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Australian Paediatric Surveillance Unit Annual Report 2018

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Context

The Australian Paediatric Surveillance Unit (APSU) has been conducting active, prospective, national surveillance for rare diseases of children over the last 25 years with monthly reporting by paediatricians. Communicable diseases currently under surveillance include: acute flaccid paralysis (to identify potential cases of poliovirus infection); congenital cytomegalovirus infection; neonatal herpes simplex virus infection; perinatal exposure to human immunodeficiency virus (HIV) and paediatric HIV infection; juvenile onset recurrent respiratory papillomatosis; severe complications of influenza (undertaken during the influenza season June to September 2018); congenital rubella infection; and severe complications of varicella virus infection including neonatal and congenital varicella infection. Of related interest is the study of microcephaly in infants less than 12 months of age, for which monitoring commenced in relation to the emergence of Zika virus and finished at the end of July 2018.

Introduction

The Australian Paediatric Surveillance Unit (APSU)ⁱ was established in 1993 with the purpose of enabling active, prospective, national case ascertainment of rare conditions in childhood.¹ It covers a wide range of rare conditions, including infectious and vaccine-preventable diseases, genetic disorders, injuries and mental health conditions, in addition to complications of common diseases and adverse effects of treatment.

Essential features of the APSU surveillance system include: provision in advance of clear case definitions for each condition under surveillance and practical reporting instructions; uniform national data collection, which overcomes difficulties in obtaining data from individual state and territory health systems;¹ and its active nature which prompts paediatricians to report and hence results in more complete case-finding.² Additionally, the APSU surveillance system has demonstrated preparedness

and capacity for rapid response to public health threats.^{3,4} Information gathered by the APSU is fundamental to inform relevant public health policy, with the ultimate aim of contributing to the health of Australia's children.

This report provides a summary of eight conditions under surveillance during January to December 2018.

Surveillance Method

The established APSU method for conducting surveillance has previously been published.^{5,6} Briefly, each month, APSU contributors nationally (including ~1,450 paediatricians, paediatric subspecialists and other clinicians who work primarily with children) are sent either an e-mail (94.0%) or a reply-paid report card (6.0%), listing the current conditions under surveillance. Figure 1 shows an example of a report card from 2018.

Contributors are asked to return the email or report card, indicating whether they have seen a case newly diagnosed with any of the condi-

ⁱ <http://www.apsu.org.au/>

tions listed on the report card or have 'nothing to report'. Clinicians who notify a case are then requested to complete a study questionnaire, providing de-identified data, and a case code is created to facilitate detection of duplicate reports. A link to the study questionnaire is sent electronically to reporting clinicians. Links to study protocols and case definitions are also provided on the card and are downloadable. Figure 2 is a schematic diagram showing the methodology of the APSU. Return of the report card by APSU contributors who are not reporting a case is crucial to the estimation of case ascertainment. The list of conditions on the card is limited to reduce the burden on reporters.

In the case of acute flaccid paralysis (AFP), surveillance is conducted on behalf of the Department of Health. In response to the monthly report card, paediatricians are prompted to report cases to either the APSU (data are then provided to the National Enterovirus Reference Laboratory, NERL) or direct to NERL. In both cases the APSU questionnaire is completed by clinicians. In addition, inpatient cases are identified in seven tertiary paediatric teaching hospitals by nurses working for the Paediatric Active Enhanced Disease Surveillance system (PAEDS) and then reported to NERL. The NERL ensures completeness and accuracy of data provided on questionnaires and compiles and stores data on all AFP cases. Clinical details of all reported cases are regularly reviewed by the Polio Expert Panel (PEP) for confirmation of diagnosis and classification and reporting to the World Health Organization (WHO).

The APSU process utilises Research Electronic Data Capture (REDCap) for data management. REDCap is a secure web application which allows reporting clinicians to complete online questionnaires, providing information that is stored securely on a server at the University of Sydney.

In 2018, there were eight communicable diseases or related conditions under surveillance. Appendix A provides the case definition for each

condition. Human Research Ethics Committee Approval was obtained for every condition under surveillance.

Results

The annual overall response rate to the monthly APSU report card for 2018 was 92.0% which is consistent with the response rate of 91.2% in 2017. The APSU received a total of 123 notifications for the different conditions under surveillance (excluding AFP) which included 96 cases after exclusion of duplicates and cases that did not meet diagnostic criteria. Figure 3 shows the geographical distribution of APSU-reporting contributors in 2018.

APSU contributors comprise a similar proportion of males (51.3%) and females (48.7%) based across major Australian cities, inner regional, outer regional and remote areas. The geographical coverage by state was: 38.1% in New South Wales, 23.7% in Victoria, 16.6% in Queensland and less than 10% in other states or territories, consistent with the population distribution. Below is a detailed report for each condition.

Acute flaccid paralysis (AFP)

The APSU commenced AFP surveillance at the request of the Department of Health in March 1995 in response to the WHO's efforts to monitor poliomyelitis in the Western Pacific Region. The objectives of this surveillance are: (i) to conduct surveillance for cases of AFP and contribute to the documentation of the reported rate of AFP over time in those under 15 years in Australia, with the aim of detecting and enabling response to polio-compatible cases in the Western Pacific region; (ii) to collect necessary case and clinical information to enable classification of reported AFP cases by the PEP; (iii) to enable and encourage clinicians to report case information in a timely way to facilitate further clinical investigations and to prompt adequate stool sample collection (two stool specimens of sufficient quantity for laboratory analysis, collected at least 24 hours apart, within 14 days after the onset of paralysis); (iv) to ensure appropriate subnational

Figure 1. Example of an APSU report card

APSU REPORT CARD JUNE 2018B

NOTHING TO REPORT? PLEASE SELECT REPLY AND TYPE 'NTR' IN THE SUBJECT LINE OF THIS EMAIL

DO YOU HAVE A CASE TO REPORT? SELECT REPLY AND TYPE THE NUMBER OF CASES IN THE SPACE PROVIDED BELOW

**Once again the APSU is conducting surveillance for Severe Complications of Influenza. Please notify any cases to the APSU as soon as possible during the study period (1st June 2018 until the 30th September 2018).
Questionnaires can be filled out ONLINE by following this secure link: [Online Severe Complications of Influenza 2018 Questionnaire](#).
Flu protocol and printable questionnaire can be accessed by following this link: [2018 Severe Complications of Influenza Protocol & Questionnaire](#).**

If you report a case, please record patient details for later reference

NEWLY DIAGNOSED CASES ONLY - Please report cases diagnosed within study period only

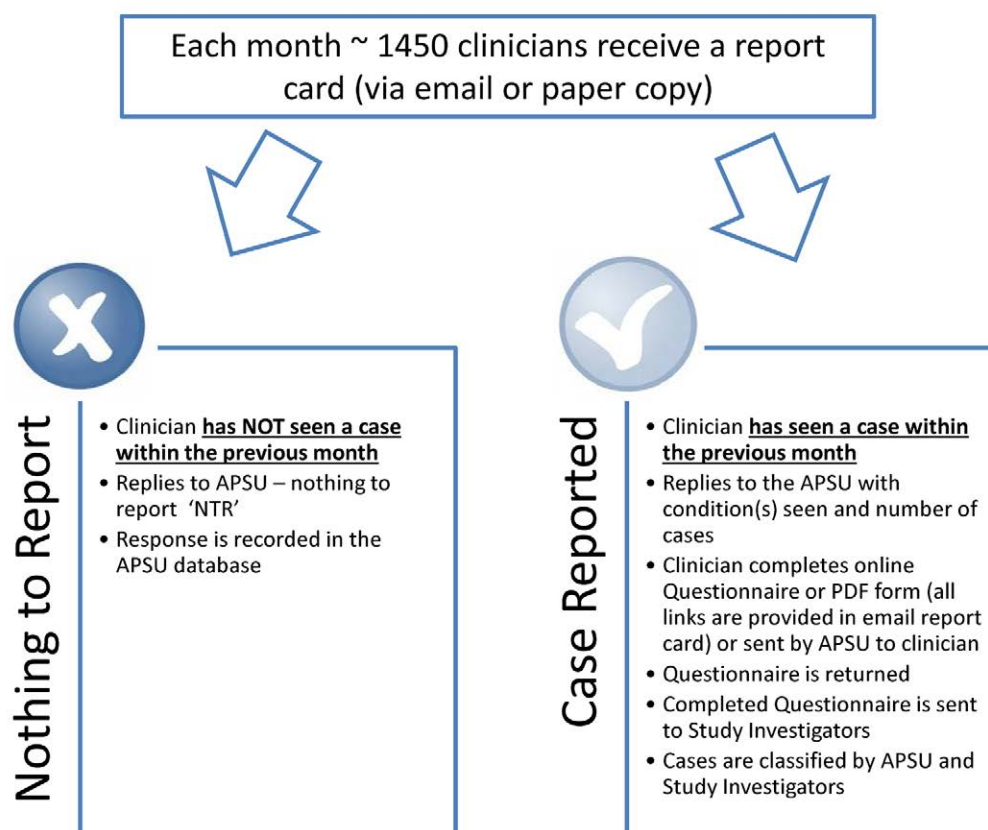
Study case report forms are available through the hyperlinks below or via the APSU website <http://apsu.org.au/studies/current/>

No of Cases	Study Case Report Forms - printable form for fax/email	Web links for completion of ONLINE Case Report Forms
[]	Acute flaccid paralysis **	
[]	Severe Complications of Influenza	Online Severe Complications of Influenza Questionnaire
[]	Severe injury Related to Disc Battery	Online Severe Injury Related to Disc Battery Questionnaire
[]	Stroke in Children < 2 years old	Online Stroke in Children < 2 years old Questionnaire
[]	Microcephaly in children < 12 months old	Online Microcephaly in children < 12 months old Questionnaire
[]	Fetal Alcohol Spectrum Disorder	Online Fetal Alcohol Spectrum Disorder Questionnaire
[]	MECP2 Duplication Syndrome	
[]	Juvenile onset Recurrent Respiratory Papillomatosis	
[]	Congenital varicella	Online Congenital Varicella Questionnaire
[]	Neonatal varicella	Online Neonatal Varicella Questionnaire
[]	Rett syndrome	
[]	Congenital cytomegalovirus infection - NSW - Other States	
[]	Neonatal Herpes Simplex Virus Infection	Online Herpes Simplex Virus Infection Questionnaire
[]	Paediatric HIV infection OR perinatal exposure to HIV - Mother - Child	
[]	Congenital rubella	Online Congenital Rubella Questionnaire

See your protocol sheet for details regarding stool/serum specimens.

Please ALSO report cases of acute flaccid paralysis immediately by telephone to the National Enterovirus Reference Laboratory on (03) 9342 9607 or email enterovirus@mh.org.au.

Figure 2. Schematic methodology of APSU surveillance



geographical coverage of surveillance activities; and (v) to describe and monitor trends in the aetiology, clinical features and short-term outcome of non-polio AFP in Australia.

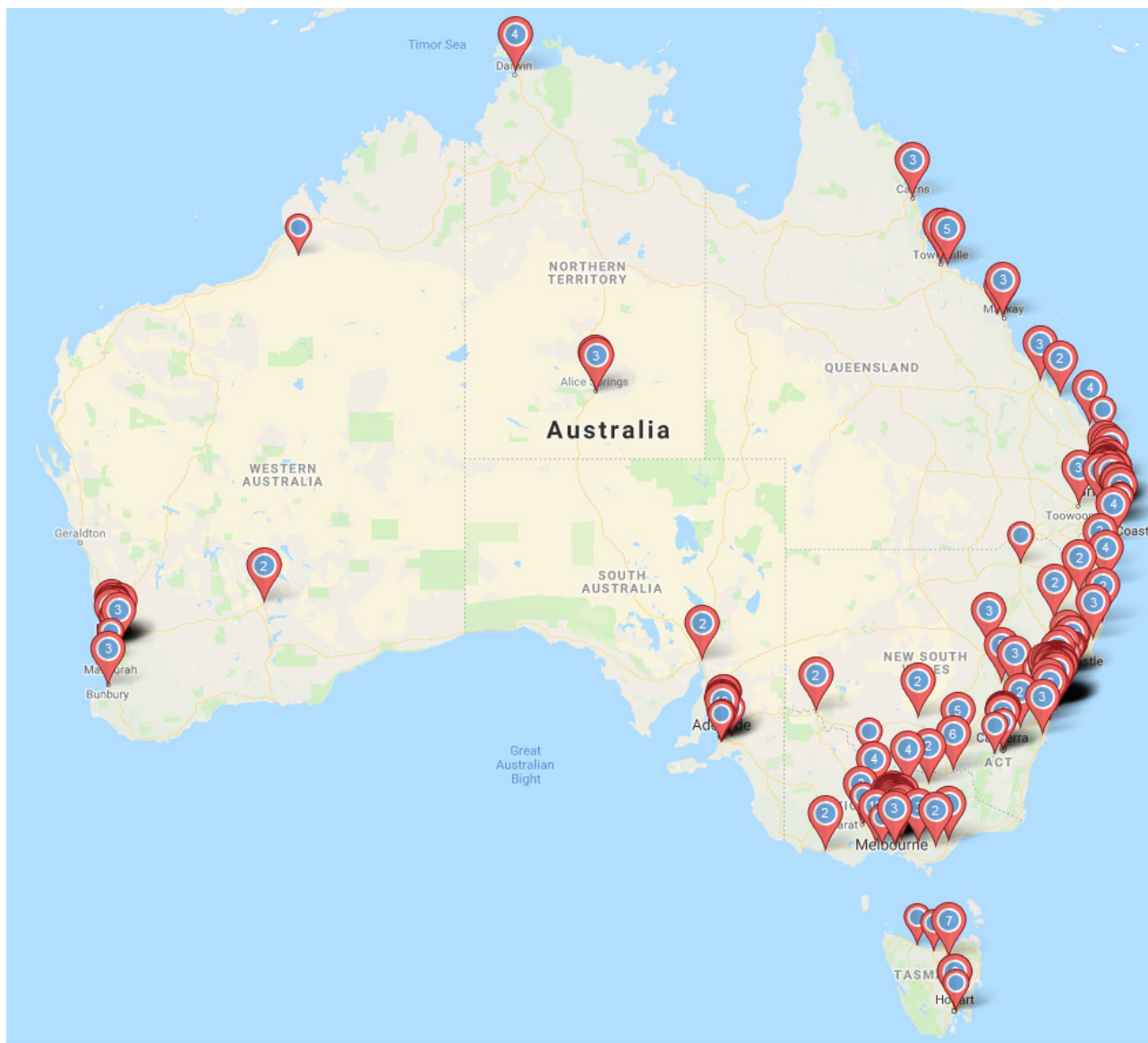
In 2018, there were 88 notifications of AFP received. Questionnaire data were available from all sources for 80 out of 88 (90.9%). Of the 88 notifications, 22 were duplicate reports and 9 were errors (outside of age range, outside of 2018 period). Of the remaining 57 cases, 54 were classified by the PEP as AFP non-polio and three as polio-compatible due to insufficient evidence to exclude poliomyelitis (stool samples were inadequate). Cases were reported from most states and territories; 24 from Victoria (42.1%), 10 from New South Wales (17.5%), 10 from Queensland (17.5%), 8 from Western Australia (14.0%), 3 from the Northern Territory (5.3%); and 2 from South Australia (3.5%). Nine cases reported to APSU came from clinicians working in hospitals that are not included in PAEDS.

The diagnoses of cases are shown in Table 1, the most common being Guillain-Barré syndrome and transverse myelitis as previously described.⁷

Congenital cytomegalovirus infection (CMV)

Human cytomegalovirus (CMV) is the leading non-genetic cause of congenital malformation in developed countries including Australia.^{8,9} Infection may result in fetal and neonatal death or the development of serious clinical sequelae including sensorineural hearing loss and neurodevelopmental disability. We have recently shown that awareness in the medical and general community about congenital CMV is very low and in need of improvement.¹⁰ The objectives of this surveillance are: (i) to determine the incidence of congenital and suspected congenital CMV infection, prior to trials of vaccines and antiretrovirals; (ii) to determine the presenting

Figure 3. Geographical coverage of APSU contributors in 2018 (Maptive software)



features and clinical spectrum of disease due to congenital CMV; and (iii) to identify the therapy used for congenital CMV infection.

During 2018, there were 35 notifications of CMV infection. The response rate to the clinical questionnaire was 71.4%, indicating that there were 24 confirmed cases, one duplicate report and 10 probable cases (requests have been sent for additional data but had not been received at the time of publication).

The ongoing APSU study is a crucial mechanism for increasing awareness and improving diagnosis. During 2017–2018, data from the APSU study informed our work on translation

of knowledge into information for clinicians and the community, sampling of different populations to improve understanding of congenital CMV,^{10,11} discussions with NGOs conducting research and providing clinical services in the disability sector (particularly the Cerebral Palsy Alliance and the Congenital CMV Association of Australia), and national and state paediatric and obstetric services. As the longest such study (19 years) in the world, international interest in these Australian data is high.

Data from the APSU CMV study have contributed to:

1. A NSW Ministry of Health agreement to

Table 1. Most common conditions of non-polio AFP

PEP classification	N (%)
Guillain-Barré syndrome	21 (38.9%)
Transverse myelitis	11 (20.4%)
Acute disseminated encephalomyelitis	4 (7.4%)
Anterior horn cell disease: other neurotropic virus	2 (3.7%)
Enterovirus encephalomyelitis	2 (3.7%)
Neuropathies of infectious diseases	2 (3.7%)
Acute cerebellar ataxia	1(1.9%)
Amebic encephalitis	1(1.9%)
Botulism	1(1.9%)
Clinically isolated syndrome	1(1.9%)
Demyelinating polyradiculopathy	1(1.9%)
Drug induced paralysis due to corticosteroids and blocking agents	1(1.9%)
HSV encephalitis	1(1.9%)
Spinal cord ischaemia	1(1.9%)
Other ^a	4 (7.0%)

a Other includes: cerebellar ataxia, encephalitis, ischaemia and brainstem encephalitis.

enhance congenital CMV awareness through provision of information via public health units on congenital CMV.

2. Development of information sheets for the general public, partly or wholly based on documents drafted by investigators from the APSU study group.ⁱⁱ

3. A short online video funded and prepared by the Cerebral Palsy Alliance (led by Dr Hayley Smithers-Sheedy of CPA and Ms Kate Daly of the Congenital CMV Association of Australia) to raise awareness of congenital CMV infection and its role in the aetiology of cerebral palsy.ⁱⁱⁱ

4. Negotiations, led by Dr Lisa Hui and Dr Antonia Shand, with the Royal Australian and New Zealand College of Obstetricians and Gynaecologists (RANZCOG), on including

specific information for Obstetricians on congenital CMV prevention in RANZCOG-endorsed guidelines.

5. Education of primary care, infectious diseases and pathology physicians about congenital CMV through webinars.^{iv}

6. Development of International Consensus Guidelines now used in public health and government negotiations for congenital CMV screening.¹²

7. Multiple presentations in 2018 by the investigators including invited talks at the Annual Meetings of the Australian Institute of Medical Scientists/AACB, Australasian and European Societies of Infectious Diseases short course on Infectious Diseases in Pregnant women, fetuses and newborns, Australian

ii <https://www.cmv.org.au/dl-flyer/>

iii <https://www.cerebralpalsy.org.au/cmv/>

iv <https://www.racgp.org.au/education/professional-development/online-learning/webinars/communicable-disease/congenital-cmv-common-commonly-missed>

and New Zealand Placental Research Association and invited talks at the University of Erlangen Germany and nationally.

The APSU data continue to be crucial to these communications as findings show ongoing congenital CMV infection and its persistent lack of recognition.

Neonatal herpes simplex virus infection (HSV)

Neonatal herpes simplex virus infection (HSV) is a rare but important condition which presents with disease localised to the skin, eye and/or mouth, encephalitis or a highly lethal disseminated infection associated with shock, disseminated intravascular coagulation and bleeding. It is now treatable with antiviral agents. The objectives of APSU surveillance are: (i) to estimate the incidence and to describe the demographics, presentation, diagnosis and management of acute HSV infection in infants less than 3 months of age in Australia; (ii) to determine the acute and prophylactic management of these infections; (iii) to describe the outcome at discharge from hospital and at 12 months after diagnosis; and (iv) to describe the relationship between infant and maternal risk factors for neonatal HSV infection and adverse outcomes for the infant after infection.

In 2018, there were seven notifications of neonatal HSV infection. The response rate to the clinical questionnaire was 100%, identifying six confirmed cases and one duplicate case. One confirmed case was born in late 2017 and notified in early 2018 from Queensland. This infant had asymptomatic HSV-1 infection and was treated with the antiviral drug Acyclovir. Of the five confirmed cases notified and born in 2018, two were from Victoria, one from Western Australia, and two from Queensland. All of the infants born in 2018 had symptomatic neonatal HSV infection: one had skin, eye or mouth (SEM) disease as the main clinical feature at presentation, two had neurological (CNS) disease, and two had disseminated multi-organ infection. Four infants survived: three of these

infants had HSV-1 infection and one of the four was not HSV typed. All four infants were treated with Acyclovir. The infant with disseminated disease died from the infection; this infant had HSV-2 infection and did not receive any antiviral treatment. Neonatal HSV infection remains a rare but potentially lethal disease.

Data from the APSU HSV study have contributed to:

1. The 2018 Australasian Society for Infectious Diseases/European Society of Clinical Microbiology and Infectious Diseases (ASID/ES-CMID) short course on Infectious Diseases in Pregnant women, fetuses and newborns – Herpes simplex virus in pregnancy and neonates.^v
2. A presentation at the 2018 Australian Academy of Health and Medical Sciences AGM and Scientific meeting.

Perinatal exposure to HIV and paediatric HIV infection

HIV infection among children in Australia is a rare occurrence, with mother-to-child transmission being the most frequent source of HIV among children in Australia. The objectives of APSU surveillance are: (i) to monitor the pattern of newly-diagnosed HIV infection among children aged less than 16 years at HIV diagnosis; (ii) to monitor the pattern of perinatal exposure to HIV among children born to women with HIV infection; (iii) to monitor the uptake of interventions for minimising mother-to-child transmission among women whose HIV infection was diagnosed antenatally; and (iv) to monitor the pattern of mother-to-child transmission in Australia.

In 2018, 35 notifications of perinatal exposure to HIV were reported to the APSU. The response rate to the clinical questionnaire was 91.4%.

v <https://www.asid.net.au/events/event/asidescmid-course-on-infectious-diseases-in-pregnant-women-fetuses-and-newborns>

Of these, 29 were confirmed cases, three were duplicate reports, and three are yet to be classified due to outstanding data (requests have been sent for additional data but were not received at the time of publication). Of the 29 confirmed cases, 27 were Australian-born cases of perinatal exposure to HIV, with one case of perinatal HIV transmission. This compares to 44 Australian born cases of perinatal exposure reported in 2017 and 36 in 2016, with one case of perinatal HIV transmission reported in each of those years. Data on perinatal HIV exposures and perinatal HIV transmissions in Australian born infants are routinely reported in the Australian Annual Surveillance Report on HIV, viral hepatitis and sexually transmissible infections,¹³ and the annual national report tracking the progress against relevant indicators in the National HIV Strategy. Data are also routinely reported to the Joint United Nations Programme on HIV/AIDS (UNAIDS) as part of international reporting on mother-to-child transmission of HIV.

APSU data suggest that Australia continues to achieve high coverage of programs to prevent mother-to-child transmission of HIV; however, vigilance is required to ensure that HIV diagnosis is identified in or prior to pregnancy and appropriate treatment is offered to ensure mother-to-child transmission is eliminated.

Juvenile onset recurrent respiratory papillomatosis (JoRRP)

Juvenile onset recurrent respiratory papillomatosis (JoRRP) is a condition in which benign papillomata develop and recur in the larynx. It usually develops in infancy or early childhood and is the most common benign neoplasm of the larynx in children. JoRRP is caused by human papillomavirus (HPV) infection; of which HPV 6 and HPV 11 are considered the most common causative genotypes.

The incidence of JoRRP has decreased since the introduction of the HPV vaccine into the National Immunisation Program in 2007.¹⁴ Clinician reporting on new JoRRP cases has continued throughout 2018 via the APSU sur-

veillance mechanism and its objectives are: (i) to estimate the Australian incidence of recurrent respiratory papillomatosis (RRP) in children aged less than 15 years; (ii) to describe symptoms, clinical presentation and treatment of RRP in Australia; (iii) to describe characteristics of maternal and delivery history; (iv) to describe child and maternal HPV vaccination history; (v) to describe viral types isolated in biopsy samples; (vi) to describe the distribution of RRP and HPV genotypes according to antenatal maternal HPV vaccination status, and child vaccination status; and (vii) to describe current methods of treatment of JoRRP in Australia.

In 2018, there were no notifications and no suspected or confirmed cases for this condition, whereas three notifications were received in 2017, one of which was a duplicate report. Both cases were classified as probable, with a case of non-laryngeal papillomatosis.

A publication in the Journal of Infectious Diseases, entitled *A prospective study of the incidence of Juvenile-Onset Recurrent Respiratory Papillomatosis after implementation of a national HPV vaccination program*,¹⁴ included our research findings since the project began in 2011 and was classified by the journal as a 'major impact' publication, based on downloads and reading.

Severe complications of influenza

Severe complications of influenza surveillance is added to the routine monthly APSU report card during the influenza season each year from June to September. The objective of this surveillance is to document clinical features, medical and vaccination history, and outcomes in children admitted to national hospitals with severe complications of influenza that are not reported to existing surveillance systems.

There were 22 notifications of severe complications of influenza during June to September 2018. The response rate to the clinical questionnaire was 100%. Of the notifications, 20 were confirmed as cases, one of which was fatal,

one duplicate report and one error (outside the reporting period). The number of cases reported in 2018 was much lower than during the previous influenza season (June to September 2017) when there were 107 confirmed cases. The 2017 total was the second-highest number of confirmed cases since seasonal APSU surveillance of severe influenza complications began in 2008.⁵ The high number of notifications observed in 2017 was also documented by another surveillance system.¹⁵

The APSU is preparing a manuscript for publication, compiling data from 613 children reported from the last ten years of surveillance of severe complications of influenza.

Congenital rubella infection

Congenital rubella is a potentially vaccine-preventable condition resulting from maternal infection during pregnancy. It poses significant health consequences in children. The objectives of APSU surveillance are: (i) to more accurately define the present incidence of congenital rubella in Australia; (ii) to evaluate the reasons why mothers of children with congenital rubella have not been effectively vaccinated; and (iii) to monitor the outcome of the rubella vaccination programme.

There were no notifications of congenital rubella syndrome reported to the APSU during 2018. Likewise, no notifications were ascertained by The National Notifiable Disease Surveillance System in 2018.¹⁶ Nevertheless, it is important to continue surveillance as imported or locally-acquired infection can still occur, especially among unvaccinated populations.¹⁷

Neonatal and Congenital varicella

Neonatal and congenital varicella infections are vaccine-preventable conditions resulting from varicella infection during pregnancy and which can lead to serious infant diseases. The objectives of APSU surveillance are: (i) to estimate the incidence of neonatal or congenital varicella infection seen by Australian paediatricians and

its associated morbidity and mortality; (ii) to document the source of maternal and neonatal infection or the management and short-term outcome of congenital varicella; (iii) to compare results with those from a previous APSU study of neonatal or congenital varicella that concluded in 1997, prior to the availability of varicella vaccination; (iv) to document current management practices and short term outcome of neonatal varicella; and (v) to estimate the need for screening to identify non-immune women antenatally.

There were no notifications of congenital varicella syndrome reported during 2018. In contrast, in 2017, there was one confirmed case of congenital varicella syndrome. The child presented with multiple clinical abnormalities including herpes zoster (shingles), neurological abnormality, eye lesions and gastrointestinal abnormalities. Regarding neonatal varicella infection, there was one notification reported to the APSU in 2018.

Continued surveillance is required because the National Immunisation Program of varicella vaccination, which commenced in 2005, has primarily targeted young populations, leaving adults who remain unvaccinated as an ongoing potential source of infection.⁵

Microcephaly

APSU surveillance of microcephaly commenced in June 2016, in response to the emergence of Zika virus infection internationally, and formally ended in mid-2018. The objectives of this surveillance were: (i) to describe the epidemiology of microcephaly in children aged less than 12 months presenting to paediatricians; (ii) to describe all causes of microcephaly in Australia; (iii) to document the infective causes of microcephaly such as congenital CMV infection, congenital rubella, toxoplasmosis and maternal Zika virus infection, and to describe how infection was acquired; and (iv) to educate Australian paediatricians about the possible causes of microcephaly including maternal Zika virus infection in women with appropriate

travel history of exposure and to disseminate best practice guidelines as these become available or are updated.

During the surveillance period June 2016 – July 2018, there were a total of 106 notifications of microcephaly. In 2018, there were 23 notifications. The response rate to the clinical questionnaire was 91.3%, of which 16 were confirmed cases, four were outside the case definition, one was a duplicate and two have outstanding data or minimal information, precluding classification.

No cases of Zika-associated microcephaly were reported. Two mothers travelled outside Australia during pregnancy or in the three months before pregnancy. One visited a country with evidence of virus circulation before 2015 (Category 2) and the other visited a country with low Zika-transmission likelihood, according to the WHO Zika virus country classification scheme in place during the APSU study. There was one case attributed to CMV infection. Other cases were associated with chromosomal anomalies, intracranial vascular events, or developmental anomalies of the central nervous system (CNS). For the majority of cases (56.2%) no cause for microcephaly could be determined, which is consistent with other published data.¹⁸

APSU has also conducted a 10-year retrospective medical record audit for cases of microcephaly (classified using ICD-AM codes Q00-Q07, Q89.83, Q87.1, Q86, A50, P35.0-P35.2, P35.8 and P37.1), which aims to estimate the prevalence and causes of microcephaly in children receiving care at the Sydney Children's Hospital Network (Westmead) between 2008 and 2018 (unpublished).

The investigators have been invited to contribute data on severe microcephaly (<1st percentile or more than three standard deviations below the mean) from the APSU microcephaly study to an International Network of Paediatric Surveillance Units report. This will include comparable data from the Canadian Paediatric Surveillance Program, British Paediatric Surveillance Unit

and New Zealand Paediatric Surveillance Unit and will allow for international comparison of frequency, causation and clinical presentation.

Conclusions

The APSU provides the only national information available for many of the rare communicable diseases under surveillance. Moreover, the APSU is unique in that it receives monthly reports on inpatients and outpatients in urban and rural regions and from all states and territories, thus providing cases additional to those identified in hospital surveillance systems and overcoming difficulties in obtaining state and territory-based data. Over 1400 paediatricians contribute to APSU and over 90% of them report to APSU each month, providing demographic and clinical data. Clinicians attest to the value of the APSU for improving clinician knowledge, highlighting areas for future research and informing their clinical practice.^{19,20}

This information enables us to monitor disease burden and identify trends over time, describe current management and short term outcomes, recognise populations at heightened risk and guide clinical care and public health actions that provide the foundation for better outcomes for Australian children.

In the case of AFP, APSU data have contributed for 23 years to the reports provided to WHO by the Australian Government to provide evidence that the Western-Pacific Region remains polio-free. In the case of microcephaly, APSU was able to respond rapidly to a request from the Australian Department of Health to initiate national surveillance for microcephaly in the context of the emergence of an epidemic of microcephaly caused by Zika virus infection internationally. Similarly, seasonal surveillance of severe complications of influenza in children was initiated in response to a request from government following several deaths in children and has provided information for 10 years. This study has identified the importance of vaccination for all young children, the need for early diagnosis and antiviral treatment for children

hospitalised with influenza, and the high burden of severe influenza in children. The study on congenital CMV infection is the longest-running study of its kind internationally and has assessed recognition and sequelae in Australian children for the last 19 years, improving diagnostic techniques. The HSV study has reported the burden of disease in Australian infants with HSV describing clinical manifestations and features of this infection. The HPV study has documented a decline in JoRRP incidence in children following a quadrivalent HPV vaccination program, a world first, and the study of HIV has allowed the assessment of use of interventions to minimise the risk of HIV transmission from mother to child in Australia.

The need for the APSU to continue conducting surveillance is fundamental in providing evidence-based information relevant not only for clinicians but also for policy makers and the community in general.

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Appendix A. APSU conditions under surveillance

Surveillance study – Case definition
<p>Acute flaccid paralysis (AFP) Any child less than 15 years of age with acute flaccid paralysis in one or more limbs or acute onset of bulbar paralysis. All cases reported through APSU, NERL and PAEDS are reviewed by the PEP and classified as: confirmed poliomyelitis; non-polio AFP, polio-compatible or non-AFP. The NERL determines whether there is an infectious cause of AFP including enteroviruses. The PEP secretariat reports all Australian cases to the World Health Organization (WHO).</p>
<p>Congenital cytomegalovirus (CMV) infection Congenital CMV: Any child from whom CMV is isolated in the first three (3) weeks of life, from urine, blood, saliva, or any tissue taken at biopsy. Suspected congenital CMV: any child up to 12 months of age, in whom CMV is isolated from urine, blood, saliva or any tissue taken at biopsy <i>and/or</i> a positive serum IgM is found <i>and</i> in whom clinical features exist that may be due to intrauterine CMV infection. Clinical features associated with congenital CMV infection include: prematurity, low birth weight, sensorineural deafness, other neurological abnormalities (encephalitis, microcephaly, developmental delay), seizures, microphthalmia, chorioretinitis, cataracts), hepatitis, hepatosplenomegaly, thrombocytopenia, pneumonitis or myocarditis.</p>
<p>Neonatal and young infant herpes simplex virus (HSV) infection Any neonate or infant aged less than 3 months of age (regardless of gestation) seen in the last month with laboratory confirmation of HSV infection <i>and</i> with either clinical evidence of HSV infection <i>or</i> laboratory confirmation of maternal perinatal HSV infection in an asymptomatic infant. Laboratory confirmation is by detection of HSV by PCR in a surface swab, respiratory specimen <i>and/or</i> sterile site (CSF or blood) (or by virus isolation), or by immunofluorescence. Clinical evidence of neonatal HSV infection is one or more of: typical herpetic lesions of the skin, eye or mouth; evidence of disseminated infection (bleeding, bruising or coagulopathy, jaundice or elevated serum bilirubin, hepatosplenomegaly or elevated liver transaminases), pneumonitis (respiratory distress or chest radiograph) or encephalitis (lethargy, seizures, apnoea or abnormalities on neuroimaging or EEG). Laboratory evidence of maternal perinatal HSV infection is provided by detection of HSV in maternal genital swab <i>and /or</i> mother seroconverted to HSV or IgM positive in pregnancy or early postnatal period.</p>
<p>Paediatric human immunodeficiency virus (HIV) infection and perinatal exposure to HIV in Australia Any child aged less than 16 years at diagnosis of HIV infection in Australia or any child born to a woman with diagnosed HIV infection. Children born to women with HIV infection and who are known to have been exposed to HIV perinatally, by <i>in utero</i> exposure or through breastfeeding, should be notified, even if they are subsequently confirmed as HIV antibody negative.</p>
<p>Juvenile onset recurrent respiratory papillomatosis (JoRRP) Any infant or child under the age of 15 years diagnosed with juvenile onset recurrent respiratory papillomatosis (JoRRP) confirmed by endoscopy of the larynx <i>and</i> by histology.</p>
<p>Severe complications of influenza in children < 15 years (June – September 2018) Any child aged less than 15 years with laboratory confirmed influenza admitted to hospital with at least one of the following complications:</p> <ul style="list-style-type: none">• Pneumonia (confirmed on X-ray or microbiology)• Oxygen requirement• Mechanical ventilation requirement• Laboratory proven secondary bacterial co-infection; bacteraemia; septicaemia;• Encephalitis / encephalopathy• Seizures (including simple febrile seizure, prolonged or focal seizure or status epilepticus)• Transverse myelitis• Polyneuritis / mononeuritis• Reye syndrome• Myocarditis; pericarditis; cardiomyopathy• Rhabdomyolysis• Purpura fulminans• Disseminated coagulopathy• Shock (requiring >40 ml/kg fluid resuscitation)• Acute renal failure• Death, including death at presentation to hospital• Guillain-Barré syndrome

Surveillance study – Case definition

Congenital rubella

Any child or adolescent up to 16 years of age who in the opinion of the notifying paediatrician has definite or suspected congenital rubella, with or without defects, based on history, clinical and laboratory findings.

Microcephaly in children aged less than 12 months

Any child less than 12 months of age with microcephaly when the occipito-frontal circumference (OFC) is more than two standard deviations (<3rd percentile) below the mean for age and gender according to standard growth charts and adjusted for gestation in the preterm baby

The WHO recommends the Intergrowth Charts^a which allow for adjustment for gestational age and are based on a wide range of ethnicities.^b

Severe complications of varicella virus infection including neonatal and congenital varicella infection

Neonatal varicella

Any infant who has neonatal varicella based on history, clinical and/or laboratory findings in the first month of life without features of congenital varicella syndrome.

Features of neonatal varicella infection include pox-like rash which may be papulovesicular, vesiculopustular or haemorrhagic, and fever. Other systemic symptoms may be present. Complications of neonatal varicella include bacterial superinfection, neurological and haematological problems and general visceral involvement.

The diagnosis of neonatal varicella can be made when an infant in the first month of life presents with clinical features of varicella infection. There may be a history of maternal varicella infection in the last 1–4 weeks of pregnancy or contact with a varicella infected person after birth.

The diagnosis can be confirmed by laboratory tests to detect:

- Viral antigen/viral isolate from scrapings of the skin lesions or viral DNA from lesion fluid.
- Varicella specific IgM in a serum sample from the infant (or from the contact).

Congenital varicella

Any stillbirth, newborn infant, or child up to the age of 2 years who, has definite or suspected congenital varicella infection, with or without defects and meets at least one of the following criteria:

- Cicatricial skin lesions in a dermatomal distribution and/or pox-like skin scars and/ or limb hypoplasia.
- Development of herpes zoster in the first year of life.
- Spontaneous abortion, termination, stillbirth or early death following varicella infection during pregnancy.

Confirm varicella infection by one or more of the following:

- Detection of varicella-specific IgM antibodies in cord blood or in serum specimen taken in the first 3 months of life (only 25% of cases are positive).
- Persistence of varicella specific IgG antibody in a child aged beyond 6 months of age.
- Identification of varicella virus in skin lesions or autopsy tissue.
- History of maternal varicella during pregnancy or maternal contact with varicella in pregnancy in the mother of an infant with congenital abnormalities.

The following clinical signs may also be present in cases of congenital varicella syndrome:

- Microcephaly, hydrocephalus, cerebellar hypoplasia, motor or sensory deficits, sphincter dysfunction and peripheral nervous system defects.
- Microphthalmia, cataracts, Horner's syndrome, chorioretinitis, nystagmus, retinal scars, optic atrophy.
- Gastrointestinal abnormalities including colonic atresia, hepatitis, liver failure.
- Genito-urinary abnormalities.
- Cardiovascular abnormalities.
- Intrauterine growth retardation.

a <https://intergrowth21.tghn.org/>

b The Intergrowth calculator can be found at <http://intergrowth21.ndog.ox.ac.uk/en/ManualEntry>