A cost-effectiveness analysis of "test" versus "treat" patients hospitalized with suspected influenza in Hong Kong

You JH, Chan ES, Leung MY, Ip M, Lee NL

Record Status
This is a critical abstract of an economic evaluation that meets the criteria for inclusion on NHS EED. Each abstract contains a brief summary of the methods, the results and conclusions followed by a detailed critical assessment on the reliability of the study and the conclusions drawn.

CRD summary
The study evaluated cost-effectiveness of four screen-and-treat management strategies for hospitalised severe respiratory infection with suspected seasonal or 2009 H1N1 influenza. The authors concluded that oseltamivir treatment alone was the most cost-effective for Hong Kong healthcare authorities where prevalence of seasonal influenza was greater than 2.5%. Reporting was generally clear and the conclusions appear reasonable. Limitations in reporting of input selection and sensitivity analyses made it difficult to assess validity of the model results.

Type of economic evaluation
Cost-utility analysis

Study objective
The aim of the study was to assess the cost-effectiveness of diagnostic test-guided and empirical antiviral treatment approaches in adult patients hospitalised for severe lower respiratory infections with suspected influenza.

Interventions
The study compared four management strategies for suspected seasonal or 2009 H1N1 influenza: immunofluorescence assay (IFA) guided; polymerase-chain-reaction (PCR) test-guided oseltamivir treatment; oseltamivir treatment plus PCR and either continue or discontinue oseltamivir treatment based on test results; and oseltamivir treatment alone. Oseltamivir was administered in a twice daily dose of 75mg per person.

Location/setting
Hong Kong/secondary care.

Methods
Analytical approach:
A decision-tree model was used to synthesise published data from a selection of relevant published studies that documented the epidemiology of influenza virus in populations from various countries. The authors stated the study perspective was that of the Hong Kong health system.

Effectiveness data:
Clinical data estimates for the efficacy of the four strategies were in terms of mortality rates and odds ratio of death of seasonal influenza and 2009 H1N1 influenza. Clinical data estimates for mortality, influenza prevalence, specificity and sensitivity of the diagnostic tests and others were derived from a literature search of MEDLINE for the period 2000 to 2011. Articles were included if they were reported in English, contained respiratory illness of seasonal or 2009 H1N1 nature and reported mortality and/or intensive care unit admission rates. Key clinical data were diagnostic accuracy followed by treatment effectiveness.

Monetary benefit and utility valuations:
Utilities were derived from a published study and apportioned by age groups (18 to 64 years and 65 to 85 years).

Measure of benefit:
The measure of benefit used was quality-adjusted life years (QALYs). Future potential life-years gained were estimated using patient age and life expectancy. Future QALYs were discounted at a 3% annual rate.
Cost data:
Direct hospital medical costs were included for patients infected by influenza virus with and without requiring services in the intensive care unit. These costs were based on a previous published cost-analysis by the authors. Oseltamivir costs were obtained from local health pricing sources. Testing costs were from the literature and expert opinion. Costs were discounted at 3% and reported in US dollars ($) 2011.

Analysis of uncertainty:
One way sensitivity analyses were performed on inputs using 95% confidence intervals where available or a range of ±20%. A two-way analysis of uncertainty was performed to evaluate the joint effect of changing prevalence of influenza and prevalence of 2009 H1N1. A probabilistic sensitivity analysis using 10,000 Monte Carlo simulations was used to evaluate joint parameter uncertainty. Results of the probabilistic sensitivity analysis were displayed using cost-effectiveness acceptability curves.

Results
For oseltamivir treatment alone, mean discounted costs were $1,247 compared with $1,248 for PCR-guided treatment, $1,249 for IFA-guided treatment and $1,253 for PCR plus oseltamivir treatment. Discounted QALYs were 1.692 for oseltamivir treatment alone compared with 1.691 QALYs for PCR-guided treatment, 1.673 for IFA-guided treatment and 1.691 for PCR plus oseltamivir treatment. Oseltamivir treatment alone was considered to be dominant in the base case as it incurred fewer costs and higher QALYs than the other strategies.

Two-way sensitivity analysis showed that at 2.5% influenza prevalence oseltamivir treatment alone was most cost-effective; PCR-guided treatment was most cost effective at lower prevalences. Where H1N1 virus predominated, oseltamivir alone became the most cost-effective from 0.4% influenza prevalence. In probabilistic sensitivity analyses, the probability that oseltamivir treatment alone was cost-effective was 97% at a willingness-to-pay threshold of $50,000 per QALY gained.

Authors' conclusions
The authors concluded that for Hong Kong healthcare providers a strategy of oseltamivir treatment alone was the most cost-effective option for managing patients hospitalised with severe respiratory infections with suspected influenza when the seasonal influenza prevalence was greater than 2.5%.

CRD commentary
Interventions:
The authors provided a clear description and illustration of the four strategies to manage patients hospitalised with severe respiratory infections with suspected influenza in their setting.

Effectiveness/benefits:
Utility values were extracted from a published report. Sample and valuation methods were not described. The authors did not describe how they identified and selected the study for utility values. Efficacy and data parameters were derived from retrospective observational studies on populations outside Hong Kong. Details of inclusion criteria for effectiveness inputs were provided but there was no information on the synthesis or selection of clinical data from the included studies. It was not clear whether the most appropriate data were selected for effectiveness and benefits.

Costs:
Relevant major direct medical costs to Hong Kong healthcare providers were included. Resource use appeared appropriate and was based on a previous study by the authors that evaluated costs to the Hong Kong government for patient-level hospitalisations for influenza. The price year was not stated.

Analysis and results:
The study time horizon was not stated so it was unclear whether discounting for costs and benefits was appropriate. Results of the one-way sensitivity analyses were not reported. Probabilistic sensitivity analysis results were presented clearly. Underlying distributional assumptions for parameters were not supplied and it was unclear how variances and ranges were used in the probabilistic sensitivity analysis.

The authors gave a thorough discussion of study limitations and compared their study to a similar study with
appropriate explanations for differences. The conclusions appeared appropriate but the authors’ interpretation of the model results may be overstated given negligible cost differences (within $6) and QALY differences (within three decimal places) between the four strategies.

Concluding remarks:
Reporting was generally clear and the conclusions appeared reasonable. Limitations in the reporting of input selection and sensitivity analyses results and methods make assessing the validity of the model results difficult.

Bibliographic details

PubMedID
22479363

DOI
10.1371/journal.pone.0033123

Original Paper URL
http://www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0033123

Indexing Status
Subject indexing assigned by NLM

MeSH
Adult; Aged; Antiviral Agents /economics /therapeutic use; Cost-Benefit Analysis; Fluorescent Antibody Technique /methods; Hong Kong /epidemiology; Hospitalization /economics /statistics & numerical data; Humans; Influenza A Virus, H1N1 Subtype /drug effects /genetics; Influenza, Human /diagnosis /drug therapy /epidemiology; Models, Economic; Monte Carlo Method; Oseltamivir /economics /therapeutic use; Outcome Assessment (Health Care) /economics; Polymerase Chain Reaction /methods; Prevalence; Quality-Adjusted Life Years; Respiratory Tract Infections /diagnosis /drug therapy /epidemiology

AccessionNumber
22012015357

Date bibliographic record published
13/06/2012

Date abstract record published
30/04/2013