Vaccine effectiveness in pandemic influenza – primary care reporting (VIPER): an observational study to assess the effectiveness of the pandemic influenza A (H1N1)v vaccine

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Executive summary

Health Technology Assessment 2010; Vol. 14: No. 34, 313–346
DOI: 10.3310/hta14340-05

Health Technology Assessment
NIHR HTA programme
www.hta.ac.uk

Executive summary

Objectives

To determine influenza A (H1N1)v vaccine effectiveness (VE) in the Scottish population at an early stage of the 2009–10 H1N1v vaccination programme, using a sentinel surveillance network of 41 general practices contributing to the Practice Team Information (PTI) network.

Methods

The PTI network of general practices covers a 5% sample of the Scottish population ($n = 246{,}368$). Using the unique Community Health Index (CHI) number, general practice patient-level data were extracted and linked to the Scottish Morbidity Record (SMR) catalogue, which has information on all inpatient hospitalisations in Scotland. We also used the Health Protection Scotland (HPS) data set, which consists of laboratory-confirmed cases of influenza A (H1N1)v from the practices. The study involved a longitudinal evaluation of the aspect of the influenza A (H1N1)v vaccination programme implemented through general practice in autumn/winter 2009. Primary care practices were given financial incentives to record and code additional data electronically, over and above that routinely recorded for clinical care or as part of the PTI project, including: H1N1 vaccination status, age, deprivation status, pregnancy, and, where it was feasible, health worker status. During the study period, we assessed the vaccination uptake in the relevant high-risk populations, i.e. pregnant women, children (< 5 years), health-care workers and patients with at-risk comorbidities. For VE using information from linked virological swab data, a logistic regression model was fitted adjusting for the effects of gender, age, deprivation and being in an at-risk morbidity group. Admission rates to hospital for influenza-related serious morbidity were determined in vaccinated and unvaccinated patients, stratified by at-risk populations, age bands, sex, and socioeconomic status. VE estimates were derived from Poisson regression models, adjusting for gender, age, deprivation and clinical risk group. Influenza-related serious morbidity in vaccinated and unvaccinated patients in the whole population was calculated according to vaccination status for the target groups. An adjustment to the standard error of the estimated effect was made to account for clustering of patients within practices.

Results

At 25 December 2009, vaccine uptake estimates for the study population were 12.0% [95% confidence interval (CI) 11.9 to 12.1]. For those patients in an at-risk group ($n = 59{,}721$), the uptake rate was 37.5% (95% CI 37.1 to 37.9). Amongst 2203 pregnant women (4.3% of women aged 15–44 years) and 1314 health-care workers (0.8% of working-aged people aged 18–65 years), rates of vaccine uptake were 33.0% (95% CI 31.0 to 34.9) and 26.4% (95% CI 24.0 to 28.8), respectively. More male [odds ratio (OR) 2.67, 95% CI 1.44 to 4.96] health-care workers were vaccinated than female health-care workers. Among the 1492 patients swabbed, 467 were positive for H1N1, giving a positivity rate of 31.3% (95% CI 29.0 to 33.7). Among those in a clinical risk group who were not vaccinated, 41.3% (95% CI 35.6 to 46.9) tested positive for influenza A (H1N1) v. This represented a significant difference from the H1N1 positivity percentage among patients with no clinical risk ($p < 0.01$). Among those vaccinated and in a clinical risk group, only one patient (5%, 95% CI 0.3 to 23.6) tested after vaccination was positive for influenza A (H1N1) v. By comparing postvaccination swabs in those who were vaccinated with swabs taken in those who remained unvaccinated, the VE was found to be 95.0% (95% CI 76.0 to 100.0). There were 2739 admissions to hospital in the study population, of which 1241 were emergency admissions. All 48 emergency hospitalisations for influenza and pneumonia occurred in patients who did not receive the vaccine. VE for single or combined end points of influenza and pneumonia hospitalisation for all patients was estimated at 100.0% (95% CI ∞ to 100.0). There were 132 hospitalisations in the unvaccinated group versus five in the vaccinated group for cardiovascular-related conditions. There were 193 hospitalisations in the unvaccinated group versus nine in those vaccinated in the group of patients admitted for influenza, pneumonia,

chronic obstructive pulmonary disease (COPD) and cardiovascular-related conditions. VE for cardiovascular-related conditions alone, or in individuals with influenza, pneumonia COPD and cardiovascular-related conditions, was 71.1% (95% CI 11.3 to 90.6) and 64.7% (95% CI 12.0 to 85.8), respectively.

Implications for practice

Policy-makers and clinicians should be encouraged that the VE estimates obtained are comparable to those found for seasonal influenza and should strengthen the evidence base for health-care practitioners involved in distributing vaccine in other countries. Influenza A (H1N1)v immunisation in primary health care settings is both effective and widely acceptable, as evidenced by high uptake rates, and should continue to be the mainstay of disease prevention for at-risk patients.

Research recommendations

A further analysis encompassing the whole influenza season is required to encompass more days of vaccination exposure, which will increase precision (with resulting narrower confidence intervals). For pregnant women and under-5-year-olds, a further study using a greater time period of exposure is required to calculate and present meaningful results. A future study that will repeat this data linkage and allow the calculation of longer-term VE (in reducing both morbidity and mortality) should be undertaken later in 2010.

Conclusions

Evidence from swabs submitted from patients in the cohort presenting with influenza-like illness in general practice suggests that the introduction of influenza A (H1N1)v vaccine in Scotland during 2009 was associated with a high degree of protection against influenza A (H1N1)v. In addition, receipt of influenza A (H1N1)v vaccine was associated with a reduction in both admission for cardiac-related conditions and for the combined category of influenza, pneumonia, COPD and cardiac conditions. Policy-makers ought to be encouraged that the VE estimates obtained are comparable to those found for seasonal influenza. Additionally, as the first large-scale demonstration of effectiveness in a UK population, these interim results should help strengthen the evidence base for health-care practitioners involved in distributing influenza A (H1N1)v vaccine in other countries, now that the phased roll-out has been completed in the UK. Influenza A (H1N1)v immunisation in the primary health care setting is both effective and widely acceptable, as evidenced by high uptake rates, and should continue to be a mainstay of disease prevention for at-risk patients. Whether the reduced incidence of severe complications of influenza will persist or a reduction in mortality has occurred will only be apparent when data collected from later in 2010 are analysed.

Publication

Simpson CR, Ritchie LD, Robertson C, Sheikh A, McMenamin J. Vaccine effectiveness in pandemic influenza – primary care reporting (VIPER): an observational study to assess the effectiveness of the pandemic influenza A (H1N1)v vaccine. *Health Technol Assess* 2010;**14**(34): 313–346.

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This themed issue of the *Health Technology Assessment* journal series contains a collection of research commissioned by the NIHR as part of the Department of Health's (DH) response to the H1N1 swine flu pandemic. The NIHR through the NIHR Evaluation Trials and Studies Coordinating Centre (NETSCC) commissioned a number of research projects looking into the treatment and management of H1N1 influenza.

NETSCC managed the pandemic flu research over a very short timescale in two ways. Firstly, it responded to urgent national research priority areas identified by the Scientific Advisory Group in Emergencies (SAGE). Secondly, a call for research proposals to inform policy and patient care in the current influenza pandemic was issued in June 2009. All research proposals went through a process of academic peer review by clinicians and methodologists as well as being reviewed by a specially convened NIHR Flu Commissioning Board.

The final reports from these projects have been peer reviewed by a number of independent expert referees before publication in this journal series.

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The research reports in this themed issue were funded through the Cochrane Collaboration; the Health Services Research programme (HSR); the Health Technology Assessment programme (HTA); the Policy Research Programme (PRP); and the Service Delivery and Organisation Programme (SDO).

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The authors have been wholly responsible for all data collection, analysis and interpretation, and for writing up their work. The HTA editors and publisher have tried to ensure the accuracy of the authors' report and would like to thank the referees for their constructive comments on the draft document. However, they do not accept liability for damages or losses arising from material published in this report. The views expressed in this publication are those of the authors and not necessarily those of the NIHR or the Department of Health.

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ISSN 1366-5278

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