ABSTRACT

Quantifying the relationship between influenza-related emergency department visits and hospital admissions in BioSense

AF McIntyre[1], L Finelli[1], HS Burkom[2], SR Benoit[1], KL Kniss[1], and TA Kass-Hout[1]

[1]*Centers for Disease Control and Prevention, Atlanta, GA, USA; and* [2]*Johns Hopkins University Applied Physics Laboratory, Baltimore, MD, USA*
E-mail: AMcIntyre@cdc.gov

Objective

The purpose of this analysis is to gain understanding of the burden of influenza in recent years through analysis of clinically rich hospital data. Patterns of visits and severity measures such as the ratio of admissions related to influenza-like illness (ILI) by age group from 2007 to 2010 are described.

Introduction

Real-time emergency department (ED) data from the Bio-Sense surveillance program for ILI visits and ILI admissions provide valuable insight into disease severity that bridges gaps in traditional influenza surveillance systems that monitor ILI in outpatient settings and laboratory-confirmed hospitalization, but do not quantify the relationship between ILI visits and hospital admissions.

Methods

All patients with ILI presenting to EDs participating in BioSense ($n = 650$ hospitals) during September 2007 through June 2010 were included in this analysis. ILI visits were defined as encounters with an influenza diagnosis code
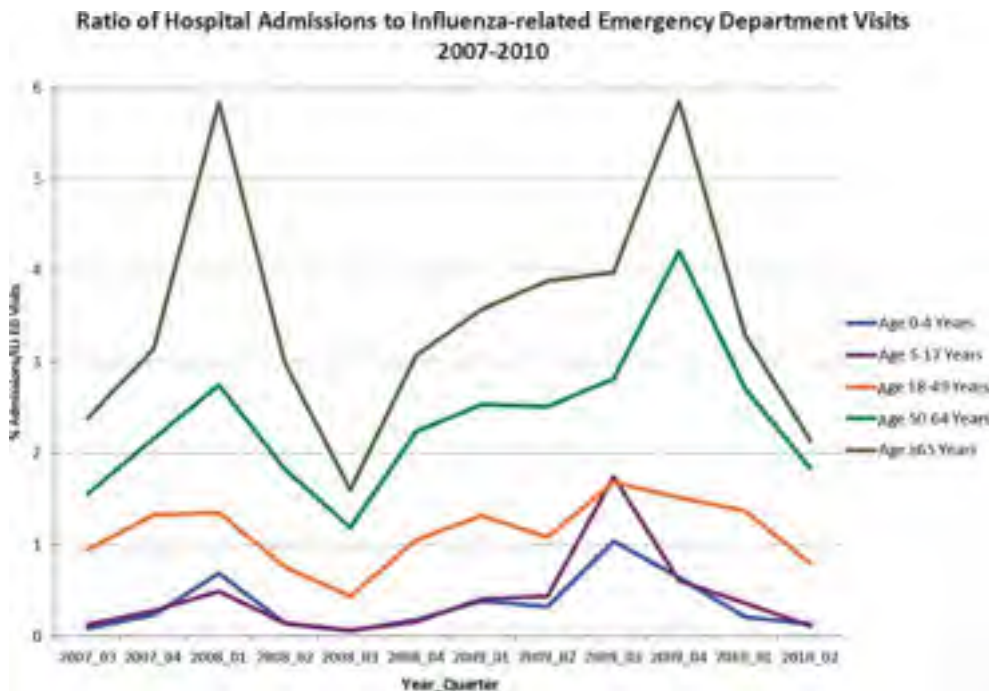

Figure 1   Ratio of hospital admissions to influenza-related emergency department visits.

(ICD-9-CM codes 487 and 488) or an ILI-related chief complaint ('influenza' or fever and cough/upper respiratory infection). Age groups were defined as 0–4 years, 5–17 years, 18–49 years, 50–64 years, and $\geqslant 65$ years. Those with unknown age or age > 105 years were excluded. To account for age and seasonal differences, frequencies and mean were stratified by age group and by calendar year quarter to calculate the proportion of ILI-related ED visits resulting in hospitalization. Analysis of variance was performed to assess differences in mean hospitalization encounters by age group and calendar year quarter.

Results
There were 1,925,539 patients who sought care for ILI at EDs reporting to BioSense during September 2007 through June 2010. Among those with ILI, 59,294 (3.1%) were hospitalized. The admission to ILI ratio was similar ($P = 0.58$) by quarter with 2.92% (range 2.65–3.14%) of visits admitted in Quarter 1, 3.00% (range 2.79–3.32) in Quarter 2, 3.94% (range 2.86–5.33%) in Quarter 3, and 3.33% (range 2.18–4.84%) in Quarter 4. The mean admission to ILI ratio was highest in those aged $\geqslant 65$ years (M = 3.48%, s.d. = 1.31), followed by 50–64 years (M = 2.36%, s.d. = 0.77), 18–49 years (M = 1.34%, s.d. = 0.36), 5–17 years (M = 0.41, s.d. = 0.46), and 0–4 years (M = 0.34%, s.d. = 0.30), although there were no significant differences by age group. By quarter and age group, the highest admissions occurred during Quarter 1 among those aged $\geqslant 65$ years (M = 4.24%, s.d. = 1.40), 18–49 years (M = 1.35%, s.d. = 0.03), and 0–4 years (M = 0.43%, s.d. = 0.24), during Quarter 3 for 5–17 years (M = 0.64%, s.d. = 0.96), and during Quarter 4 for 50–64 years (M = 2.87%, s.d. = 1.16) (Figure 1).

Conclusions
Data on the relationship between hospitalizations and ILI ED visits provide an objective method to describe the burden of disease and to compare severity between influenza seasons, as seen in the leading peak for the 5- to 17-year group in the pandemic spring wave. Further analyses are underway to assess the degree to which (1) the 2009 H1N1 pandemic impacted these results and (2) comorbid conditions affected susceptibility to and exacerbation of influenza in different age groups.

Acknowledgements