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Influenza surveillance in children: first experiences with the Belgian Paediatric Surveillance system 'PediSurv'

by

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Introduction

Early in the influenza A(H1N1)2009 pandemic, children <5 years were considered to be at increased risk of contracting the disease and developing complications (1-2). With the start of the mitigation phase, surveillance had to be enhanced to support decision making and several surveillance systems were reinforced, adapted or set up.

The paediatric outpatient population was thought to be insufficiently covered by the Sentinel General Practitioners (SGP) network for children <5 years (3) and the consultation behaviour of young children's parents could not be predicted during the pandemic. Therefore surveillance of influenza-like illness (ILI) in outpatient children was launched by extending the surveillance scope of the already existing Paediatric Surveillance Network (PediSurv). This network consists of about 440 voluntary participating paediatricians and about 350 GPs in Brussels. It was set up as part of the epidemiological surveillance of communicable diseases in Europe and in the framework of polio eradication and measles elimination (4-5). Currently, PediSurv monitors the occurrence of acute flaccid paralysis, measles, mumps, Invasive Pneumococcal Disease (IPD), congenital rubella and haemolytic uremic syndrome. Although PediSurv is not an exhaustive surveillance system and calculation of incidence is not possible for all diseases, the stable participation rate allowed to observe trends and to detect clusters and outbreaks (6-7).

This article describes how we introduced clinical and virological surveillance activities of influenza within this surveillance system and presents the results from week 39 until week 53 of 2009.

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Methods

In June 2009, we asked all participating PediSurv paediatricians if they were willing to participate in epidemiological and virological influenza surveillance. In September 2009, those wanting to participate received the questionnaires on the epidemiological surveillance. Following parameters were collected daily by the paediatricians and sent to the Scientific Institute of Public Health (WIV-ISP) on a weekly basis: the number of ILI and the number of people hospitalised for ILI by age group (<1 and 1-5), the overall number of consultations in 0-5-year olds and the type of practice (private, hospital, emergency wards). Already hospitalised patients were excluded since these patients could also be monitored for SARI (8). The criteria for ILI were: sudden onset of fever with at least one respiratory symptom (cough, rhinitis, sore throat,…). This case definition was based on available literature and accepted by the PediSurv committee (9-10).

The initial request in June 2009 for virological surveillance was to collect swabs 1 to 2 times per week in children presenting with ILI. However due to limited resources we had to restrict the number of samples to a maximum of 150 between week 39 (end of September) and 53 of 2009. Therefore we selected 50 paediatricians based on geographical criteria. To avoid bias towards the more severe ILI cases, we asked to sample the first patient presenting with ILI symptoms after the 15th of each month. Two nasal and two throat swabs were to be collected from each child. A standardised questionnaire contained items on clinical presentation, hospitalisation, antiviral treatment, risk factors and vaccination against influenza and IPD.

Samples were analysed at the National Influenza Centre of the WIV-ISP and at the University Hospital Gasthuisberg in Leuven. A specimen was defined as influenza-positive if polymerase-chain-reaction (PCR) assays were positive for influenza A or B. A specimen was defined as A(H1N1)2009-positive if the results of the PCR A and A(H1N1)2009 were both positive (11).

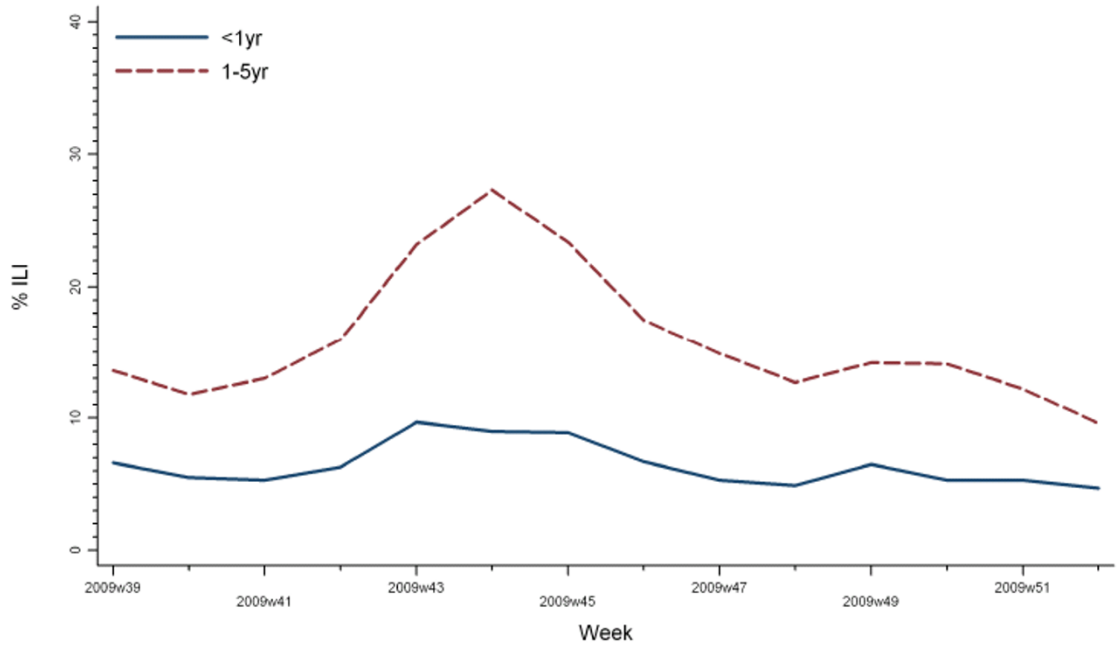
Data of week 52 and week 53 were analysed together. Data management and statistical analysis were done at the WIV-ISP, using Stata (version 10) and SAS (version 9.1)

Results

After the initial request in June 2009, 136 of the 440 paediatricians of PediSurv (31%) were willing to participate in the epidemiological surveillance. By October 2009, between 52 and 65 paediatricians had effectively returned the weekly epidemiological questionnaire (average response of the network of 13%).

From week 40 an increase of consultations attributed to ILI could be observed, following the same trend for the age groups <1 and 1-5 years (Figure 1).

Figure 1. Percentage of consultations attributed to influenza-like illness (ILI) in children 0-5 years old in paediatric practice (week 2009-39 to 2009-52/53)



A maximum of 36% of consultations for ILI was reached in week 44 for the 0-5 years old and a smaller peak could be observed in week 49 with 21% of consultations for ILI. In the course of the epidemic, the overall weekly hospitalisation rate for ILI patients varied between 5 and 10% (Table 1). The highest weekly hospitalisation rate was found in children <1 year old (17% in week 48).

Table 1. Hospitalisation in children with influenza-like illness (ILI) reported by paediatricians (week 2009-39 to 2009-52/53)

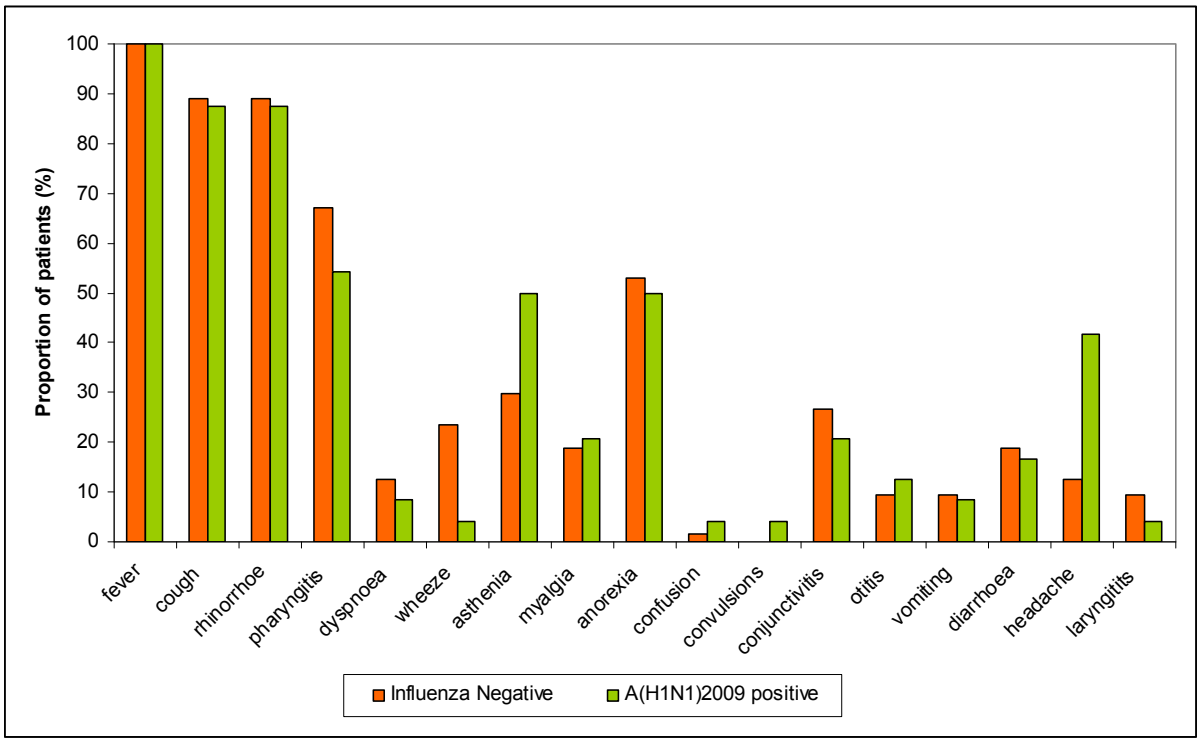
week	Pedi	< 1 yr		1-5 yr		total	
		#	%	#	%	#	%
39	60	22	9.8	20	4.3	42	6.1
40	56	9	6	21	6.4	30	6.3
41	63	15	7.5	21	4.3	36	5.2
42	63	17	6.9	33	5.3	50	5.7
43	65	38	8.8	61	5.9	99	6.8
44	62	33	8.8	41	3.6	74	4.9
45	59	46	14.8	39	4.8	85	7.5
46	61	25	11.5	18	3.2	43	5.5
47	57	22	13.9	24	5.4	46	7.7
48	52	26	17.4	26	6.8	52	9.7
49	55	24	10.2	19	3.7	43	5.7
50	52	35	16	29	5	64	8
51	50	26	13.8	26	6	52	8.3
52	59	20	12.9	16	5.1	36	7.6

Pedi=number of reporting Pediatricians; #=number of hospitalizations; %= percentage of hospitalizations reported to the number of ILIs

In June 2009, 118 paediatricians were willing to participate in the virological surveillance. After the selection of 50 paediatricians, an additional 19 paediatricians were addressed to increase the number of collected samples. By week 2009-53 we received samples from 88 children of whom 24 (27%) had laboratory confirmed Influenza A(H1N1)2009. None of the samples were positive for other influenza types or subtypes.

All children who were sampled had fever and 98% had at least one respiratory symptom (thus matching the case definition of ILI). Clinical presentation was similar for children with and without laboratory confirmed influenza, although headache was more present in laboratory confirmed cases (Figure 2). Most children had fever and cough or fever and rhinorrhoea (89%). Of all tested children, 6 required hospitalisation, of whom 5 were influenza-positive. Three of the children who were hospitalised and influenza-positive had a chronic respiratory condition. Two tested children were vaccinated against seasonal influenza vaccine (one influenza-positive); no-one was vaccinated with the pandemic vaccine.

Figure 2. Proportion of patients according to clinical symptoms and laboratory results for influenza (n=88, week 2009-39 to 2009-52/53)



Discussion

The PediSurv network proved to be a flexible system which allowed rapid activation of a group of paediatricians. Introduction of the influenza surveillance confirmed the epidemic trend in children observed by the SGPs. Increase, peak and decrease in number of consultations for ILI in paediatric practice coincide with the changes in incidence in the age group 0-4

years old seen in general practice (3). The second smaller peak in ILI consultations coincides with a peak in RSV (Respiratory Syncytial Virus) circulation (12).

This network allowed collecting a number of samples in the paediatric outpatient population. Our analysis confirmed the aspecificity of ILI criteria for influenza diagnosis: clinical presentation of A(H1N1)2009 infection is largely indistinguishable from that of other viral infections, but should still be used as a guide for who needs testing (13-14).

The hospitalisation rate was the highest among children <1 year, which does not necessary reflect the severity of the disease, but can be due to short observational hospital admissions (15). Up to now, the majority of the cases of A(H1N1)2009 infection in children were mild and a recent serological study in England estimated that one child in three was infected, ten times more than estimated from clinical surveillance (16-17).

Limitations of our surveillance are the low response and the inability to calculate incidences and thereby precluding the extrapolation of our results to the paediatric population. The willingness to participate was 31% at the start, but actual participation was probably lowered by the considerable workload brought about by the questionnaire and the reduction in the number of samples we had to make for the virological part of the surveillance.

We have demonstrated the potential for using PediSurv for emergency surveillance. This surveillance system has the advantage of being well-established and enabled access to epidemiological, clinical and virological data. The clinical surveillance of influenza however could not provide additional information during the course of the epidemic that was not already available from other surveillance systems. In the future a surveillance of only the severe hospitalised cases of influenza could be considered, as was conducted in the paediatric surveillance network in Australia (18). Virological surveillance provided additional information on the clinical presentation of A(H1N1)2009 infection in young children, but resources are needed to collect samples on a more regular basis during an epidemic.

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