Title:

Burden of Hospitalized Pneumonia in Hong Kong 2011-2015 – Research Protocol

Registration:

The protocol of this study is available online from the website of the Centre for Safe Medication Practice and Research (http://www.pharma.hku.hk/sweb/CSMPR/), The University of Hong Kong.

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Introduction

Pneumonia is a common lower respiratory infection worldwide. It is among the top three leading causes of death and is associated with considerable morbidity and economic loss.[1,2] Pneumonia can affect individuals of all ages. In particular, it accounts for approximately 16% of all deaths among children younger than 5 years and frequently exacerbates chronic medical conditions in the elderly.[3] During the last decade, pneumonia remains the second leading cause of death and increasingly contributes to hospital inpatient discharges and deaths in Hong Kong.[4] There are increasing concerns about antimicrobial resistance, serotype replacement, and treatment failure in patients with pneumonia.[5,6] The overall uptake of seasonal influenza and pneumococcal vaccines in the general population is relatively low. [7,8]

The latest quantitative data on the burden of disease is essential for evaluating the effectiveness of immunization policies in the real-world setting and for optimizing health resource allocation. However, the incidence and fatality of pneumonia in age strata and its implications on healthcare resource utilization in Hong Kong remains unknown. This population-based descriptivestudy aimed to address the contemporary data gap on the burden of hospitalized pneumonia, from 2011-2015.

Objectives

1. To determine the disease burden and epidemiological characteristics of hospitalized pneumonia in the overall population of Hong Kong.
2. To determine direct costs and length of stay (LOS) for the management of hospitalized pneumonia in Hospital Authority hospitals of Hong Kong.

Methods

Data source

The Clinical Data Analysis and Reporting System (CDARS), a territory-wide electronic health database that contains the medical records from all public hospitals which serves 7.3 million population in Hong Kong, will be used for the disease burden estimation. A unique and anonymous identifier was assigned to each patient by the data authorization to protect patient privacy and facilitate data retrieval. Patient-specific data, including demographic and prescription information, diagnosis, procedures, laboratory tests,

date of consultation, admission and discharge information, are included in CDARS and will be used for analysis.

Study design

This is a population-based descriptive study.

Patient identification

Hospitalized patients with a discharge diagnosis of pneumonia (principal, secondary or others), between 1 January 2011 and 31 December 2015, recorded in CDARS were identified based on International Classification of Diseases Ninth Revision Clinical Modification (ICD-9-CM) codes (480-486 and 487.0). The index date was the first date of hospital admission with a recorded diagnosis of pneumonia. The medical conditions contained all the medical history recorded ten years (3652 days) prior to or on the index date. ICD-9-CM codes used to define each medical conditions are detailed in ***Appendix 1***.

For all of the identified patients, we will analyze the types of antimicrobial drugs (***Appendix 2***) prescribed within 48 hours from admission to estimate their likelihood of acquiring source from community or hospital settings. Organisms cultured from blood, sputum and throat samples during the hospitalization will be analyzed to identify the cultured positive pathogens.

Outcome measurements

We will analyze the disease burden in seven age strata (0-4, 5-19, 20-49, 50-64, 65-74, 75-84 and ≥85 years).

Clinical outcomes

Clinical burden measurements include age-specific and age-standardized incidence and case-fatality. Age-specific incidences will be calculated as the number of cases divided by the corresponding population denominator from Hong Kong Census in the same year.[9] Crude incidence will be standardized by direct method using the Hong Kong population in 2015 as reference. The case-fatality analysis will be restricted to death from pneumonia (ICD-10-CM: J12-J18) within the same hospital admission.

Economic outcomes

Economic burden measurements include in-hospital all-cause fatality, 28-days readmission, hospital LOS, and direct costs per episode. All-cause fatality will be calculated as the number of inpatient deaths from any cause divided by the number of cases. Direct costs are the costs associated with the hospitalization and the follow-up visits to a specialist outpatient clinic (SOPC) after discharge. Unit costs, including daily charges of hospitalization and SOPC consultation cost per visit, will be referenced from the public charges of health service in the Hospital Authority of Hong Kong.[10] We will assume discharged patients have one follow-up visit in a SOPC attributable to pneumonia. [11] Total costs will be calculated by multiplying the unit cost with the duration or frequency of services used. Costs will be presented in US dollars in 2015, without discounting.

Statistical analysis

Results will be reported according to the STROBE statement for observational studies[12] and expressed as frequencies, proportions, means with standard deviation (SD), median with interquartile ranges (IQR), and estimates with 95% confidence intervals (CI) where appropriate. We will use R version 3.3.1 (R Foundation for Statistical Computing, Vienna, Austria) and Microsoft Excel for data analysis. Two authors will independently cross-check the analysis and results for quality insurance.

Ethics

Ethics approval will be sought from the Institutional Review Board of Hospital Authority Hong Kong West Cluster. Informed patient consent is not required because the data used in this study are anonymized.

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Appendices

Appendix 1. ICD-9-CM Diagnostic/Procedure Codes for Identifying Medical Conditions

Condition	Codes
Asplenia	41.5*
Chronic heart disease	393-398, 402, 404, 410-414, 416, 424, 425, 428, 429.7, 36.0*,36.1*, 36.2*, 36.3*
Chronic liver disease	571, 572, 573.0, 456, 39.1*, 42.91*
Chronic lung disease	277.0, 416.8, 416.9, 490-492, 494, 496, 500-505, 506.4, 515, 516, 518.83, 518.84, 770.7
Chronic renal failure	403, 404, 582, 583, 585, 586,753.0, V42.0, V45.1, V56, 39.27*, 39.42*, 39.43*, 39.95*, 54.98*
Congenital heart disease	745, 746, 747.1
Congenital immunodeficiency	279
Diabetes	249, 250, 357.2, 362.0, 366.41, 648.0, E932.3, 250.6, 354, 355, 357.2, 357.9, 249.2, 250.4
Disease of white blood cells	288.0, 288.1
Human immunodeficiency virus (HIV) infection	042, V08
Malignant neoplasms of solid organs	140-199, V58.0, V58.1, V67.1, V67.2, 92.2*, 99.25*
Malignant neoplasm of lymphatic and hematopoietic tissue	200-209
Nephrotic syndrome	581
Sickle cell disease and other hemoglobinopathies	282.4-282.7, 284, 289.4, 289.5, 759.0, 759.3
Solid organ transplantation (SOT) and peripheral blood and stem cell transplant (PBSCT)	V42.0, V42.1, V42.6 - V42.9, 33.5*, 33.6*, 37.5*, 41.0*, 41.94*, 46.97*, 50.59*, 52.8*, 55.69*

Note: * ICD-9-CM procedure codes

Appendix. British National Formulary Categories under Antimicrobials (5.1-5.3)

Codes	Description
5.1	Antibacterial drugs

5.1.1	Penicillins
5.1.1.1	Benzylpenicillin and phenoxymethylpenicillin
5.1.1.2	Penicillinase-resistant penicillins
5.1.1.3	Broad-spectrum penicillins
5.1.1.4	Antipseudomonal penicillins
5.1.1.5	Mecillinams
5.1.2	Cephalosporins, carbapenems, and other beta-lactams
5.1.2.1	Cephalosporins
5.1.2.2	Carbapenems
5.1.2.3	Other beta-lactam antibiotics
5.1.3	Tetracyclines
5.1.4	Aminoglycosides
5.1.5	Macrolides
5.1.6	Clindamycin
5.1.7	Some other antibacterials
5.1.8	Sulfonamides and trimethoprim
5.1.9	Antituberculosis drugs
5.1.10	Antileprotic drugs
5.1.11	Metronidazole and tinidazole
5.1.12	Quinolones
5.1.13	Antibacterial drugs for urinary-tract infections
5.2	Antifungal drugs
5.2.1	Triazole antifungals
5.2.2	Imidazole antifungals
5.2.3	Polyene antifungals
5.2.4	Echinocandin antifungals
5.2.5	Other antifungals
5.3	Antiviral drugs
5.3.1	Antiviral drugs for HIV infection
5.3.2.1	Antiviral drugs for herpes simplex and varicella–zoster infection

5.3.2.2	Antiviral drugs for cytomegalovirus infection
5.3.3	Antiviral drugs for viral hepatitis
5.3.3.1	Antiviral drugs for chronic hepatitis B
5.3.3.2	Antiviral drugs for chronic hepatitis C
5.3.4	Antiviral drugs for influenza
5.3.5	Antiviral drugs for respiratory syncytial virus