SHORT REPORT

Cost-effectiveness analysis of MMR immunization in health care workers

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Background
Assessment of measles, mumps and rubella (MMR) status is an essential part of occupational health clearance for new health care workers (HCWs). At the time of this study the policy at Sheffield Occupational Health Service (SOHS) was to perform serological testing of HCWs without evidence of previous immunization prior to MMR vaccination.

Aims
To identify the cost implications of changing policy to offer vaccination without prior serological testing to HCWs without evidence of previous immunization.

Methods
A retrospective cohort analysis of all MMR serological results from individuals attending SOHS for pre-placement assessment between 1 April 2010 and 31 March 2012.

Results
Seven thousand five hundred and sixty-nine individuals attended SOHS for pre-placement screening. Of these, 52% (3921) had no evidence of prior vaccination to at least one MMR disease and underwent serological testing. Thirty-three per cent (1204) of these HCWs were sero-negative to at least one condition requiring vaccination. With the suggested change in policy, our data indicate a cost-saving of over £105 000 per year may currently be achieved at SOHS.

Conclusions
Our findings highlight significant savings through offering vaccination without prior serology for HCWs with no evidence of prior immunization to MMR. An awareness of costs associated with serology, vaccination and staff clinics, as well as the wider impact of population vaccination campaigns, are important factors determining the most cost-effective strategy in this area.

Key words: cost-effectiveness analysis; health care workers; measles; MMR; mumps; occupational health practice; rubella; vaccination.

Introduction
Assessment of immunity to measles, mumps and rubella (MMR) is an essential component of pre-placement occupational health (OH) clearance of UK health care workers. At the time of study, Sheffield Occupational Health Service (SOHS) assessed immunity to these conditions by serological testing prior to vaccination (‘vaccination with serology’) of health care workers (HCWs) with no evidence of prior immunization (i.e. documentation of two previous MMR vaccinations or of past infection).

It may be more cost-effective to vaccinate HCWs routinely at pre-placement screening without evidence of MMR immunity (‘vaccination without serology’), particularly in view of the good safety profile of MMR vaccination, even when additional doses are given [1]. This report explores the MMR serological status of a cohort of HCWs attending pre-placement assessment at SOHS, and the potential cost savings of a ‘vaccination without serology’ policy.

Methods
We performed an analysis of all MMR serological results from HCWs attending SOHS for pre-placement clearance between 1 April 2010 and 31 March 2012, extracting data from the SOHS computerized database (COHORT, Tempus Software Ltd). Data were analysed using Microsoft Excel. Departmental practice during the period of analysis is shown in Figure 1.

The study was registered as a service evaluation project with the Clinical Effectiveness Unit at Sheffield Teaching Hospitals. We were informed by the Unit that ethical approval was not required since neither patients nor patient identifiable data were used.
Results

During the study period, 7569 individuals attended SOHS for pre-placement screening. Of these, 52% (3921) had no evidence of prior vaccination to at least one of measles, mumps or rubella. A total of 8504 serological tests were performed for these 3921 individuals (an average of 2.17 tests per HCW), as some HCWs either did not require all three tests or did not attend their appointments. Of these, 33% (1204) HCWs tested seronegative for at least one condition.

To estimate future yearly cost savings we developed a model in which we assumed that 3921 HCWs would attend pre-placement assessment without documented evidence of immunization to at least one of MMR over a 2 year period. We assumed that each of these would undergo an average of 2.17 tests for MMR serology and that 1204 of these would require a two dose course of MMR. We also assumed that current costs (£23 for clinic appointments and £29 for serology) would remain the same. Under the current policy the costs of clinic time, serology and vaccination amount to £392 183 (3921 HCWs × £23 + 8504 tests × £29 + 1204 seronegative HCWs × £46). Under the proposed new policy, where in the absence of evidence of previous MMR immunization the first dose of MMR vaccine would be given at the initial pre-placement clearance appointment and vaccine charges would be included in the cost of clinic appointments overall costs would fall to £180 366 (3921 × £23 × 2), i.e. a saving of £211 817 (£105 908.50 per year).

We wished to ascertain the effect of changing costs associated with vaccination, clinics and serological tests upon predicted cost savings. Vaccination without serology was more cost-effective than vaccination with serology at any level of seropositivity to MMR. If the cost of a single staff nurse appointment rose to greater than £100 in the new model with costs fixed in the current model, vaccination with serology became more cost-effective. Although it is unlikely to occur unless a substantially cheaper test becomes available, if the cost of performing serology were to fall below £8.42 the current model (vaccination with serology) would become more cost-effective without change in other costs.

Discussion

Our findings highlight significant savings through a vaccination without serology policy for HCWs without documented evidence of prior vaccination or seropositivity to MMR. We have shown the importance of understanding the impact of changing costs in making decisions in this area. It is probable that our findings are applicable to many other OH providers in the UK with comparable vaccine, serology and administration costs. We are aware of only one study, conducted in Turkey, which previously explored the cost-effectiveness of vaccination with and without serology. This suggested that pre-vaccination screening for mumps immunity was cost effective provided the proportion of immune health care workers was ≥78% [2]. These findings may not apply in UK OH settings however, given differing pricing structures.

Although it is known that a positive serological result for rubella and measles is very likely to indicate a protective level of immunity it has been suggested that the usefulness of positive mumps IgG serology in determining the degree to which a HCW is protected is limited [3]. Our suggestion that it is more cost-effective to perform serology prior to vaccination when the cost of serology falls below £8.42 may be more applicable for measles and rubella than for mumps, unless a clinically meaningful mumps serological test can be developed in the future.
Predicting future cost savings in this area is difficult, and is dependent on a number of factors including future vaccine uptake rates in childhood programmes [4], shifting population demographics, and changing transmissibility of the disease. Costs associated with complications including infection were not included in our economic model. One other important consideration relates to the fall in uptake due to concerns over a spurious link between MMR vaccination and autism in the mid-1990s in the UK. This makes it likely that cost-savings can be made in coming years unless a successful nationwide MMR vaccination catch-up campaign is initiated.

Further work may explore the applicability of our findings to other settings, particularly in countries without national childhood MMR immunization programmes. Another area of future research concerns the acceptability of mandatory MMR vaccination programmes for HCWs, to determine whether this can be implemented effectively in OH practice [5,6].

**Key points**

- Assessment of measles, mumps and rubella status is an important part of pre-placement occupational health clearance of health care workers.
- The cost implications of different strategies for vaccinating health care workers to measles, mumps and rubella have not been widely documented.
- Awareness of the underlying measles, mumps and rubella immunity status of health care workers cohorts is an important consideration in choosing the most appropriate strategy.

**Funding**

The study was not funded.

**Acknowledgements**

The authors would like to thank Dr Alison Rimmer for supporting the study at SOHS.

**Conflicts of interest**

None declared.

**References**