

peritonsillar abscess, deep neck abscess, subdural empyema, Lemierre's syndrome, and Pott's puffy tumor. Based upon medical records review and ICD-10 codes, patients were included in this study if they had a head or neck infection and reported a positive rapid influenza diagnostic test within 30 days preceding hospital admission.

**Results.** We identified 44 patients with head or neck infections, of which 6 patients met inclusion criteria (table). The male-to-female ratio was 5:1 and the median age was 11.6 years (range 1.7–13.9 years). Most patients were diagnosed with influenza during a period of high influenza activity and the median time from influenza diagnosis to hospital admission was 4.5 days (range 1–6 days). One patient had received seasonal influenza vaccination. Patients had a wide range of infections, including orbital cellulitis (3), retropharyngeal abscess (2), and 1 of each of the following: Lemierre's syndrome, peritonsillar abscess, Pott's puffy tumor, and subdural empyema; 4 also had sinusitis. A causative pathogen was established in four cases: methicillin-resistant *Staphylococcus aureus*, *Streptococcus anginosus* group, *S. pyogenes*, and *S. intermedius*. The median duration of hospitalization was 22 days (range 5–35 days) and treatment duration ranged from 3.5 to 6 weeks. All patients completed antibiotic treatment successfully and had favorable outcomes.

**Conclusion.** We suggest that complicated bacterial head and neck infections may represent an under recognized co-infection or secondary complication of infection with influenza virus, further stressing the importance of prevention and treatment of influenza infection.

Table 1. Clinical Characteristics of Patients with Head and Neck Infections following Influenza Virus Infection

Case	Sex, age (years)	2017 Influenza vaccination, Prior influenza vaccination	Pneumococcal vaccination	Time from influenza diagnosis to admission (days)	Diagnoses	Pathogen	Procedure	Definitive Treatment	Treatment Duration (weeks)
1	M, 11.2	No, No	PCV7, 4 doses PCV13, 1 dose	1	Sinusitis, Orbital cellulitis	Unknown	ESS	linezolid, ceftriaxone, metronidazole	3.5
2	F, 1.7	No, No	PCV13, 4 doses	5	Lemierre's syndrome, RPA	MRSA	I&D	vancomycin	6
3	M, 12	No, Yes	PCV7, 4 doses	4	Sinusitis, Pott's puffy tumor, orbital cellulitis	<i>Streptococcus anginosus</i> group <sup>†</sup>	ESS	ceftriaxone, metronidazole	5
4	M, 5.3	No, No	PCV13, 4 doses	3	Sinusitis, orbital cellulitis	Unknown <sup>‡</sup>	ESS	vancomycin, ceftriaxone	4
5	M, 13.9	Yes, Yes <sup>§</sup>	PCV7, 4 doses	6	RPA and peritonsillar abscesses	<i>S. pyogenes</i> <sup>¶</sup>	I&D	penicillin	3
6	M, 12.6	No, Unknown	Unavailable	5	Sinusitis, subdural empyema	<i>S. intermedius</i>	Craniotomy	ceftriaxone	4

Abbreviations: ESS endoscopic sinus surgery, I&D incision and drainage, MRSA methicillin resistant *Staphylococcus aureus*, PCV pneumococcal conjugate vaccine, RPA retropharyngeal abscess

<sup>†</sup>Patient had a polymicrobial infection with *Prevotellastrepococcus*, *Prevotella*, and *S. mitis*; <sup>‡</sup>Patient had a Gram-stain positive for gram-positive cocci in pairs and gram-negative rods; <sup>§</sup>Patient received influenza vaccination in 2006, 2007, 2009, 2012, 2014, and 2015; <sup>¶</sup>Patient had a polymicrobial infection with *Prevotella*.

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### 2347. Antiviral Use Is Associated With a Decrease in Rate of Influenza-Related Complications and Resource Utilization

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**Background.** The CDC has reported that seasonal influenza in 2017–2018 has been one of the worst on record, with hospitalization rates among the highest recorded, especially among younger age groups (age 50–65, hospitalization rate of 63.1 per 100,000 people compared with 35.1 in last severe season, 2015–2016). Understanding how antiviral use affects rates and severity of complications is important to inform treatment decisions. This study used real-world US claims data for 3 flu seasons (2014–2016) to understand the frequency of flu complications and how intervention with antivirals may affect their occurrence.

**Methods.** This was a retrospective cohort study using US commercial claims data from the 2014–2016 flu seasons. Patients with a diagnosis code for flu were identified and required to have continuous coverage for at least 365 days before and 91 days after diagnosis. Patients who were prescribed antivirals within 48 hours of the first flu-related encounter during the flu season were identified and propensity score matched to a comparative cohort without antiviral use within 48 hours but comparable baseline health resource utilization (HRU) and comorbidities. All-cause and respiratory-related HRU and costs in the 30 and 91 days after flu diagnosis were analyzed and compared.

**Results.** A total of 989,530 cases of influenza were identified over 3 flu seasons, with 60.2 percent receiving antiviral therapy (Table 1). In the matched sample, greater HRU and costs was identified in the cohort that did not receive antiviral therapy, with 15% vs. 10.4% ( $P < 0.001$ ) visiting the ER, and 2.8% vs. 0.9% ( $P < 0.001$ ) being admitted for inpatient care within the first month (Table 2). Similarly, greater HRU was also seen in respiratory-related HRU and costs in the cohorts that did not receive antiviral therapy. Findings were similar in unmatched cohorts.

**Conclusion.** In data for the last 3 available flu seasons, flu patients treated with antivirals had less complications, healthcare resource utilization and overall costs than those who did not receive antiviral treatment. Limitations with this kind of study restrict the conclusions that can be made from this analysis, however suggest that treating flu can improve outcomes and resource utilization beyond symptom resolution.

Table 1.	All three seasons combined		Flu seasons					
			2014		2015		2016	
	N	%	N	%	N	%	N	%
Received antiviral treatment within 48 hours								
No	394,222	39.8%	159,838	38.8%	98,223	43.3%	136,161	38.8%
Yes	595,308	60.2%	251,879	61.2%	128,880	56.7%	214,549	61.2%
Total	989,530	100.0%	411,717	100.0%	227,103	100.0%	350,710	100.0%

Table 2.	Matched Cohorts				
	No antiviral Use (N=363,587)		Used antiviral (n=363,587)		p values
	N	%	N	%	
All cause HRU Post 1m					
Inpatient	10,148	2.8%	3,428	0.9%	<.0001
ER	54,485	15.0%	37,644	10.4%	<.0001
ICU/CCU	3,717	1.0%	1,203	0.3%	<.0001
Mechanical ventilation	240	0.1%	17	0.0%	<.0001
All cause HRU Post 3m					
Inpatient	12,594	3.5%	5,710	1.6%	<.0001
ER	66,302	18.2%	49,172	13.5%	<.0001
ICU/CCU	4,498	1.2%	1,831	0.5%	<.0001
Mechanical ventilation	272	0.1%	34	0.0%	<.0001

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### 2348. Influenza Complications Amongst Pediatric Inpatients in Singapore, a Tropical Country

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**Background.** Influenza is a common cause of morbidity and mortality in children. This was a retrospective study of hospitalized children with influenza at KKH admitted from January 2013 to December 2014 to compare the type of complications by age and underlying medical conditions.

**Methods.** Influenza patients were identified by a positive polymerase chain reaction (PCR) or immunofluorescence antigen from nasopharyngeal swabs. Patients were grouped into neurologic, respiratory, other and no complication. Multinomial regression was used to compare age and complications with underlying disease.

**Results.** There were a total of 1,272 patients with a median age of 37 months (IQR 13–76 months). Influenza A constituted 76.3% with serotype H3N2 (54.5%), H1N1 (18.2%), unknown (5.4%). Influenza B constituted 22.9% with serotypes: Yamagata (16.3%), Victoria (5.7%). Only 4 patients (0.3%) had sequelae or death. 28% of influenza admissions had complications. The most common being neurologic 44% ( $n = 156$ ) followed by respiratory 31% ( $n = 110$ ). The most common clinical complications were: febrile seizure 34.1%, bronchitis/bronchiolitis 9.9%, pneumonia 7.3%. There was a significant difference between complications by male gender ( $P = 0.001$ ), community acquisition ( $P = 0.007$ ), influenza type, other positive viruses, comorbidity, asthma/lung disease, neurologic disease, history of seizures, ICU/High Dependency admissions (all  $P \leq 0.001$ ), developmental delay ( $P = 0.002$ ), Kawasaki disease on aspirin ( $P = 0.026$ ), gastro-esophageal reflux ( $P = 0.034$ ) and prescription of oseltamivir ( $P = 0.003$ ). Neurologic complications occurred especially in the 2–< 5 year age group (37.2%), respiratory complications in the 6–23 month age group (39.1%). Age  $\geq 5$  year was more likely to have neurologic complication if they had a history of seizures (OR 14.2,  $P < 0.001$ ). Age  $\geq 2$  years was more likely to have respiratory complications if they had asthma/lung disease (OR 3.5,  $P < 0.001$ ).

**Conclusion.** Although influenza mortality was low, 28% of influenza admissions in children had significant complications. Children with underlying medical problems should routinely receive influenza vaccinations to avoid complicated influenza illness.

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### 2349. Long-Term Neurological Outcome and Neutralizing Antibody Titers Against Parainfluenza Virus A3 (PeV-A3) in Children who Developed PeV-A3-Related Diseases in Neonatal and Infantile Periods

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