Cost-effectiveness of antiviral stockpiling and near-patient testing for potential influenza pandemic

Siddiqui M R, Edmunds W J

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 objective was to assess the cost-effectiveness of stockpiling antiviral drugs and near-patient tests (results at the time of testing) against an influenza epidemic. The authors concluded that stockpiling only the antiviral drugs was cost-effective, provided they were effective at preventing deaths from pandemic influenza. The quality of the study methodology was good and the methods and results were clearly reported. Given the evidence available, and the scope of the analysis, the authors’ conclusions are appropriate.

Type of economic evaluation
Cost-utility analysis

Study objective
The objective was to assess the cost-effectiveness of stockpiling antiviral drugs for a potential influenza epidemic, and to assess the use of near-patient testing (results at the time of testing) in the management of antiviral drugs, in the event of a pandemic.

Interventions
This study investigated three potential strategies for the management of patients with the symptoms of influenza during an influenza epidemic.

Strategy one was no intervention, which was no treatment with antiviral drugs, but management of complications if they arose.

Strategy two was treat only, which was treatment with antiviral drugs (oseltamivir) and management of complications if they arose.

Strategy three was test-treat, which was testing and then treatment with oseltamivir for those with positive test results for influenza.

Location/setting
UK/primary care.

Methods
Analytical approach:
A decision tree model was constructed to compare the costs and outcomes associated with the three strategies for the management of influenza-like illness in the UK. All the analyses were performed for two fatality scenarios: one based on the 1918 influenza pandemic, with a rate of 2.3%; and the other based on the 1957 and 1968 to 1969 pandemics, with a rate of 0.3%. The authors assumed a time to pandemic of 30 years. They reported that the perspective was that of the UK National Health Service (NHS).

Effectiveness data:
The effectiveness and clinical data were derived from a number of published studies. The main clinical effectiveness estimates were the efficacy of oseltamivir and the sensitivity and specificity of the near-patient tests. Several meta-analyses evaluating the efficacy of oseltamivir were compared and the authors selected the one with the most patients (Kaiser, et al. 2003, see ‘Other Publications of Related Interest’ below for bibliographic details). The sensitivity and
specificity of the near-patient tests were derived from the best performance of the currently available tests.

**Monetary benefit and utility valuations:**
Quality of life estimates were derived from a published study investigating the quality of life lost due to influenza-like illness.

**Measure of benefit:**
Quality-adjusted life-years (QALYs) were used as the measure of benefit.

**Cost data:**
The direct costs were those of general practitioner (GP) consultations, hospitalisations, accident and emergency (A&E) visits, antiviral treatment, and near-patient tests. For oseltamivir, the authors assumed a shelf-life of six years and, for the near-patient test, a shelf-life of two years was assumed. GP visits, A&E visits and hospitalisations were derived from the results of the meta-analyses that defined the effectiveness estimates, with the unit costs being derived from standard UK sources. The unit costs of treatment and testing were derived from the British National Formulary and the manufacturer, respectively. As these costs could be incurred over a 30-year period, future costs were discounted at an annual rate of 3.5%. All costs were reported in UK pounds sterling (£) and the price year was 2004.

**Analysis of uncertainty:**
A series of one-way sensitivity analyses were performed by varying all the parameter estimates. In addition, a probabilistic sensitivity analysis was performed by fitting distributions around each parameter estimate.

**Results**
Using the 1918 fatality rate, the no treatment strategy resulted in the loss of around 2.2 discounted QALYs, with a total discounted cost of £113 million. The treat-only programme reduced the loss in QALYs by 700,000, whereas the test-treat intervention further reduced the loss by 30,000 QALYs.

Using the 1957 (and 1968 to 1969) fatality rate, no treatment resulted in the loss of around 0.4 million QALYs, at a cost of £113 million. Treat-only reduced this loss in QALYs by 90,000 and test-treat further reduced the loss by 4,000 QALYs.

The costs and benefits were combined using an incremental cost-utility ratio or the additional cost per QALY gained. Compared with no treatment, treat-only resulted in an additional cost per QALY gained of £1,900, for the 1918 fatality rate, and £13,700 per QALY gained, for the 1957 rate. Compared with treat-only, the test-treat intervention resulted in an additional cost per QALY gained of £31,000 for the 1918 rate, and £228,000 per QALY gained for the 1957 rate.

The results of the probabilistic sensitivity analysis showed that, with fixed antiviral drug and test stockpiles, the probability of the treat-only intervention being cost-effective was high, irrespective of the fatality rate.

**Authors' conclusions**
The authors concluded that stockpiling antiviral drugs, but not near-patient tests, in sufficient quantities to treat all clinical patients, was cost-effective, provided the drugs were effective at preventing deaths from pandemic influenza.

**CRD commentary**
**Interventions:**
The three interventions were reported clearly and in detail. Although, no explicit justification was given for their selection, they appear to have been the main options available to the health care system in the event of an influenza pandemic. In addition, the authors reported that oseltamivir was chosen as the antiviral drug as it had previously been shown to be more cost-effective and easier to stockpile than zanamivir.

**Effectiveness/benefits:**
The authors did not report whether a systematic review of the literature was undertaken to identify the relevant clinical and effectiveness data. However, all the estimates, together with their sources, were reported in full in an online appendix. In addition, the main clinical effectiveness estimate was derived from a meta-analysis of randomised
controlled trials, which are considered to be the gold-standard study design for comparing health interventions.

**Costs:**
The perspective was appropriately reported and all of the major costs relevant to the NHS appear to have been included. The sources of resource use and unit costs were reported by the authors. In addition, the time horizon of the study, discount rate, and price year were appropriately reported.

**Analysis and results:**
Appropriate details and a diagram of the model were given. The impact of uncertainty on the results was exhaustively tested in a series of one-way and probabilistic sensitivity analyses. Probabilistic sensitivity analyses are the most thorough way of assessing the overall impact of uncertainty in a model. Although, the methods and results were reported adequately, the authors did not provide the final cost estimates for both the treat-only and test-treat options, with only the incremental cost-utility ratios being provided. The main limitation reported by the authors was the uncertainty surrounding the efficacy of the antiviral drugs against the next strain of pandemic influenza.

**Concluding remarks:**
The quality of the study methodology was good and the methods and results were clearly reported. Given the evidence available, and the scope of the analysis, the authors’ conclusions are appropriate.

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