A Pharmacoeconomic Model for the Treatment of Influenza

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Abstract

Objective: The aim of this study was to develop a generic treatment algorithm for influenza and influenza-like illness (ILI) that could be used to estimate the costs and outcomes of current and new treatments for influenza in different countries for different patient subgroups.

Methods: A series of possible treatment pathways was identified and the probabilities of different patient subgroups following each pathway were estimated by using the published literature. The health outcomes and health service use and unit costs for each pathway were estimated from trial data and standard data sources. An interactive computer model was created, the base-case input parameter values were assigned, and estimates of the current costs of influenza and ILI in different population subgroups estimated. Sensitivity analyses were performed by changing input parameter values.

Results: The average healthcare cost of influenza and ILI per person in the US was $US72 for the general population and $US330 for a high risk population (1997 values). The average total cost per patient (healthcare cost plus productivity losses) was $US320 for the general population and $US546 for a high risk population. These costs are sensitive to changes in the proportion of patients visiting a physician and to the proportion of patients hospitalised with complications of the disease. Days to alleviate major symptoms and other health outcome measures are sensitive to the percentage of patients who receive antiviral therapy as well as to the efficacy of this therapy.

Conclusions: The costs and health outcomes of influenza and ILI depend on the extent to which patients visit a physician, the use of antiviral drugs, and the incidence of complications requiring hospital care. The computer model will allow decision-makers to assess the cost effectiveness and the potential budget impact of new antivirals for treating influenza.

The economic costs of treating influenza and the complications arising from it worldwide are substantial. In addition, for those aged 25 to 64 years, the costs of absenteeism from work because of influenza are potentially high.[1] In Austria, in 1990, the hospital treatment cost associated with influenza complications was approximately 104 million Austrian schillings (equivalent to $US1 per inhabitant).[2] The estimated economic cost of influenza in the US ranges from $US3 billion to $US5 billion per year, and the per person cost of medical care was estimated in 1975 to be $US70 for the general population and $US325 for the high risk population.[3] In the US, much of the healthcare cost of
influenza occurs in the elderly population, and the incremental amount reimbursed by Medicare as a result of influenza is estimated to be between $US750 million (1990 to 1991) and $US1 billion (1989 to 1990) annually.\[4\] These studies indicate that considerable cost savings can be realised through the prevention and effective treatment of influenza around the world.

Vaccination for influenza is currently the most common method of disease management. Vaccination is recommended not only for the elderly but also for younger high risk people, i.e. those with chronic conditions such as asthma and diabetes mellitus that might be exacerbated by an attack of influenza. In some countries, many healthy people in the working-age group are also vaccinated against influenza. The efficacy of current vaccines depends on a good match between circulating and vaccine strains. Also, compliance with recommendations for vaccination is often incomplete, and many people in high risk population subgroups do not receive the vaccine each year.\[5\] Owing to the limitations of vaccines and the difficulties of fully implementing vaccination policies, there is a place for safe and effective antiviral therapy as an adjunct to vaccines in either the non-vaccinated or individuals in whom vaccination fails to prevent the development of influenza symptoms.

Several antiviral agents have been used for treating influenza, including rimantadine and amantadine. However, they are not widely used in clinical practice because they are efficacious only against influenza A (not B). Moreover, it is difficult to know whether a patient presenting with influenza-like illness (ILI) symptoms has influenza and, if so, which type of influenza it is. Currently, rapid diagnostic procedures are being developed and new antiviral agents with a broader spectrum of activity (influenza A and B) are in late phase clinical development.\[6,7\]

To determine whether these new treatments are cost effective, it is critical that we understand the current disease and treatment patterns of influenza, and the components of the healthcare costs for different patient subgroups. To define the disease patterns of influenza, it is necessary to estimate the rate of influenza in a group of people with symptoms of either true influenza or an ILI. This rate will vary from year to year and, in general, cannot be predicted. Treatment patterns include whether or not people with influenza or ILI visit the physician during the course of their illness and the timing of that visit after the onset of symptoms. Treatment patterns also include the types of medications that the typical patient receives – antiviral, antibiotic, or over-the-counter (OTC) – and at what rate patients are hospitalised for the treatment of complications. The treatment patterns will vary according to population subgroup.

In this article, we describe a generic treatment algorithm and an interactive computer model that can be used to estimate the costs and outcomes of current and new treatments for influenza in different countries for different patient subgroups. We demonstrate the use of the model to estimate the average per patient costs and health outcomes associated with influenza and ILI in the US, under current treatments and for 2 population subgroups: the general population and those at greater risk of complications from influenza infection (i.e. the high risk population). The latter group includes patients with respiratory and cardiovascular conditions, impaired immune function, and the elderly. We also use the model to estimate the sensitivity of these outcome measures to changes in the assumed disease and treatment patterns as well as changes in the use and efficacy of current treatments.

Methods

To estimate the costs and health outcomes for different treatments for influenza, we first identified a series of possible treatment pathways. We then used trial data and other sources to derive estimates of the probability of each person who experiences symptoms of influenza or ILI following each treatment pathway for each patient subgroup of interest (i.e. the general population and the high risk population defined previously in this article). For each treatment pathway, we estimated the