

Correlation between emergency room visits for influenza-like illness during the influenza A (H1/N1) pandemic in children and adults

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Accepted 7 June 2012. Published online 23 July 2012.

Surveillance of incident influenza-like illness (ILI) was implemented in two children and adult medical emergency departments during the influenza A (H1/N1) pandemic to assess correlations in the daily number of ILI-related emergency room visits (ERV) between these departments. A total of 7165 ILIs in children and 610 ILIs in adults were observed. We noticed a high linear correlation between the number of ERV involving ILI on

day D in the pediatric department and the number of ERV because of ILI 2 days later in adults ($R = 0.82$, $P < 10^{-4}$). Therefore, the rate of adult ILI-related ERV might be anticipated based on the rate of pediatric ERV.

Keywords Adults, children, emergency department, epidemic, influenza A (H1/N1).

Please cite this paper as: Bénét et al. (2013) Correlation between emergency room visits for influenza-like illness during the influenza A (H1/N1) pandemic in children and adults. *Influenza and Other Respiratory Viruses* 7(3), 364–366.

Introduction

During seasonal influenza outbreaks or pandemics, peak viral circulation generates an overflow of emergency room visits (ERV).¹ Morbidity from influenza is age related.² Compared to seasonal epidemics, the influenza A (H1/N1) pandemic in 2009 involved a large number of cases.^{3,4} It offered a rare opportunity to report differential timing between pediatric and adult ERV by influenza-like illness (ILI) cases.⁵ Our objective was to assess possible correlations in the daily number of ILI-related ERV between pediatric and adult medical emergency departments (ED) during the influenza A (H1/N1) pandemic in two French university hospitals.

Methods

Prospective surveillance of incident ILI was implemented during the influenza A (H1/N1) pandemic, between September 10, 2009 and January 6, 2010 in the adult (≥ 16 years) medical emergency department of Hôpital Edouard Herriot located in Lyon (France) and in the pediatric (< 16 years) medical emergency department of Hôpital Femme-Mère-

Enfant (Bron, France). The distance between these two hospitals is around 2 km. A resident visited both EDs daily to collect information. ILI was defined as acute respiratory syndrome with (i) fever $> 38^{\circ}\text{C}$, asthenia or muscle soreness, and (ii) respiratory signs (cough/dyspnea).⁵ Correlations between the number of incident ILI cases admitted in the pediatric and adult EDs were evaluated with Pearson's correlation coefficient (R). The lag in days between the two epidemic curves was investigated by fitting linear regressions between the daily number of ERV in the adult and pediatric departments. The lags tested were children ILIs on day D and adult ILIs on day $D + j$, with $j = -7$ to $+7$ days. All data were analyzed anonymously with Stata 11.0 software (Stata-Corp. Stata Statistical Software: Release 11. College Station, TX, USA). Our study received no external funding. According to French law, surveillance of infections in hospitals without any intervention does not need institutional review board authorization or written consent.

Results

Overall, ERV numbered 11 374 (mean: 96/day) in the adult ED and 19 274 (mean: 175/day) in the pediatric ED.

In total, 610 ILIs in the adult ED and 7165 ILIs in the pediatric ED were observed during the study period, respectively, 5.4% and 37.2% of total ERV (Figure 1).

The daily numbers of ERV regarding ILI in the pediatric and adult EDs were correlated ($R = 0.77$, $P < 10^{-4}$). The highest correlation was found between the number of ERV concerning ILI in the pediatric ED on day D compared to the number in the adult ED, with a lag of +2 days ($R = 0.82$, $P < 10^{-4}$) (Figure 2). A similar trend was apparent, with a 2-day lag, for the proportion of ERV involving ILI ($R = 0.74$, $P < 10^{-4}$).

Discussion

We noticed a high linear correlation between the daily number of ERV attributed to ILI on day D in the pediatric ED and the number of ERV because of ILI 2 days later in the adult ED. In a study of influenza A (H1N1) transmis-

sion within households, the mean interval between the onset of symptoms of index and secondary cases was 2.4 days;⁴ 57% of the index cases were under 18 years. We discerned a roughly similar delay between infants and adults with ILI consulting for care in EDs. An explanation might be that the timing of visits by children and adults could be related to the incubation period of influenza. If children are the major source of infection spread in the community, adults – including parents – would be infected after exposure to children.⁶ However, the ecological approach did not permit testing the spread of influenza from children to adults. A similar trend of ERV by children and adults would have meant similar spreading in both populations.

Several authors have already reported ILI time series by age groups.^{2,7} They observed that ERV by children often exceeded the threshold before adults. It is noteworthy that most of these reports are based on weekly cases.^{2,7} We found a similar trend, but because the unit of time that we

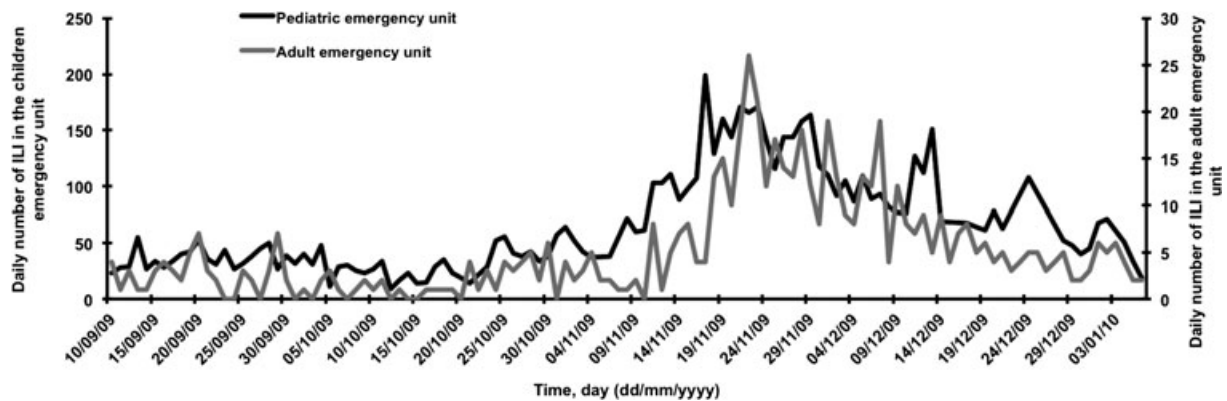


Figure 1. Epidemic curve showing emergency room visits for ILI care during the influenza A (H1N1) pandemic in the pediatric and adult emergency departments of two Lyon university hospitals, Lyon, France, 2009–2010.

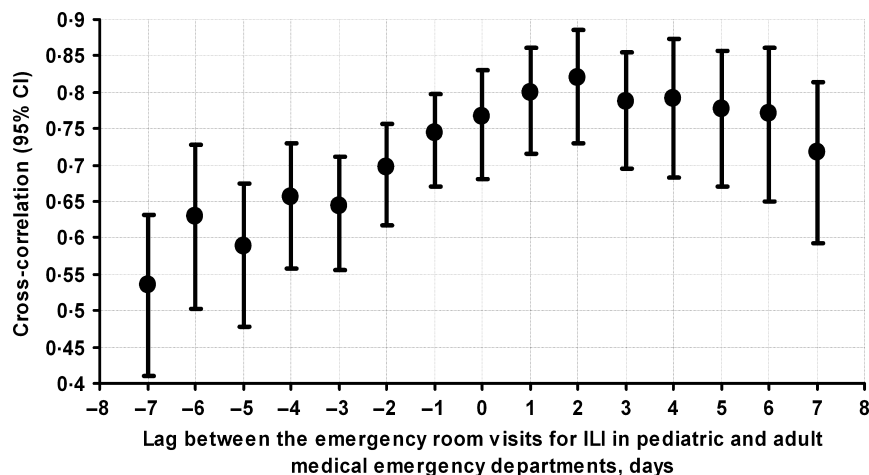


Figure 2. Cross-correlation between the number of emergency room visits for ILI care in the pediatric and adult emergency department of two Lyon university hospitals, Lyon, France, 2009–2010. CI, confidence interval.

used was the day, we were able to estimate this lag time more accurately. Finally, these results could help in the organization of emergency rooms during seasonal influenza outbreaks or future influenza pandemics.⁸

In conclusion, the rate of ERV by adults might be anticipated based on the rate of ERV by children 2 days earlier.

Addendum

All authors approved the final manuscript. PC, SMD, DF, YG, PYG, and PV were involved in study conception and design. TB, NV, and PV obtained and analyzed the data. TB and PV drafted the manuscript. TB acts as guarantor.

Acknowledgments

We thank Ovid Da Silva for editing this manuscript.

Funding

This study received no external support.

Competing interests

None.

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