the other most significant features of the program is its ability to connect paediatricians and paediatric subspecialists across Canada. During my first few months with the CPSP, it was remarkable to see how clinicians and researchers initiating new studies were able to reach out, through the network, to diverse potential collaborators. We, as child health providers and advocates, are fortunate to have such passionate and dedicated colleagues, and to have such a robust infrastructure to facilitate the study of rare conditions and evolving health threats.

I am so pleased to have joined the CPSP at such an exciting time. I very much look forward to working with all members of the CPSP community.



Acting CPSP Medical Advisor

Dr. Jonathon Maguire

The CPSP is an important asset to the children of Canada and the health professionals who care for them. As the CPSP Medical Advisor in 2014–2015, I had the privilege of assisting the program with reacting to new threats to children's health, shedding new light on old foes, and furthering our understanding of rare diseases. A number of CPSP studies were published in international journals, several attracted media attention, and all provided valuable data to support improvements in practice or child health policy.

In 2015, we had the opportunity to undertake a strategic planning exercise and develop a plan that will guide the program's priorities over the next three years. Target areas include increasing knowledge translation and publication impact, engaging strong research teams and capacity building, maintaining a high level of involvement from CPSP participants, using study results to inform advocacy efforts, and linking with other organizations to enhance the value of data.

I would particularly like to highlight a new capacity-building initiative that was launched in late 2015, which is the paediatric trainee research grant. This is a great career-building opportunity for paediatric residents who are interested in public health research, rare conditions, or rare complications of more common conditions.

As I take over the role of Chair of the CPSP Steering Committee in 2016, I am looking forward to working with our new research teams, CPSP participants, and the Steering Committee. I would like to thank outgoing Chair Dr. Kimberly Dow, Surveillance Manager Melanie Laffin Thibodeau, and CPS Executive Director Marie Adèle Davis for their tireless dedication to the CPSP.



CPSP Steering Committee

Kimberly Dow, MD (Chair)	Canadian Paediatric Society
Christine Armour, MD	Canadian College of Medical Geneticists (Liaison)
Peter Buck, DVM, MSc	Centre for Food-borne, Environmental and Zoonotic Infectious Diseases, Public Health Agency of Canada
Claude Cyr, MD	Canadian Paediatric Society
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Anne Rowan-Legg, MD	Canadian Paediatric Society
Dorcas Taylor, MSc	Centre for Communicable Diseases and Infection Control, Public Health Agency of Canada

In 2015, **Dr. Kim Dow** completed a six-year term as Chair of the Steering Committee. Kim had previously served on the committee for four years, as a representative of the CPS and liaison for the Paediatric Chairs of Canada. The committee wishes to sincerely thank Kim for her dedication to the program and her valuable expertise on the committee and wish her all the very best in future endeavours.

The committee also extends sincere thanks to **Dr. Jim King**, who served a six-year term as a CPS representative, and **Margaret Herbert** from the Public Health Agency of Canada for their valuable input and contributions to the Steering Committee.

CPSP Working Group

Melanie Laffin Thibodeau, BCom (Chair)	Canadian Paediatric Society
Marie Adèle Davis, MBA	Canadian Paediatric Society
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Jonathon Maguire, MD	Canadian Paediatric Society
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Publications 2013–2015

Published papers related to studies and one-time surveys

(For a complete list with hyperlinks, see www.cpsp.cps.ca/publications/published-papers-related-to-studies.)

Acute flaccid paralysis

Performance of acute flaccid paralysis surveillance compared to WHO standards. Desai S, Smith T, Thorley BR, Grenier D, Dickson N, Altpeter E; SPSU Committee, Sabbe M, Elliott E, Zurynski Y. *J Paediatr Child Health* 2015;51(2):209–14

Guillain-Barré syndrome after immunization in Canadian children (1996–2012). Top KA, Desai S, Moore D, Law BJ, Vaudry W, Halperin SA, Bettinger JA for members of the Canadian Immunization Monitoring Program Active. *Pediatr Infect Dis J* 2015;34(12):1411–3

Acute flaccid paralysis surveillance: The need for ruling out polio infection. Rotondo J, Desai S, Pless R, Ahmad R, Squires S, Booth TF. *Paediatr Child Health* 2015;20(6):309–10

The polio eradication endgame: Why immunization and continued surveillance is critical. Booth TF, Grudeski E, McDermid A, Rotondo J. *Canada Communicable Disease Report* 2015;41(10):232–9

Adverse events following immunization

Canadian paediatricians' approaches to managing patients with adverse events following immunization: The role of the Special Immunization Clinic network. Top KA, Zafack J, De Serres G, Halperin SA. *Paediatr Child Health* 2014;19(6):310–4

Complementary and alternative medicine

Serious adverse events associated with pediatric complementary and alternative medicine. Zorzela L, Boon H, Mior S, Yager J, Gross A, Vohra S. *Eur J Integr Med* 2014;6(4):467–72

Concussion management

Concussion management by paediatricians: A national survey of Canadian paediatricians. Gordon KE, Do MT, Thompson W, McFaul S. *Brain Inj* 2014;28(3):311–7

Congenital cytomegalovirus infection

Congenital cytomegalovirus infection in Canada: Active surveillance for cases diagnosed by paediatricians. Vaudry W, Lee BE, Rosychuk RJ. *Paediatr Child Health* 2014;19(1):e1–5

Congenital myotonic dystrophy

Congenital myotonic dystrophy: Canadian population-based surveillance study. Campbell C, Levin S, Siu VM, Venance S, Jacob P. *J Pediatr* 2013;163(1):120–5.e1–3

Food allergy

Canadian allergists' and nonallergists' perception of epinephrine use and vaccination of persons with egg allergy. Desjardins M, Clarke A, Alizadehfard R, Grenier D, Eisman H, Carr S, et al. *J Allergy Clin Immunol: In Practice* 2013;1:289–94

Growth charts

Use of growth charts in Canada: A National Canadian Paediatric Surveillance Program survey. Lawrence S, Cummings E, Chanoine J-P, Metzger D, Palmert M, Sharma A, Rodd C. *Paediatr Child Health* 2015;20(4):185–8

Methicillin-resistant *Staphylococcus aureus* (MRSA)

Clinical characteristics of pediatric patients hospitalized with methicillin-resistant *Staphylococcus aureus* in Canadian hospitals from 2008 to 2010. Leifso KR, Gravel D, Mounchili A, Kaldas S, Le Saux N. *Can J Infect Dis Med Microbiol* 2013;24(3):e53–6

Paediatric myasthenia

Clinical characteristics of paediatric myasthenia: A surveillance study. VanderPluym J, Vajsar J, Jacob FD, Mah JK, Grenier D, Kolski H. *Pediatrics* 2013;132(4):e939–44

Persistent albuminuria

Persistent albuminuria in children with type 2 diabetes: A Canadian Paediatric Surveillance Program study. Sellers EA, Hadjiyannakis S, Amed S, Dart AB, Dyck RF, Hamilton J, Langlois V, Panagiotopoulos C, Dean HJ. *J Pediatr* 2015 Oct 12. pii: S0022-3476(15)01055-0. doi: 10.1016/j.jpeds.2015.09.042. [Epub ahead of print]

Respiratory syncytial virus infections

Respiratory syncytial virus infections in pediatric transplant recipients: A Canadian Paediatric Surveillance Program study. Robinson JL, Grenier D, MacLusky I, Allen UD. *Pediatr Transplant* 2015;19(6):659–62

Severe combined immunodeficiency

Severe combined immunodeficiency (SCID) in Canadian children: A national surveillance study. Rozmus J, Junker A, Thibodeau ML, Grenier D, Turvey SE, Yacoub W, Embree J, Haddad E, Langley JM, Ramsingh RM, Singh V-A, Long R, Schultz KR. *J Clin Immunol* 2013;33:1310–6

Severe iron-deficiency anemia

Severe iron-deficiency anaemia and feeding practices in young children. Parkin PC, DeGroot J, Maguire JL, Birken CS, Zlotkin S. *Public Health Nutr* 2015 Jun 1:1–7. [Epub ahead of print]

Surveillance

An innovative web based system for reporting rare diseases in paediatrics. Mukhi SN, Laffin Thibodeau M, Szijarto B. *Online J Public Health Informatics* 2015;7(2):e215

CPSP Highlights published in 2015 in *Paediatrics* & *Child Health*

(For a complete list with hyperlinks, see www.cpsp.cps.ca/publications/cpsp-highlights.)

CPSP 2014 Results: What have we learned? Maguire J, Laffin Thibodeau M, Oliver J. *Paediatr Child Health* 2015;20(8):435–6

Acute flaccid paralysis surveillance: The need for ruling out polio infection. Rotondo J, Desai S, Pless R, Ahmad R, Squires S, Booth TF. *Paediatr Child Health* 2015;20(6):309–10

Tick bites in the Lyme light. Barton M, Leonard E, Lindsay LR, Langley JM, Koffi JK, Ogden NH. *Paediatr Child Health* 2015;20(5):237–8

Paediatric palliative care in Canada: A national survey of paediatricians. Cyr C, Maisonneuve M-H. *Paediatr Child Health* 2015;20(3):153–4

Liquid detergent packets: Small, brightly coloured, convenient and hazardous! Do MT, Maguire J, Laffin Thibodeau M. *Paediatr Child Health* 2015;20(2):92

Hypoglycemia in an unmonitored full-term newborn. Flavin M, Maguire J. *Paediatr Child Health* 2015;20(1):52

Presentations in 2015

(For a complete list with hyperlinks, see www.cpsp.cps.ca/publications/presentations.)

National

Conversion disorders

Conversion disorders in Canadian children and youth: A national survey of prevalence estimate and clinical features. Grant C, Krasnik C. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (poster)

Fragile X syndrome

Fragile X syndrome in Canada: A Canadian Paediatric Surveillance Program study. Aubertin G. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (poster)

Kawasaki disease

Kawasaki disease: An update on clinical management. Schwartz S, Yeung R. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (oral)

Liquid detergent packets

Injuries associated with liquid detergent packets. Ofner M, Laffin M, Herbert M, Do MT. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (poster)

Lyme disease

Surveillance for childhood Lyme disease by the Canadian Paediatric Surveillance Program (CPSP): Initial findings. Ogden N, Barton M, Koffi J, Leonard E, Lindsay R, Langley J. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (poster)

Severe alcohol intoxication

Severe alcohol intoxication among Canadian adolescents: Data from first 18 months of surveillance. Acker A, Dow K, Thomas K, Allain D, Norris M. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (poster)

Tuberculosis

Paediatric tuberculosis: A social disease. Kitai I. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (oral)

Early results of national surveillance of childhood tuberculosis in Canada. Giroux R, Kitai I, Consunji-Araneta R, Baikie M, Morris S. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (poster)

International

Periodic fever syndromes

Surveillance of periodic fever syndromes in Canada. Dancey P, Benseler S, Gattorno M, Junker AK, Laxer RM, Miettunen P, Turner LA. American College of Rheumatology and Association of Rheumatology Health Professionals Annual Meeting, San Francisco, in November 2015 (poster)

Tuberculosis

Early results of national surveillance of childhood tuberculosis in Canada. Giroux RJP, Kitai I, Consunji-Araneta R, Baikie MM, Morris SK. Pediatric Academic Societies Annual Meeting, San Diego, in April 2015 (poster)

Surveillance at Work

Overview

The importance of surveillance to the practice of medicine cannot be overstated. Through the ongoing, systematic collection of data, the burden of disease can be determined, interventions to prevent the occurrence of a disorder can be assessed, and the information collected can be used to develop health policy. Surveillance takes research data into action.

According to Statistics Canada, the Canadian population on July 1, 2015 was an estimated 35,851,774, with 7,848,844 individuals 0–19 years of age inclusively, which represents 22% of the population. Although individually uncommon, rare diseases affect hundreds of thousands of Canadian children and youth and typically have lifelong impacts. The incidence of many rare disorders is unknown, and yet is essential for improved clinical care, advocacy, and health service planning.

The CPSP provides an innovative means to undertake paediatric surveillance and increase awareness of childhood disorders that are high in disability, morbidity, mortality, and economic cost to society, despite their low frequency. Preference is given to studies that have strong scientific and public health importance or could not be undertaken any other way. All studies in the program must conform to high standards of scientific rigour and practicality, and the CPSP assures the confidentiality of all information collected. To enhance data capture on individual studies, the program works collaboratively with other professional groups, such as psychiatrists, pathologists/coroners, and adult infectious disease specialists.

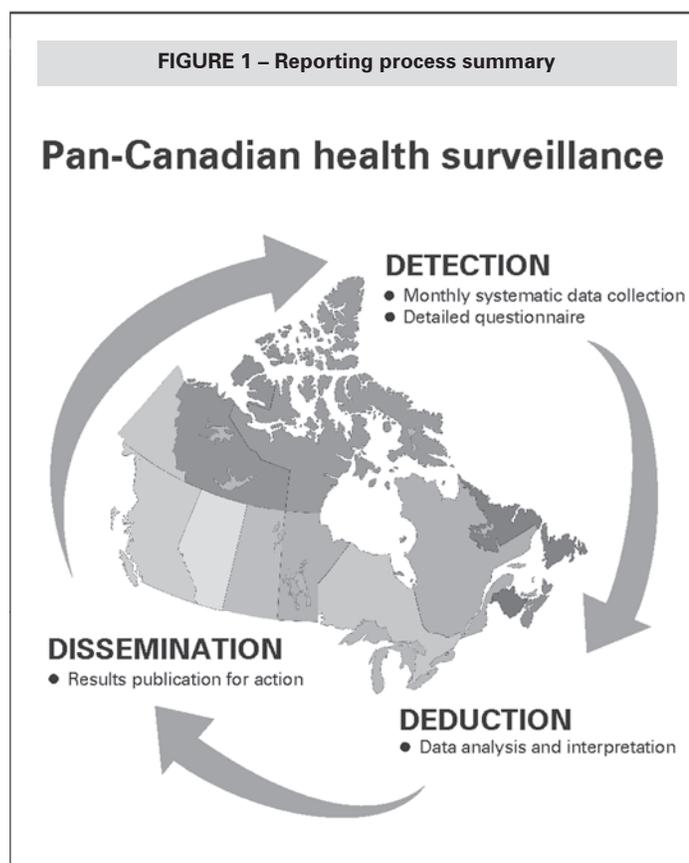
Process

The CPSP Steering Committee oversees the program and reviews new study proposals. Upon initiation of a new study, practising Canadian paediatricians, paediatric subspecialists, and other health care providers receive a summary of the protocol, including the case definition and a brief description of the condition. This serves to educate and increase awareness of the conditions under surveillance while providing a uniform basis for reporting. The CPSP uses a two-tiered reporting process to ascertain and investigate cases: an initial 'check-off' form and a detailed questionnaire. The full process is summarized in Figure 1 and includes the 3Ds of surveillance: detection, deduction, and dissemination.

Case ascertainment is undertaken by comparing a few selected study results with cases reported to other relevant national surveillance programs and by investigating duplicate reports and comparing data with related programs or centres.

Reporting

The check-off form, listing the conditions currently under surveillance, is distributed monthly to participants. For each condition,



Surveillance at Work

respondents are asked to indicate the number of new cases seen in the last month, including 'nil' reports. A 'nil' report is very important in active surveillance; the CPSP cannot simply assume that no reply means there were no cases. In October 2011, the program launched eCPSP, an electronic platform giving participants the opportunity to receive their monthly forms online. By December 2015, 72% of program participants were signed up for electronic reporting.

Participants report all cases meeting the case definitions, including suspect or probable cases. This sometimes leads to duplicate reports but avoids missed cases. The list of studies conducted by the program since 1996 can be accessed at www.cpsp.cps.ca/surveillance.

Confidentiality is maintained by using only non-nominal patient information, such as the date of birth and sex of the child. This anonymous information is used to exclude duplicates and is sent to the original respondent to request case-specific information.

Once the detailed questionnaire is returned to the CPSP, it is forwarded to the investigator for analysis. If further information is required to confirm or exclude a case, a member of the CPSP staff contacts the respondent on behalf of the investigator.

Participants who do not reply every month receive reminders. In addition, information on the monthly compliance rates and the number of cases reported is distributed quarterly to all participants to keep them informed of progress. In 2015, the national reporting rate was 76% (Table 1) and the response rate for completion of detailed questionnaires was 84% (Table 2).

Participant workload

The monthly reporting system is simple and the follow-up study questionnaires are easy to complete. As only non-nominal,

TABLE 1 – Initial response rates (%) and number of participants for 2015

Provinces/territories	Reporting rates (%) [*]	Number of participants [†]
Alberta (AB)	78	344
British Columbia (BC)	71	251
Manitoba (MB)	79	121
New Brunswick (NB)	83	25
Newfoundland and Labrador (NL)	76	55
Northwest Territories (NT)	79	2
Nova Scotia (NS)	87	90
Nunavut (NU)	75	2
Ontario (ON)	76	972
Prince Edward Island (PE)	88	9
Quebec (QC)	74	557
Saskatchewan (SK)	71	59
Yukon (YT)	100	1
Canada	76	2488

* The CPSP national monthly reporting rate averages 80%. Every effort is made to maximize reporting, and annual response rates are subject to change due to delays in reporting.

† The total number of individual CPSP participants is over 2500. However, in this table, the number of CPSP participants in Canada is calculated based on both individual and group reporting. When a group designate responds to the CPSP on behalf of group members, it is counted as one response.

TABLE 2 – 2015 detailed questionnaire completion rates as of May 1, 2016

Studies/conditions	Reported cases [*]	Pending	% Completion rate
Acute flaccid paralysis	39	3	92
Adverse drug reactions – serious and life-threatening	32	5	84
Childhood Lyme disease	34	3	91
Childhood tuberculosis	65	13	80
Hypoglycemia in low-risk term newborns	80	17	79
Listeria in the newborn and early infancy	3	0	100
Severe alcohol intoxication in adolescents	3	0	100
Sudden unexpected death in epilepsy	8	2	75
Total number of cases (all studies)	264	43	84

* Excluding duplicate and excluded cases

non-identifiable data are collected through the CPSP, respondents do not hesitate to provide clinical information.

In 2015, the majority of participants (93%) had 'nil' cases to report. The importance of zero reporting must be re-emphasized. Table 3 illustrates the number of cases reported by respondents in 2015. As studies come and go, the workload shifts to different subspecialties. Through the years, studies with national collaborative networks have been very successful. The 2015 study with the most reports was Hypoglycemia in low-risk term newborns.

Number of cases	% Respondents
0	92.7
1–5	7.1
6–10	0.1
>10	0.1

The CPSP is extremely grateful that the majority of participants diligently complete the detailed questionnaires subsequent to reporting cases. This step suggests that they appreciate the enormous value of the scientific data collected and reinforces the Steering Committee's insistence on short, precise, and pertinent detailed questionnaires.

To thank paediatricians and paediatric subspecialists for their tremendous commitment and support, the names of participants who completed the initial reporting forms for all months in 2015 and/or returned one or more detailed questionnaires were entered in draws for various prizes.

Investigators' corner

Through timely, active surveillance, the CPSP provides investigators with an innovative means of obtaining non-nominal, national data on low-frequency diseases and conditions from over 2500 participants. The program is committed to a high case-ascertainment rate and, due to follow-up reminders to non-respondents, obtained a response rate of 84% on detailed questionnaires (Table 2). The CPSP offers an opportunity for international collaboration with other paediatric surveillance units worldwide and a chance to make a difference in the health and well-being of Canadian children and youth.

Individual researchers are encouraged to submit proposals for new studies that meet the "criteria for inclusion", and to follow the "format for submission", available on the CPSP website at www.cpsp.cps.ca/apply-proposez. The Steering Committee reviews submissions at its spring and fall meetings, giving preference to studies that have either strong scientific and public health importance or those that could not be undertaken any other way. Following the review, studies must receive ethical approval and have external funding arrangements in place before final acceptance to the program. Researchers interested in obtaining more information about the program are encouraged to visit the website, www.cpsp.cps.ca, or to contact the manager of surveillance at cpsp@cps.ca.

One-time survey questions

The CPSP is also available to investigators as a cost-effective tool to survey participants on a one-time basis to identify the prevalence of a problem or answer a specific question. Once approved by the CPSP Steering Committee, the one-time survey is sent to all participants with the monthly initial reporting form. Collected results are forwarded to the investigator for data analysis.

Results of the 2015 one-time survey questions are found on pages 35–39, and the list of surveys completed to date can be accessed at www.cpsp.cps.ca/surveillance/one-time-surveys.

International developments

The program offers an opportunity for international collaboration with other paediatric surveillance units worldwide, through the International Network of Paediatric Surveillance Units (INoPSU). The network provides a successful and easily accessible platform for international research. No other network enables international comparisons of demographics, diagnosis, treatments, and outcomes for rare childhood conditions.

Established in 1992, INoPSU now includes 12 paediatric surveillance units (PSUs) among its membership. Incredibly, many of the units have been collecting data on rare childhood conditions for more than 20 years. Over 300 rare conditions have been studied to date, including rare infectious and vaccine-preventable diseases, mental health disorders, child injuries, and immunological conditions. The network encompasses approximately 10,000 child health care providers who voluntarily contribute data on these rare diseases every month.



The CPSP is looking forward to co-chairing the next INoPSU meeting on August 16, 2016 in Vancouver, British Columbia, in advance of the 28th International Congress of Paediatrics. During INoPSU meetings, member countries have the opportunity to highlight their surveillance program activities, explore innovative study ideas of interest to the network, discuss knowledge translation and joint publication opportunities, as well as strategize on how best to maintain active engagement of participants.

Glossary of terms for tables of cases in each study results

Reported: Reports of cases received

Duplicates: Cases reported by more than one participant

Excluded: Cases not meeting the case definition

Pending: Detailed reports not received or not yet confirmed

Confirmed: Cases verified as meeting the case definition

CPSP Principal Investigators

Surveillance studies in 2015



Dr. Shalini Desai
Acute flaccid paralysis



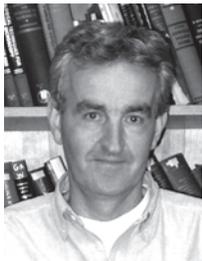
Margaret Zimmerman
*Adverse drug reactions –
serious and life-threatening*



Dr. Nicholas Ogden
Childhood Lyme disease



Dr. Shaun Morris
Childhood tuberculosis



Dr. Michael Flavin
*Hypoglycemia in low-risk
term newborns*



Dr. Robert Bortolussi
*Listeria in the newborn
and early infancy*



Dr. Amy Acker
*Severe alcohol intoxication
in adolescents*



Dr. Elizabeth Donner
*Sudden unexpected
death in epilepsy*

Surveillance Studies in 2015

Acute flaccid paralysis

Ongoing study since January 1996

Highlights 2015

- In accordance with World Health Organization (WHO) recommendations and worldwide efforts to eliminate polio, Canada conducts acute flaccid paralysis (AFP) surveillance in the under 15 population to monitor for polio in light of ongoing transmission of wild poliovirus in countries around the world.
- Twenty-one cases of AFP were confirmed in 2015, representing a non-polio AFP detection rate of 0.37 cases per 100,000 children less than 15 years of age.
- All AFP cases were thoroughly investigated and none were diagnosed as poliomyelitis. The most common diagnoses were Guillain-Barré syndrome (GBS) and transverse myelitis (TM).

Background and objectives

The complete protocol can be accessed at www.cpsp.cps.ca/surveillance.

Case definition

Acute onset of focal weakness or paralysis characterized as flaccid (reduced tone) without other obvious cause (e.g., trauma) in a child less than 15 years of age. Transient weakness (e.g., post-ictal weakness) does not meet the case definition.

Results

In 2015, 39 reports of AFP were made to the Public Health Agency of Canada (PHAC), 17 (44%) from the CPSP network and 22 (56%) from the Canadian Immunization Monitoring Program ACTive (IMPACT). Eighteen cases were not included in the analysis: seven were duplicates, three did not meet the age criteria, seven were lost to follow-up, and one detailed questionnaire is still pending. Twenty-one cases met the national case definition. No cases of poliomyelitis were identified. The 21 confirmed cases represent a non-polio AFP incidence rate of 0.37 cases per 100,000 children less than 15 years of age (Table 2). Of the confirmed cases, the average time from case onset to reporting to the CPSP was 67 days (range: 24 to 167).

Cases ranged in age from less than 1 to 14 years with a mean of 8.2 years (95% CI 6.1–10.4) and a median of 9.8 years. In previous years the mean age of cases was 6.8 years (95% CI 6.6–7.1) and the median was 5.9 years. Eight (38%) cases were male and 13 (62%) were female.

Documentation of age-appropriate polio immunization was provided for 10 (48%) cases, 2 (10%) were not up-to-date for their immunizations, and the remaining 9 (43%) did not have information regarding immunization. Poliovirus vaccine coverage in Canada in 2013 was estimated to be 91% for three or more doses among 2-year-olds, 90% for four or more doses among 7-year-olds, and 85% for four or more doses among 17-year-olds.

Medical history and clinical features

Among the 21 cases, none were considered immunocompromised and only two had an abnormal neurological history (a case of Bell's palsy and a case with a history of dysphagia with progressive bulbar involvement).

Reported	Duplicates	Excluded	Pending	Confirmed
39	7	10	1	21

Year	Number of cases	Incidence rate*	% with adequate stool sample†	% with 60 days follow-up‡
2006	39	0.69	20.5	43.6
2007	50	0.89	42.0	46.0
2008	42	0.75	33.3	42.9
2009	59	1.05	30.5	49.2
2010	47	0.84	34.0	55.3
2011	44	0.78	31.8	47.7
2012	33	0.59	45.5	36.4
2013	36	0.64	19.4	38.9
2014	42	0.74	11.9	45.2
2015	21	0.37	14.3	43.0

* Incidence rate per 100,000 population; number in bold font meet the WHO target of 1.0 case per 100,000 population less than 15 years of age.

† Adequate stool sample refers to one stool sample taken within 14 days of paralysis onset; WHO target: 80%

‡ WHO target: 80%.

Six (29%) cases had symptoms of an infection within the 60 days of AFP onset, of which, three had a positive laboratory test identifying an organism: one case each of adenovirus, mycoplasma pneumoniae, and rhinovirus.

Two (10%) cases reported experiencing fever at the onset of paralysis. All cases had information regarding the distribution of weakness, with 19 (91%) cases experiencing bilateral weakness, 1 case having only the respiratory muscles affected, and 1 case having only the cranial nerves affected. Five (24%) cases experienced weakness in two limbs and 14 (67%) in four limbs. Eight (38%) cases had their respiratory muscles affected and nine (43%) had cranial nerves affected. The average time from symptom onset to greatest weakness was 9.6 days (median: 6 days, range: 0 to 43).

Investigation for enteroviruses and *Campylobacter*

Two (10%) cases had no samples obtained for virological investigations, eight (38%) had samples obtained from one source, and 11 (52%) had samples obtained from more than one source. Sources included stool for 6 (29%) cases, throat swabs for 9 (43%) cases, nasopharyngeal swabs for 5 (24%) cases, a blood sample for 1 (5%) case, a urine sample for 2 (10%) cases, cerebrospinal fluid (CSF) for 14 (67%) cases, and unspecified sources for 6 (29%) cases. Three out of the six (15%) cases with stool samples were considered adequate (i.e., taken within 14 days of the paralysis onset). Stool collection dates were unavailable for two of the three remaining cases and stool collection for the last case occurred later, when the sensitivity of enterovirus isolation would have been lower. None of the samples were positive for polioviruses. *Clostridium botulinum* was identified in one case.

Neurological investigations and final diagnoses

All cases underwent at least one type of neurological investigation, the most frequent being magnetic resonance imaging (MRI) (19, 91%) and CSF examination (17, 81%). Among the 17 cases that had CSF chemistry results, four (24%) had abnormal findings. Among the 13 cases that underwent electromyography and nerve conduction studies, 10 (77%) had abnormal findings. Among the 19 cases that had an MRI, 13 (68%) had abnormal findings. No cases had an abnormal CT scan. As observed in previous years, the majority of AFP cases were diagnosed as GBS (13, 62%), two of which were a Miller-Fisher variant. Four (19%) cases were diagnosed as TM. The remaining cases were diagnosed as follows: 2 cases of acute disseminated encephalomyelitis, 1 case of atypical transverse myelitis, 1 case of Bell's palsy, and 1 case of botulism.

Hospitalization and outcomes

Every case was hospitalized; length of stay ranged from 2 to 60 days with a mean of 19 days (95% CI 10.5–27.4) and a median of 9 days. This was consistent with previous years (mean: 13.6 [95% CI 12.4–14.8], median: 8). Outcome at the time of the initial report was documented in 18 (86%) cases: 1 (6%) fully recovered, 16 (89%) partially recovered with residual weakness, and 1 (6%) had not recovered. Nine (43%) cases had clinical outcomes reported at 60 days, including four cases who had fully recovered and five cases who had partially recovered.

Discussion

Although Canada and the rest of the Americas were certified as polio-free in September 1994 by WHO, there is an ever-present risk of poliovirus importation and spread within Canada so long as transmission is still occurring in other regions of the world. In 2015, polio remained endemic in only two countries worldwide (Pakistan and Afghanistan). Nonetheless, continued poliovirus exportations and the risk of further international spread to vulnerable countries pose a threat to the Global Polio Eradication Initiative's aim to eradicate polio by 2018. These pressures have led the WHO's director general to declare the international spread of wild poliovirus a public health emergency of international concern under the 2005 International Health Regulations. This declaration has served as a reminder of the importance of continued vigilance in countries where polio has long been eliminated. Canada's AFP surveillance system remains a core program that assists in monitoring for polio, provides a baseline for AFP incidence and causes in Canada, and maintains Canada's polio-free status with WHO.

Several previously identified quality assurance issues continue to be evident in 2015. As in previous years, Canada was unable to meet its AFP surveillance system objectives – objectives that are based on performance indicators used by WHO. Historically, Canada has met the non-polio AFP incidence target of 1.0 case per 100,000 population under 15 years of age only three times since AFP surveillance began in 1996 (1999, 2000, and 2009) and has never met the targets of stool testing in 80% of cases and 60-day follow-up of 80% of cases. Although

Surveillance Studies in 2015

Canada's inability to meet the incidence target may be associated with lower baseline levels of non-polio AFP in Canada, under-reporting of cases most likely plays a strong role. This is conceivable since AFP is not yet reportable in all provinces and territories, and adult neurologists who treat paediatric patients may not be part of the CPSP network. As this study is ongoing, delays in reporting may have occurred and numbers for 2015 are expected to change.

Canada's low rate of stool sampling is likely due to a low index of suspicion for poliovirus infection and the use of technology-intensive neurological investigations. The lack of 60-day follow-up information could stem from most AFP cases being discharged from acute care hospitals prior to the 60-day follow-up and the lack of access to patient records. Currently, direct follow-up with the patients and/or their physicians is not possible through the CPSP.

In response to these concerns, several mitigation activities are being developed and implemented:

- **Education and expansion:** An update to the 1997 protocol for the investigation of AFP and suspected paralytic poliomyelitis is currently in development and is expected to provide guidance to physicians in an era when many have likely never treated a suspected case of poliomyelitis. Communication activities with the Canadian Public Health Laboratory Network and the CPSP regarding the importance of submitting stool samples to the National Microbiology Laboratory are also being implemented. Potential outreach directly to neurologists is also being explored.
- **Electronic reporting:** The move to electronic reporting of AFP cases to the CPSP and PHAC in the next few years is expected to result in increased AFP case reporting and a large reduction in reporting delays.

Conclusion

- Although Canada did not meet the WHO performance indicators for national AFP surveillance in 2015, there was no evidence to suggest that any polio cases occurred in Canada in 2015 and Canada's polio-free status remains.
- The most common diagnoses of AFP in Canada in children less than 15 years of age were GBS and TM.

Publications and presentations

The polio eradication endgame: Why immunization and continued surveillance is critical. Booth TF, Grudeski E, McDermid A, Rotondo J. *CCDR* 2015;41(10): 232–40.

Performance of acute flaccid paralysis surveillance compared to WHO standards. Desai S, Smith T, Thorley BR, Grenier D, Dickson N, Altpeter E; SPSU Committee, Sabbe M, Elliott E, Zurynski Y. *J Paediatr Child Health* 2015;51(2):209–14

Guillain-Barré syndrome after immunization in Canadian children (1996–2012). Top KA, Desai S, Moore D, Law BJ, Vaudry W, Halperin SA, Bettinger JA for members of the Canadian Immunization Monitoring Program Active. *Pediatr Infect Dis J* 2015;34(12):1411–3

Acute flaccid paralysis surveillance: The need for ruling out polio infection. Rotondo J, Desai S, Pless R, Ahmad R, Squires S, Booth TF. *Paediatr Child Health* 2015;20(6):309–10

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Available upon request from the CPSP office

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Co-investigator

Rotondo J

Acknowledgements

The investigators would like to acknowledge the excellent work of Robert Pless, Susan Squires, Martin St-Jean, and Jenne Cunliffe.

Adverse drug reactions – serious and life-threatening

Ongoing study since January 2004

Highlights 2015

- In 2015, the study confirmed 22 suspected paediatric adverse drug reaction (ADR) cases.
- Antibacterials (oral or intravenous), followed by psycholeptics and antiepileptics were the most frequently reported drug classes suspected of causing adverse reaction(s).
- Since the implementation of the study in 2004, amoxicillin, carbamazepine, and methylphenidate are the three most frequently reported suspect drugs.
- The majority of the adverse reaction reports described skin and subcutaneous disorders. This finding is consistent with the trend seen with all reports received through the CPSP since 2004.

Background and objectives

The complete protocol can be accessed at www.cpsp.cps.ca/surveillance.

Case definition

Serious and life-threatening adverse drug reactions* in an infant or child up to the age of 18 years, associated with the use of prescription, non-prescription, biological (immunoglobulin) products, complementary medicines (including herbals) and radiopharmaceutical products

* Noxious and unintended severe response to a drug, which occurs at any dose and results in emergency observation, hospitalization, persistent or significant disability or death

Exclusions

Reactions to medical devices, blood products (platelets, red cells and single-donor plasma), vaccines, poisonings or self-administered overdoses

Results

From January 1 to December 31, 2015, 34 cases of suspected ADRs were reported and 22 cases were confirmed as meeting the case definition. Of the cases confirmed in 2015, patient sex was reported as male in 11 cases and female in 11 cases. Patient age ranged from 1 month to 17 years. By age group, nine children were aged 6 to 12 years, eight were adolescents aged 13 to 17 years, and five were children up to and including 5 years of age.

The 22 cases were classified as serious based on the criteria listed in Table 3. More than one reason for seriousness was stated in nine reports. One death was reported in 2015. Table 3 compares the reasons for seriousness over the past five years. Information regarding patient outcome was provided for all 22 reports: fatal (1, 5%); recovered (14, 64%); not yet recovered (3, 14%); and unknown (4, 18%).

The majority of the reports described reactions that were generally documented in the Canadian approved product monograph (CPM). A summary is provided for the one case involving reactions not specifically described in the CPM.

Posterior reversible encephalopathy syndrome (PRES) was reported in a female child receiving mycophenolate for the treatment of RAS-associated autoimmune lymphoproliferative syndrome. The patient had been taking mycophenolate for approximately one year and was receiving a dose of 200 mg orally every 12 hours at the time

Reported	Duplicate	Excluded	Pending	Confirmed
34	1	7	4	22

	2015 (n=22)	2014 (n=29)	2013 (n=21)	2012 (n=31)	2011 (n=31)
Up to 5 years	5	8	10	3	10
6 to 12 years	9	13	6	14	7
13 to 17 years	8	7	5	14	14
Not reported	0	0	0	0	0

Surveillance Studies in 2015

PRES occurred. No other medications were reported. In addition to RAS-associated lymphoproliferative syndrome, the patient had hepatosplenomegaly but no hepatic or renal insufficiency. There were no relevant antenatal exposures. Pregnancy complications included pregnancy-induced hypertension and type 2 diabetes mellitus. Signs and symptoms of PRES included focal seizures, altered level of consciousness and apparent visual disturbances. Magnetic resonance imaging showed bilateral signal abnormalities with some restricted diffusion. Electroencephalogram results were normal. The child was hospitalized for four days. Mycophenolate was discontinued resulting in decreased frequency of seizures and improvement in alertness and blood pressure.

PRES is a disorder of reversible subcortical vasogenic brain oedema associated with acute neurological symptoms (e.g., seizures, encephalopathy, headache, and visual disturbances) in the setting of renal failure, blood pressure fluctuations, cytotoxic drugs, autoimmune disorders, and pre-eclampsia or eclampsia.¹ PRES is not a listed adverse reaction for mycophenolate mofetil (CellCept®, CPM date of approval 2015-03-09) or mycophenolate sodium (Myfortic®, CPM date of approval 2014-12-17). Hypertension is a listed reaction for both forms of mycophenolate.

A summary is also provided for the one case describing a fatal outcome. A male child developed Stevens Johnson syndrome (SJS) and toxic epidermal necrolysis (TEN) (confirmed on biopsy) after approximately three weeks of treatment with piperacillin-tazobactam and vancomycin intravenously for a possible chest tube infection. Piperacillin-tazobactam products list both SJS and TEN as potential risks and vancomycin products include SJS. The child had an unspecified malignancy in remission and was a patient in the paediatric intensive care unit for cardiac issues at the time of the reaction. The rash improved following discontinuation of piperacillin-tazobactam and vancomycin but worsened again after the introduction of meropenem and ciprofloxacin. The child died approximately three weeks after onset of the reaction; the probable cause of death was gram negative sepsis.

Suspect health products

Table 4 lists the 24 suspect health products described in the 22 cases, sorted by the number of cases received per individual product. In 6 reports, more than one product was suspected of causing the adverse reaction: four products suspected in 1 case; three products suspected in 1 case; and two products suspected in 4 cases. The class of health product² most frequently suspected of causing the adverse reaction(s) were antibacterials (oral or intravenous) with nine reports, followed by psycholeptics and antiepileptics, each with two reports.

Caveat: Adverse reactions (ARs) to health products are considered to be suspicious, as a definite causal association often cannot be determined. Spontaneous reports of ARs cannot be used to estimate the incidence of ARs because ARs remain under-reported and patient exposure is unknown..

TABLE 3 – Annual comparison of reasons for seriousness in confirmed cases

Reason for seriousness	2015 (n=22)	2014 (n=29)	2013 (n=21)	2012 (n=31)	2011 (n=31)
Death	1	2	0	1	1
Life-threatening	8	10	6	11	11
Hospitalization	15	20	19	20	18
Disability	1	3	1	2	4
Medically important reaction*	7	10	7	13	17

* A medically important reaction is defined as one that may not be immediately life-threatening or result in death or hospitalization but may jeopardize the patient or may require intervention to prevent one of these other outcomes from occurring.

TABLE 4 – Suspect health products in 2015	
Suspect health product	# of cases
Co-trimoxazole*, piperacillin/tazobactam*, vancomycin	3 each
Guanfacine	2 each
Allopurinol, amitriptyline, amoxicillin, azathioprine, bo-ying†, carbamazepine, cefprozil, clobazam, daunorubicin, etoposide, fluconazole, lacosamide, levofloxacin, methylphenidate, mycophenolate, phenobarbital, prochlorperazine, propofol, propranolol, risperidone	1 each

* Combination product containing two active ingredients

† Traditional Chinese medicinal product

Conclusion

- The class of health product most frequently suspected of causing adverse reaction(s) reported in 2015 was antibacterials (oral or intravenous), followed by psycholeptics and antiepileptics.
- Since the implementation of this CPSP study in 2004, antibacterials have been the most frequently reported product class, followed by antiepileptics and psychoanaesthetics. Amoxicillin, carbamazepine, and methylphenidate are the most frequently reported suspect drugs in these three classes.
- Health Canada recognizes the need to strengthen information related to paediatric health, as the use of medications to treat children is increasing³ and the safety and efficacy of these medications may be significantly different in paediatric patients than in adult patients.^{2,4} The ongoing sharing of safety information through the CPSP is valuable to Health Canada as it contributes to ongoing monitoring of the benefit-risk profile of health products used in children.

References

References 1–4 are available upon request from the CPSP office.

Principal investigator

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Childhood Lyme disease

July 2014 to June 2017

Highlights 2015

- Surveillance was initiated in July 2014 to explore the incidence and epidemiology of childhood Lyme disease in Canada.
- Twenty cases of childhood Lyme disease were confirmed or probable in 2015.
- The median age of reported cases was 7 years old, with a range of 4 months to 15 years of age.
- The majority of cases were diagnosed in Ontario, Quebec, and Nova Scotia. All cases had exposure to Lyme disease endemic areas in Canada or the United States within 30 days of developing symptoms.

Background and objectives

The complete protocol can be accessed at www.cpsp.cps.ca/surveillance.

Case definition

A patient less than 16 years of age with Lyme disease, meeting the following criteria:

Confirmed Lyme disease – Patient fulfills one of two conditions:

1. Clinical evidence of illness with laboratory confirmation
 - a. Isolation of *Borrelia burgdorferi* from an appropriate clinical specimen
 - OR
 - b. Detection of *B burgdorferi* DNA by PCR in appropriate tissues
2. Clinical evidence of illness with a history of residence in, or visit to, an endemic area* and with laboratory evidence of infection
 - Positive serologic test using the two-tiered serological approach (i.e., ELISA followed by Western blot assays)

Probable Lyme disease – Patient fulfills one of two conditions:

1. Clinical evidence of illness without a history of residence in, or visit to, an endemic area* and with laboratory evidence of infection
 - Positive serologic test using the two-tiered serological approach (i.e., ELISA followed by Western blot assays)
2. Clinician-observed erythema migrans without laboratory evidence but with history of residence in, or visit to, an endemic area*

Exclusion criteria

- Confirmation of infection with a non-tick-borne disease, which fully explains symptoms
- Cases diagnosed by methods and/or laboratories not recommended by the Public Health Agency of Canada or the US Centers for Disease Control and Prevention

* An endemic area is defined as a locality in which reproducing populations of *Ixodes scapularis* or *Ixodes pacificus* tick vectors are present and transmission of *B burgdorferi* occurs at the location.

Results

Questionnaires were submitted on 29 individuals. Nine cases were excluded because they did not fit the case definition, specifically: i) the illness was not compatible with a diagnosis of Lyme disease, or ii) serology was negative in cases that could not be described as early Lyme disease and could not, therefore, be classified as category 2 probable cases. The majority of cases were reported from Ontario, Quebec, and Nova Scotia. All had contact with an area known to be endemic for Lyme disease in Canada with the exception of two cases who were exposed in an endemic area in the United States.

Reported	Duplicate	Excluded	Pending	Confirmed/ Probable
38	0	9	9	20

The median age of the reported cases was 7 years (range: 4 months to 15 years) at the time of diagnosis. Among reported cases, 39% (7/18 for which sex was recorded) were male. Sixty-five percent (13/20) of the case

diagnoses were made from May to October during the normal season of tick vector activity in most affected areas in Canada. Fifty percent (10/20) were consistent with early Lyme disease, having only a single erythema migrans lesion as the clinical manifestation. Fifteen percent (3/20) had manifestations of early disseminated Lyme disease (multiple erythema migrans or neurological symptoms), and 35% (7/20) had manifestations of late disseminated Lyme disease (arthritis). Twenty-five percent (5/20) of cases also had non-specific manifestations of headache and/or fever.

Conclusion

- As of February 2016, 20 cases of Lyme disease (age range: 4 months to 15 years) have been confirmed from five provinces in 2015.
- The median age of reported cases was 7 years and 39% of the reported cases were male.
- Surveillance will continue until 2017, and will help define the specific epidemiology of this important infection in Canadian children.

Publications and presentations

Tick bites in the Lyme light. Barton-Forbes M, Leonard E, Lindsay LR, Langley JM, Koffi JK, Ogden NH. *Paediatr Child Health* 2015; 20(5):237–8

Surveillance for childhood Lyme disease by the Canadian Paediatric Surveillance Program (CPSP): Initial findings. Ogden N, Barton M, Koffi J, Leonard E, Lindsay R, Langley J. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (poster presentation)

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Co-investigators

Barton M, Koffi JK, Lindsay LR

Childhood tuberculosis

October 2013 to September 2016

Highlights 2015

- There were 38 confirmed cases of childhood tuberculosis (TB) in 2015 with an additional 14 reports pending. Sixteen of the 38 cases were Aboriginal children, 14 were non-Aboriginal Canadian-born children, and 4 were born overseas.
- Variability exists in the distribution of childhood TB across the country. In 2015, particularly high rates of TB were seen in First Nations children, in contrast with 2014, when high rates of TB were found in Inuit children.
- No drug-resistant strains were isolated in the culture-positive paediatric patients; however, at least one child was treated for multidrug-resistant disease based on source case sensitivities. Three children had previously been treated for latent TB infection prior to their diagnosis.

Background and objectives

The complete protocol can be accessed at www.cpsp.cps.ca/surveillance.

Case definition

A new active or re-treatment case of TB disease in a patient under the age of 15 years

Proven TB disease

1. Laboratory-confirmed

Isolation of *Mycobacterium tuberculosis* complex from any clinical specimen: Positive culture **or** positive nucleic acid amplification test (NAAT), specifically *M tuberculosis*, *M africanum*, *M canetti*, *M caprae*, *M microti*, *M pinnipedii* or *M bovis* (excluding *M bovis* BCG strain)

2. Clinically confirmed

Probable intrathoracic	Probable extrapulmonary – non-pleural
Signs and symptoms, histology suggestive of TB or close contact with an infectious source case	Signs and symptoms, histology or findings on diagnostic radiology consistent with TB
Chest radiography consistent with intrathoracic TB disease	
and at least one of the following:	
<ul style="list-style-type: none"> • A positive clinical response to anti-TB treatment • Documented exposure to active case of infectious <i>M tuberculosis</i> • Immunological evidence of <i>M tuberculosis</i> infection: Positive TB skin test (TST) or positive interferon gamma release assay (IGRA) 	

Presumed TB disease

Treatment for suspected TB disease at any site with at least three anti-TB drugs

Cases are identified as “new” or “re-treatment” based on the following criteria:

- **New active case of tuberculosis disease:** No documented evidence or history of previously active tuberculosis
- **Re-treatment case of tuberculosis:**
 1. a) Documented evidence or adequate history of previously active TB that was declared cured or treatment completed by current standards and
 - b) At least a six-month interval since the last day of previous treatment and
 - c) Diagnosis of a subsequent episode of TB that meets the active TB case definition
 - or**
 2. a) Documented evidence or adequate history of previously active TB that cannot be declared cured or treatment completed by current standards and
 - b) Inactive disease for six months or longer after the last day of previous treatment and
 - c) Diagnosis of a subsequent episode of TB that meets the active TB case definition

Exclusion criteria

- Isolation of another pathogen, including atypical mycobacteria
- Patient arriving in Canada on TB treatment for presumed TB but for whom treatment is stopped because subsequent work-up in Canada suggests no TB
- Patient with latent TB (TST- or IGRA-positive but no clinical or radiologic abnormality)

Results

In the second full year of the CPSP childhood TB study, the 2015 results showed a number of differences from the previous year.

Reported	Duplicate	Excluded	Pending	Confirmed
60	1	7	14	38

Confirmed cases were found across Canada. The majority of cases came from three provinces: Manitoba (16, 42%), Quebec (9, 24%), and Ontario (7, 18%). The confirmed cases ranged in age from 2 months to 14 years, with 16 boys and 20 girls (2 did not report). Canadian-born children represented 34 (89%) cases, while 4 (11%) were born outside of Canada. Of Canadian-born children, 16 (47%) were First Nations, 14 (41%) were non-Aboriginal, and 4 did not specify. Of note, in the previous year of this study, Inuit children were found to represent 44% of the Canadian-born group with 18 confirmed cases.

Thirty-five (92%) cases had intrathoracic involvement: the lungs were implicated in 31 (89%) cases and pleura in 3 (9%). Nine (24%) cases had extrathoracic involvement: 5 (56%) with lymph nodes being involved and 2 (22%) with bone. While central nervous system involvement in 2014 made up 71% of extrapulmonary disease, only two (22%) cases were reported this year.

Twenty (53%) cases were diagnosed clinically, while 16 (42%) were microbiologically proven by culture or nucleic acid amplification. Two additional cases were presumed diagnoses. No resistance was found in any of the culture-positive cases. Treatment for drug-resistant TB was given in a case whose contact had a multidrug-resistant strain.

In six (16%) cases the child had been diagnosed with latent TB in the past and three had been fully treated for it. Of these three, none were immunocompromised.

Conclusion

- Fourteen reports are pending from 2015. Thirty-eight confirmed cases were identified in 2015: 14 (37%) were Canadian-born non-Aboriginal children and 16 (42%) were First Nations children. An additional four (11%) children were born outside of Canada. The majority of the childhood TB burden was clustered in Manitoba, Ontario, and Quebec.
- Year-to-year variability exists in the epidemiology of childhood TB in Canada. Longitudinal studies, such as the CPSP childhood TB study, are needed to adequately capture this variability.

Publications and presentations

Paediatric tuberculosis: A social disease. Kitai I. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (oral presentation)

Early results of national surveillance of childhood tuberculosis in Canada. Giroux R, Kitai I, Consunji-Araneta R, Baikie M, Morris S. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (poster presentation)

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Acknowledgements

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Hypoglycemia in low-risk term newborns

April 2014 to March 2016

Highlights 2015

- Of the 39 confirmed cases of hypoglycemia in low-risk term newborns in 2015, 42% were born by emergency Caesarean section and 22% needed some resuscitation at birth.
- The majority (62%) of cases presented in the first six hours of life.
- An underlying cause was identified in 33% of cases, of which 69% had hyperinsulinism.
- A brain MRI was performed in four (10%) cases, all of whom presented after six hours. All studies were abnormal. Two cases had MRI findings that were in keeping with hypoglycemic brain injury.
- At the time of hospital discharge 15% of cases were given an uncertain prognosis while 5% had abnormal neurological signs.

Background and objectives

The complete protocol can be accessed at www.cpsp.cps.ca/surveillance.

Case definition

Any otherwise healthy neonate less than 96 hours (4 days) old with all of the following:

- Term gestation: 37–42 weeks
- Birth weight: 2500–3999 grams
- Hypoglycemia, defined as whole blood or serum glucose <2.0 mmol/L
- Hypoglycemia treated with IV dextrose

Exclusion criteria

Neonate being monitored for hypoglycemia because of known risk factors, i.e., maternal diabetes (gestational or pre-gestational), growth restriction, macrosomia, or important neonatal illness

Results

During 2015, 81 cases of hypoglycemia in low-risk term newborns were reported and 39 cases were confirmed. Fifteen of those reported did not meet the case definition and 24 detailed questionnaires were pending at the time of analysis.

Reported	Duplicate	Excluded	Pending	Confirmed
81	3	15	24	39

Among the 39 confirmed cases, 26 (67%) were male. The mean birth weight was 3275 g (SD ± 423) and the mean gestational age at birth was 39 weeks (SD ± 1.4). Where ethnicity information was provided, 2/34 (6%) cases were from First Nations families. Fifteen of 36 (42%) cases were born by emergency Caesarean section and meconium was present at delivery in 14/36 (39%) cases. Resuscitation was required at birth in 8/36 (22%) cases, and in 6/7 (86%) of those cases, the duration of resuscitation was under two minutes.

Twenty-four of the 39 (62%) hypoglycemia cases presented in the first six hours of life. Feeding issues were reported in 10/39 (26%) cases and 7/32 (22%) cases had temperature under 36.5°C. Prior to the sentinel hypoglycemia event, a prior glucose measurement had been done in 11/31 (35%) cases: 1 for maternal hypertension, 1 for respiratory distress, 2 as part of neonatal intensive care unit (NICU)/nursery admission routine, 3 for jitteriness, 1 for hypothermia, 1 for poor feeding, and 2 for unknown reasons. For the remaining 20/31 (65%) cases, who did not have prior glucose measurement, a variety of factors triggered the glucose measurement: 2 had a routine glucose check as part of NICU admission, 2 had “routine” check, 7 had jitteriness, 3 had respiratory distress, 2 had poor feeding, 1 had hypothermia, 1 had a seizure, and in 2 cases no reason was provided.

Initiation of IV dextrose was prompted by concerning glucose levels in 38/39 (97%) cases, concerning signs in 17/39 (44%), and unsuccessful attempts at normalization of glucose levels in 17/39 (44%). A workup for an underlying cause for the hypoglycemia was done in 19/39 (49%) cases: 13/39 (33%) had an identified underlying diagnosis or compounding disorder and 9/13 (69%) had hyperinsulinism.

Brain imaging was carried out in 7/39 (18%) cases. Four of 39 (10%) cases underwent brain MRI and all were abnormal: 2 (50%) had MRI findings consistent with hypoglycemic brain injury and 2 (50%) were consistent with, or suggestive of, stroke. In all four cases, hypoglycemia was first recognized more than six hours after birth. Two of 39 (5%) cases had abnormal neurological signs at the time of hospital discharge while 5/34 (15%) cases were given an uncertain prognosis at discharge.

Conclusion

- Thirty-nine cases of hypoglycemia in low-risk newborns were confirmed in 2015.
- A disproportionately high percentage required an emergency Caesarean section or received brief newborn resuscitation, which may suggest perinatal stress and/or vulnerability to physiologic stress during labour and the newborn period.
- In most cases, the cause of hypoglycemia was not identified.
- A small percentage of babies had evidence of brain injury. In those cases, the hypoglycemia was recognized more than six hours after birth.

Publications and presentations

Hypoglycemia in an unmonitored full-term newborn. Flavin M, Maguire J. Paediatr Child Health 2015;20(1):52

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Acknowledgements

Helen Coo's assistance with data analysis is greatly appreciated.

Listeria in the newborn and early infancy

May 2015 to April 2017

Highlights 2015

- The *Listeria* in the newborn and early infancy study was launched to collect information on maternal and perinatal factors associated with early- and late-onset listeriosis.
- For the eight months of active surveillance in 2015, three cases were reported to the CPSP with two of these confirmed to date.
- Validation of case ascertainment was done through the Enhanced National Listeria Surveillance Program of the Public Health Agency of Canada, which received three reports during the study period; all three of these cases were also reported to the CPSP.

Background and objectives

The complete protocol can be accessed at www.cpsp.cps.ca/surveillance.

Case definition

New patient less than six months of age, meeting the following criteria:

1. Definitive
Positive culture of *Listeria* from a usually sterile site, such as blood, CSF or pleural fluid; or
Positive culture of *Listeria* from the placenta in the presence of compatible clinical features of listeriosis (sepsis, meningitis, respiratory distress, etc.).
2. Probable
Positive PCR for *Listeria* from a usually sterile site or the placenta in the presence of compatible clinical features of listeriosis (sepsis, meningitis, respiratory distress, etc.).

Results

Based on the Canadian birth cohort of ~380,000/year, and the reported incidence of neonatal listeriosis in the United Kingdom and the United States (5/100,000 live births and 8.6/100,000 live births, respectively), the number of neonatal listeriosis cases expected over a one-year period in Canada is 19 to 32. Three cases of *Listeria* in newborns and early infancy were reported and two cases were confirmed during the eight months of surveillance in 2015, suggesting that the incidence of neonatal listeriosis may be lower in Canada than in the United Kingdom or the United States. However, the numbers may also suggest that the current measures to capture cases in Canada are not optimal.

Reported	Duplicate	Excluded	Pending	Confirmed
3	0	0	1	2

There is little information about Canadian incidence of early-onset and late-onset neonatal listeriosis and individual-level medical risk factors. Moreover, the associated outcomes are entirely unknown. This gap in knowledge does not facilitate an evidence-based design of age-appropriate empiric antibiotic therapy. At the moment, antibiotics that would cover *Listeria* (e.g., ampicillin) are recommended for patients during the neonatal period (up to 28 days of life) who exhibit signs and symptoms of possible sepsis, bacteremia, or meningitis. In the absence of knowledge about the actual incidence, and thus risk for listeriosis in Canadian newborns, optimal support of newborns and infants at risk is impossible. To garner this knowledge, it is imperative that all cases be reported.

Conclusion

- Gathering data on the incidence and outcomes associated with neonatal listeriosis in Canada is of utmost importance to establishing optimal empiric antibiotic use.

- This study is the first to collect data on the incidence of neonatal listeriosis in Canada. To date, the incidence for neonatal listeriosis appears lower in Canada than in other countries. It is imperative that all cases be reported to ensure accurate incidence calculations.

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Severe alcohol intoxication in adolescents

March 2013 to February 2015 – Final report

Highlights

- Forty cases of young adolescents with severe alcohol intoxication were confirmed during the two-year surveillance study.
- The vast majority (86%) of adolescents presenting with severe intoxication consumed spirits.
- One (3%) adolescent died from cardiac arrest following severe alcohol intoxication.
- Thirteen (33%) of the adolescents presenting with severe alcohol intoxication required mechanical respiratory assistance.

Background and objectives

The complete protocol can be accessed at www.cpsp.cps.ca/surveillance.

Case definition

An adolescent who meets the following criteria:

- Between 11 and 15 years of age, inclusively
- Blood alcohol level >0 g/L (if available)
- Presenting with severe intoxication with impaired consciousness requiring prolonged emergency room (ER) observation (≥6 hours) or hospital admission

Results

In the two years of surveillance, there were 54 reported cases, and 49 completed questionnaires (91%). Of these, 40 cases were confirmed, meeting the case definition. These included 21 male and 19 female adolescents, with a median age of 14 years. The youngest case reported was 11 years old.

Year	Reported	Duplicate	Excluded	Pending	Confirmed
2013*	26	1	6	2	17
2014	25	0	2	3	20
2015†	3	0	0	0	3
Total	54	1	8	5	40

* March 1 to December 31, 2013

† January 1 to February 28, 2015

The study's inclusion criteria required that adolescents presenting had impaired consciousness; this meant that many of the physician respondents were unable to provide data for a number of questions in the detailed questionnaire as the adolescents may not have been able to provide the information during their assessment/admission at the hospital. This led to many, not unexpected, gaps in the data set.

Cases were reported from across the country, although no cases were reported from Manitoba, New Brunswick, or the territories. The majority (78%) of cases were reported in British Columbia (9), Ontario (7), and Quebec (15). Most of the cases reported were Caucasians (28/40, 70%). The second most common group of adolescents were identified as Aboriginal (5/40, 13%). Almost three quarters (29/40, 73%) of confirmed cases were reported between March and September each year.

Most adolescents presented to the emergency department between 1800 and 0600 hours (30/36, 83%). The majority (20/34, 59%) were observed/admitted for less than 24 hours. All patients had at least one investigation completed. The median blood alcohol level was 2.27 g/L (range: 0.97 to 4.7 g/L). There was no significant difference in the blood alcohol levels of males and females. Similarly, blood alcohol levels did not differ significantly by age.

As could be expected from the case definition of this study, the most common reason for assessment/admission to hospital was decreased level of consciousness. Violence, accidents, and "other" reasons were reported less often.

Thirteen of 40 (33%) adolescents required mechanical respiratory assistance. One adolescent died from a cardiac arrest after presenting to the hospital with severe alcohol intoxication. Follow-up care was reported for 25/39 (64%) cases, more often with adolescent medicine subspecialty clinics (8/25, 32%) or social work (8/25, 32%).

Spirits were the most common form of alcohol consumed leading to these adolescents presenting to the ER with severe intoxication (31/36, 86%). Only a minority of intoxicated adolescents reported a mix of alcohol consumed (4/36, 11%). Just over one third (14/37, 38%) of adolescents reported concurrent substance use, with cannabis being the most common concurrent substance (13/14, 93%). In this surveillance study, only one adolescent was identified as taking concurrent prescription drugs along with their alcohol and no adolescents were reported to have consumed concurrent energy drinks.

Statistical analysis did not reveal many differences between sexes at presentation; however, two significant findings were noted. Female adolescents were more likely to have consumed spirits at presentation compared with males (100% versus 74%, $p = 0.047$) and males were more likely to have had an electrocardiogram completed during their admission/observation than females (71% versus 21%, $p = 0.002$).

The median length of stay was significantly longer for those who presented reporting concurrent substance use compared with those who did not have concurrent use (33 versus 16 hours respectively, $p = 0.02$). Length of stay for those presenting to the ER having ingested a number of concurrent substances was also significantly higher ($p = 0.047$), with a median length of stay of 31 hours for those who consumed one other substance concurrently and 48 hours for those who consumed two substances concurrently. Adolescents who reported no prior substance use stayed a median of 9.5 hours versus 31 hours for those who reported a history of using previously ($p = 0.02$). Median length of stay for those adolescents who required mechanical assistance was, not surprisingly, significantly longer than those who did not require these intensive supports (48 versus 16 hours, $p = 0.02$).

Friends were a common source of alcohol (17/39, 44%). Another home or a party was reported as the location of alcohol consumption more than half of the time (22/40, 55%). The age of first alcohol use was known in 15/40 (38%) cases, with 4/15 (27%) reporting age of first use to be 12 years or younger and the youngest reported was 7 years of age. The mean age of first alcohol use was 13 years. A prior ER visit related to alcohol use was identified in 6/40 (15%) cases. Prior substance use by adolescents was reported in 21/33 (64%) cases, with alcohol (14/21, 67%) and cannabis (16/21, 76%) being the most commonly used substances.

After two years of surveillance, 40 cases of severe intoxication in adolescents have been identified across Canada. This is likely only the tip of the iceberg and represents the more severe cases of younger adolescents that required prolonged ER observation or hospital admission. This relatively low number of cases is likely multifactorial: many adolescents may present in community-based ERs staffed by non-paediatricians, where physicians were not part of this surveillance study; and the need to look for information requested on the detailed questionnaire, which may not be readily available to the physician, could have acted as a deterrent in reporting. Given these factors, it is likely that these confirmed cases represent a much larger number and there is likely a higher prevalence of severe alcohol intoxication among Canadian adolescents. The median age of confirmed cases of 14 years (and the youngest adolescent presenting at 11 years), the severity of presentation (one third of cases requiring intensive resuscitative measures), and the one associated death reported should be of great concern to all paediatricians.

This data on Canadian adolescents presenting to the ER with severe intoxication will help inform strategies for education, prevention, and harm reduction. It is noteworthy that the majority of adolescents with severe intoxication consumed spirits, suggesting that more education for adolescents on the higher potency of spirits relative to other alcoholic beverages and the dangers of consumption, even in small amounts, could reduce the incidence of severe alcohol intoxication in children and adolescents. Consideration of more stringent controls on spirits to help decrease adolescents' access would assist with harm reduction.

Conclusion

- A significant number of Canadian adolescents between the ages of 11 and 15 years with severe alcohol intoxication presented to emergency departments for observation or were admitted to hospitals across the country with very high blood alcohol levels.

Surveillance Studies in 2015

- One adolescent died from cardiac arrest following severe alcohol intoxication and 13 of the adolescents presenting with severe alcohol intoxication required mechanical respiratory assistance.
- The young age of presentation and severity of illness are cause for concern.
- Consideration of more stringent controls and education for adolescents about the higher potency/alcohol content of spirits and the risk of severe alcohol intoxication may be beneficial.

Publications and presentations

Having some drinks: A normal part of growing up or a signal of a larger problem? Acker A, Thomas K. Paediatr Child Health 2013;18(10):512

Severe alcohol intoxication among Canadian adolescents: Data from first 18 months of surveillance. Acker A, Dow K, Thomas K, Allain D, Norris M. Canadian Paediatric Society Annual Conference, Toronto, in June 2015 (oral presentation)

Severe alcohol intoxication among Canadian adolescents – two-year surveillance data. Acker A, Norris M, Dow K, Allain D, Thomas K. Submitted as abstract for the Canadian Paediatric Society Annual Conference, Charlottetown, in June 2016.

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Acknowledgements

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Sudden unexpected death in epilepsy

January 2014 to December 2015 – Final report

Highlights

- Following a one-time CPSP survey regarding paediatricians' knowledge and experience with sudden unexpected death in epilepsy (SUDEP), a 24-month surveillance study for SUDEP in children was initiated.
- Fifteen Canadian paediatricians reported cases of SUDEP from January 1, 2014 to December 31, 2015. Nine cases are confirmed to date.
- Almost all deaths occurred during sleep and during periods when children were unsupervised. Over half the children had a history of nocturnal seizures and the majority had treatment-resistant seizures. These findings are consistent with the majority of SUDEP deaths reported in adults.
- Families of children at risk for SUDEP do not appear to be informed regarding this critical risk of epilepsy.

Background and objectives

The complete protocol can be accessed through www.cpsp.cps.ca/surveillance.

Case definition

Sudden unexpected death in a child less than 18 years of age:

- With epilepsy (defined as >1 unprovoked seizure)
- With or without evidence of a recent seizure
- Without documented status epilepticus
- Without trauma

Definite SUDEP is defined as meeting the above criteria, and a post-mortem examination does not reveal a cause of death. *Probable SUDEP* is defined as definite SUDEP, but without autopsy.

Results

In 2014, there were six reports of SUDEP: one case was excluded and five were confirmed. In 2015, there were nine reports: one case was a duplicate, one case was excluded, four cases have been confirmed, and three are pending completion of the detailed questionnaire.

A summary of the nine confirmed cases is presented.

Year	Reported	Duplicate	Excluded	Pending	Confirmed
2014	6	0	1	0	5
2015	9	1	1	3	4
Total	15	1	2	3	9

To meet criteria for definite SUDEP, an autopsy is required. When SUDEP is likely from history but autopsy is not available, the case is determined to be probable SUDEP. Possible SUDEP refers to cases in which a competing cause of death is present. While a coroner or medical examiner was alerted to all reported deaths, autopsy was only performed in six cases. At the time of this report, autopsy reports are available for two cases, both demonstrating no anatomical or toxicological cause of death and allowing for determination of definite SUDEP. The remaining four are determined to be probable SUDEP due to the unavailability of autopsy report. For the three cases without autopsy, two are determined to be probable SUDEP and one possible SUDEP due to the possibility of a competing cause of death. As autopsy reports become available, the determination of SUDEP deaths will be updated.

The age at death ranged from 20 months to 16 years with a mean age of 8.7 years (SD ± 5.7). Six of the nine (67%) children were female. The reported age of first unprovoked seizure was available for eight of nine (89%) children, and ranged from age 1 to 54 months with mean age of 17 months (SD ± 17.8).

Year	Definite SUDEP	Probable SUDEP	Possible SUDEP
2014	0	5	0
2015	2	1	1
Total	2	6	1

Surveillance Studies in 2015

The majority of children had indicators of more severe, treatment-resistant epilepsy. Five children had a lifetime frequency of more than 100 primary or secondary generalized tonic-clonic seizures, two children had a frequency of less than 10 tonic-clonic seizures, and one child had a frequency of 10 to 100 seizures. Seizure frequency data for one child was missing. Five of nine (56%) children had a history of nocturnal seizures, one child did not have nocturnal seizures, and this information was not available for three children. Eight of nine (89%) children were reported to have had some degree of developmental delay.

In eight cases, the deaths were not witnessed. In these eight cases, the child was presumed to be asleep prior to death. In the ninth case, the child was reported to be awake at the time of death, with seizures observed prior to death.

Only two of the nine (22%) affected families were reported to have been aware of the risk of SUDEP prior to the death of their child.

Conclusion

- Nine cases of SUDEP were confirmed from January 1, 2014 to December 31, 2015.
- Based on the best available data regarding the incidence of SUDEP in children, a minimum of nine sudden unexpected deaths in children with epilepsy were expected to occur annually in Canada. The results of the current CPSP surveillance study reflect fewer cases annually than expected. This information suggests that not all Canadian paediatricians are aware of SUDEP among children in the community or that SUDEP in children is rarer than previously identified.
- The number of Canadian paediatricians reporting SUDEP increased in 2015 compared to 2014. This increase may reflect a promising result of heightened awareness among paediatricians regarding the identification of SUDEP in children.
- Almost all deaths occurred during sleep and during periods when children were unsupervised. Over half the children had a history of nocturnal seizures and the majority had treatment-resistant seizures. These findings are consistent with the majority of SUDEP deaths reported in adults.
- To optimize surveillance of SUDEP in Canadian children, an ongoing parallel study is being conducted in association with the Canadian Pediatric Epilepsy Network, surveying paediatric neurologists across Canada.
- Given that only two of the nine affected families were aware of SUDEP prior to the death of their child, additional education regarding the risks of epilepsy is required for both physicians and families.

Publications and presentations

Sudden unexpected death in epilepsy: Who are the children at risk? Donner EJ. Paediatr Child Health 2014;19(7):389

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One-Time Surveys

Approach to minor injuries in non-ambulatory children

February 2015

Highlights

- A one-time CPSP survey revealed that 65% of Canadian paediatricians are aware that bruises and intra-oral injuries in pre-cruising children are “warning” or sentinel injuries for possible child abuse.
- Of the respondents who appropriately identified sentinel injuries, 92% were aware of bruises as sentinel injuries, while 67% were aware of intra-oral injuries as sentinel injuries.
- Paediatric subspecialists were significantly less likely than general paediatricians to be aware of the possible significance of a sentinel injury.

Background

A sentinel injury is a visible or detectable minor injury in a non-ambulatory child that is poorly explained and therefore raises suspicions of physical abuse. Examples include bruises and intra-oral bleeding, which may be “warning injuries” for possible abuse. Timely recognition and management of a sentinel injury can potentially alter a pattern of escalating child abuse, but studies have demonstrated that, in up to a third of cases, physicians miss early signs of abuse. A CPSP one-time survey of Canadian paediatricians was conducted in February 2015 to evaluate awareness of sentinel injuries and their significance. The purpose of the survey was to assess paediatrician awareness of sentinel injuries in pre-cruising children as precursors to more serious physical abuse. Respondents were provided with clinical vignettes describing infants with sentinel injuries and were asked about their differential diagnosis and management plan. Multivariable logistic regression analysis was used to identify variables most strongly correlated with physician awareness of the significance of sentinel injuries.

Results

The survey achieved a response rate of 23%, which is similar to other CPSP one-time surveys. Of the 582 respondents, 65% were aware that bruises and intra-oral injuries in pre-cruising children are red flags for possible physical abuse. Of those respondents who appropriately identified sentinel injuries, 92% were more likely to be aware of bruises as sentinel injuries than they were of intra-oral injuries (67%). Paediatric subspecialists were significantly less likely than general paediatricians to be aware of sentinel injuries as red flags for later serious abuse (adjusted OR = 0.57, 95% CI 0.37–0.88, $p = 0.01$). Other important trends included higher awareness with more recent completion of residency, and also with additional training in the area of child abuse and neglect.

Conclusion

- Over one third of Canadian paediatricians are unaware that unexplained bruising and intra-oral bleeding in a pre-cruising child should prompt assessment for possible abuse.
- Additional physician education is warranted to ensure that paediatricians recognize the importance of a sentinel injury and understand the indications for initiating appropriate investigation and management.

References

Available upon request from the CPSP office

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Co-investigators

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Inhalation of e-cigarettes and ingestion of e-liquid

November 2015

Highlights

- Electronic cigarettes and fluid (e-cigarettes, e-fluid) are hazardous materials that, when inhaled or ingested, pose significant health risks to children.
- Participants reported over 200 cases presenting to a paediatric clinic or an emergency department for injuries and/or symptoms related to e-cigarette exposure.

Background

E-cigarettes are a type of electronic nicotine delivery system that, when activated, vaporize and deliver inhalable liquid. This chemical mixture often contains nicotine, propylene glycol, flavourings, and other substances. These materials, when inhaled and/or ingested, pose significant health risks, particularly to children. With the rise in popularity of these devices and access to these materials, there are many unanswered questions about their impact on children. It is reported that exposure to, and unintentional overdose from, these materials are increasing in Canada.

Results

A one-page survey was sent to paediatricians and paediatric subspecialists through the CPSP. Participants were asked about the number, and injuries/symptoms of children who had presented with e-cigarette exposure (inhalation and ingestion cases) in the previous 12 months. In addition, information was collected on the patient's age, sex, setting of treatment sought, e-cigarette use, and access.

A total of 519 surveys were completed and returned, identifying 220 cases. Symptoms related to inhalation were present in 135 cases (43 unintentional, 92 intentional) and symptoms related to ingestion were present in 85 cases (35 unintentional, 50 intentional).

For inhalation cases, most were male, ages 15 to 19 years, who sought treatment for nausea/vomiting, cough, throat irritation, or acute nicotine toxicity in an outpatient clinic or office. Most inhalation cases reported e-cigarette use two to three days per week and e-cigarette purchases were made from a mall kiosk/store.

For ingestion cases, most were male, ages 1 to 4 years presenting to an emergency department with nausea/vomiting, cough, or respiratory irritation. Younger ingestion cases accessed e-liquid at home; older cases reported e-cigarettes and e-liquid were purchased in a mall kiosk/store. The most common e-liquid flavours reported consumed were fruit, candy, and tobacco.

Conclusion

- E-cigarettes, recently introduced into the Canadian market, are hazardous to children.
- Results of this study highlight the serious injuries presented from exposure to e-cigarette and e-liquid. Parents should be educated on ways to prevent exposure to children.
- Further investigation into ways to reduce the risks that e-cigarettes pose to children is needed to minimize injury.

References

Available upon request from the CPSP office

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Vaccine hesitancy

September 2015

Highlights

- The most common concerns expressed by parents were the risk of autism (64%), too many vaccines (62%), the risk of a weakened immune system as a result of vaccination (52%), and vaccine additives (51%).

Background

Despite the documented success of vaccines in decreasing the incidence of vaccine-preventable illness, the rate of vaccine compliance in Canada falls below national targets. Research suggests that primary care providers play a central role in vaccine decision-making as they are viewed by parents as the most trusted source for vaccine safety information. There is limited evidence regarding effective strategies for addressing vaccine hesitancy and little is known about how vaccine hesitancy impacts paediatric practice in Canada.

Results

A one-time survey through the CPSP was conducted to understand how paediatricians respond to parents with concerns about vaccination and the impact of vaccine hesitancy on practice. The survey was distributed to 2521 paediatricians and paediatric subspecialists. The response rate was 27% (n=669) which is consistent with other CPSP one-time surveys. Fifty-seven percent of respondents were general paediatricians and 43% were subspecialists.

The results indicate that the majority of paediatricians (89%) encounter parents with concerns about vaccination. Forty percent of respondents indicated that the frequency of vaccine-hesitant parents has increased compared to five years ago. The most common concerns expressed by parents about vaccination include the risk of autism (64%), too many vaccines (62%), the risk of a weakened immune system as a result of vaccination (52%), and vaccine additives (51%). Thirty percent of paediatricians noted that at least half of children whose parents expressed concerns about vaccination never received the recommended vaccines.

When initiating discussions about vaccination, 55% of respondents used a presumptive (“We have to do some shots.”) as opposed to a participatory approach (“What do you want to do about shots?”). In response to parent resistance, paediatricians most commonly discussed the risks of non-vaccination (93%), restated their vaccine recommendations (69%), or referred to reliable patient resources (62%). More than half (52%) of paediatricians noted that discussions with vaccine-hesitant parents were generally positive and nearly two thirds (64%) indicated that discussions typically lasted less than ten minutes.

The most common challenges in working with parents who expressed concerns about vaccination were frustration with parent resistance (69%) and time (66%). Nearly half (45%) of respondents indicated that vaccine hesitancy impacts their practice; most commonly by increasing the length of clinic visits (63%), leaving less time to discuss other issues (50%), or causing tension with the parent (50%). Four percent of respondents indicated that patients that received none of the recommended vaccines would not be permitted to continue to be served by the practice.

Conclusion

- A one-time CPSP survey revealed that 89% of respondents have encountered parents who expressed concerns about childhood vaccines in the last 12 months.
- Nearly half of respondents indicated that vaccine hesitancy impacts their practice, most often by increasing the length of clinic visits, leaving less time to discuss other issues, or causing tension with the parent.

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Vitamin D deficiency rickets

March 2015

Highlights

- Following a two-year study on vitamin D deficiency rickets (2002 to 2004), which led to heightened public awareness about rickets prevention, a one-time survey in 2015 demonstrated that rickets and severe symptomatic vitamin D deficiency continue to be diagnosed across Canada.
- Rare but serious outcomes included cardiomyopathy and respiratory distress. Three patients had seizures, one of whom died. A second patient with rickets died following a respiratory infection.

Background

The results of a two-year CPSP study on vitamin D deficiency rickets (2002 to 2004) demonstrated that severe vitamin D deficiency and nutritional rickets were persistent problems among infants and children in Canada¹ despite Health Canada and Canadian Paediatric Society prevention guidelines.² This reinforced the message that vitamin D supplementation was essential to eradicate this serious but easily preventable disease. In March 2015, a CPSP one-time survey was conducted to assess whether vitamin D deficiency rickets remains prevalent in Canada and obtain a better understanding of the barriers to prevention.

Results

The frequency of symptomatic vitamin D deficiency and rickets was assessed through the CPSP, and the one-time survey identified barriers to the implementation of prevention guidelines. Vitamin D deficiency rickets was defined as a serum 25-hydroxyvitamin D level <25 nmol/L plus radiographic signs of rickets. Severe, symptomatic vitamin D deficiency (without rickets) was defined as a 25-hydroxyvitamin D level <25 nmol/L plus associated signs and symptoms, such as seizures, hypocalcemia, and fractures. Participating paediatricians reported on cases that were identified between March 2014 and March 2015.

A total of 671 paediatricians participated in the survey and the response rate was 27%, consistent with other one-time CPSP surveys. Of these, 58 (9%) paediatricians reported a total of 149 cases: 48 had nutritional rickets and 101 had severe, symptomatic vitamin D deficiency without rickets. For those presenting with rickets, 67% were aged 0 to 2 years, 23% were 3 to 8 years, and 10% were 9 years and older. For those presenting with severe, symptomatic vitamin D deficiency, 26% were aged 0 to 2 years, 26% were 3 to 8 years, and 48% were 9 years and older. The majority of cases were located in Alberta, Manitoba, Ontario, and Quebec.

Patients presented with skeletal deformity (13%), hypotonia/weakness (14%), delayed motor milestones (11%), failure to thrive (9%), irritability (7%), fractures (5%), and poor or delayed dentition (3%). More rare but serious outcomes included cardiomyopathy (1%) and respiratory distress (1%). Three patients presented with seizures, one of whom died. Another infant was identified with vitamin D deficiency rickets following post-mortem examination for sudden infant death syndrome (with cause of death being pneumonia).

In the initial vitamin D deficiency rickets study, the vast majority of confirmed cases were infants and toddlers with intermediate and dark skin, who had been exclusively breast-fed without appropriate vitamin D supplementation. This survey showed that high-risk groups go beyond dark-skinned breast-fed infants and include infants and children receiving milk or formula and those unable to afford vitamin D supplementation.

Patient risk factors included: darker skin; lack of sun exposure and vitamin D supplementation; recent immigration to Canada; developmental delay; feeding challenges due to prematurity; food allergies and dietary restrictions (including dairy); and maternal vitamin D deficiency. Barriers to effective vitamin D supplementation included health care providers' lack of promotion of the CPS recommendations, lack of supplementation, non-compliance, parents' disagreement with the need for supplementation, inability to afford vitamin D supplementation, language barriers, high cost of fortified milk in Northern communities, and spitting out the supplement. Ten percent of the reporting paediatricians noted that they were not aware of the CPS guidelines for rickets and severe vitamin D deficiency prevention.

Conclusion

- Symptomatic vitamin D deficiency and rickets are persistent in Canada and continue to be linked to serious health outcomes.
- A lack of health care providers' awareness of the CPS guidelines and caregivers' non-compliance are persistent barriers.
- High-risk groups go beyond dark-skinned breast-fed infants and include infants and children receiving milk or formula and those unable to afford vitamin D supplementation.
- Additional strategies that place prevention in the hands of mandated public health policy makers now merit consideration.

References

References 1 and 2 are available upon request from the CPSP office.

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RESEARCH OPPORTUNITIES

Call for New Studies

Wanted

Investigators to initiate new CPSP studies

The program

- Well established, timely, and cost-effective
- Multi-faceted surveillance, capable of collecting reliable data in a variety of fields
- Effective at monitoring low-frequency, high-impact diseases and conditions

Track record

- 76% response from approximately 2500 paediatricians
- 84% data completion rate for identified cases

Study ideas

- Adverse infant reactions to black market breast milk or milk concoctions (goat milk, coconut oil)
- Congenital syphilis
- Gender dysphoria
- Human papillomavirus (HPV) and HPV-related cancers
- Juvenile-onset recurrent respiratory papillomatosis
- Late-diagnosed cyanotic congenital heart disease
- Pet-related *Salmonella* infections
- Severe neonatal hypernatremia
- Severe sports-related head trauma

If you are interested in these or other studies, or for more program information, please contact 613-526-9397 ext. 239 or e-mail cpssp@cps.ca.



"For close to 20 years, the CPSP has been an important collaborative asset for research, health policy development and the active surveillance of less common paediatric disorders. The hundreds of Canadian paediatricians and paediatric subspecialists who participate monthly in the program ensure that the CPSP is an effective way to foster continuing medical education on a wide spectrum of clinical conditions that might otherwise go largely unrecognized."

Bryce Larke, MD, Professor of Pediatrics, University of Alberta, Edmonton, Alberta, 1975-2001; Chief Medical Officer of Health, Whitehorse, Yukon, 2001-2008; CPSP Steering Committee member, 2004-2010



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