Meta-analysis of effectiveness of interventions to increase influenza immunization rates among high-risk population groups

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Authors' objectives
To assess the impact of three types of intervention on influenza immunisation uptake rates in at risk populations. To investigate whether a ceiling effect exists with regard to immunisation coverage - when intervention strategies will not increase immunisation levels when the baseline level is already high.

Searching
MEDLINE was searched from 1975 to 1997. Keywords for search included: influenza, vaccination, immunization, intervention, program and coverage. Only English language studies were included. References of identified articles were checked for further studies. Published studies only included.

Study selection
Study designs of evaluations included in the review
Studies that included the number/proportion of eligible individuals immunised with influenza vaccine as an outcome. Controlled trials with randomisation at the level of the individual or the clinical practices or a quasi-experimental design. Non-randomised studies had to either include an assessment of the comparability of the groups with regard to potential confounders or control for these differences with multivariate analyses. Studies with neither a control group nor a pre-intervention assessment of immunisation coverage were excluded. Studies had to report all data necessary for the statistical calculation of effect sizes based on odds ratios. Studies that assessed the outcome in only those individuals reached by the intervention were excluded.

Specific interventions included in the review
Patient focused interventions - in-person, mail or telephone reminder.
Provider focused interventions - office based reminder systems such as chart checklists or nurse-initiated physician prompts.
Mixed interventions - provider incentive systems (financial and non-finical target-based incentives), small-group consensus programmes (physicians themselves developed strategies for achieving change), organisational changes (standing orders for nurses to vaccinate high-risk patients, walk-in flu clinics and free vaccinations).

Participants included in the review
Elderly individuals aged 60-65 or more and other high-risk groups with chronic, metabolic, or immune deficient diseases as defined by the CDC. Studies that included only the high-risk disease group were not included. Non-institutionalised individuals at the time of the intervention.

Outcomes assessed in the review
Number/proportion of eligible individuals immunised with influenza vaccine.

How were decisions on the relevance of primary studies made?
The authors do not state how the papers were selected for the review, or how many of the authors performed the selection.

Assessment of study quality
The authors do not state that they assessed validity.
Data extraction
The authors do not state how the data were extracted for the review, or how many of the authors performed the data extraction.

Methods of synthesis
How were the studies combined?
A meta-analysis was conducted using a random-effects model.

How were differences between studies investigated?
Heterogeneity was investigated using the Q-statistic.

Results of the review
Sixteen studies from 14 different research reports. Seven of the studies consisted of multiple comparison groups with a total of 23 specific interventions. 10 studies were randomised controlled trials, 4 were pre-post intervention designs (no control group) and 2 controlled trials. The total number of subjects included in these trials = 70 835.

The Q test for heterogeneity was 95.29 (n = 16), p < 0.05. The overall average pooled odds ratio was 2.08 (95% CI: 1.80, 2.41) suggesting that influenza immunisation interventions do increase coverage rates (this value should be interpreted with caution due to the significant heterogeneity present).

The results were also analysed separately by intervention type. The heterogeneity present in these models was not reported and so these values should be interpreted with caution:

Patient focused intervention (n=6): OR=1.85 (95% CI 1.25, 2.75).
Provider focused interventions (n=4): OR = 2.06(1.70, 2.48).
Mixed interventions (n=6): OR 2.50 (1.75, 3.58).

Only 3 of the studies did not find a statistically significant odds ratios suggesting a benefit of the intervention.

The association of the immunisation rate of the comparison (control or pre-intervention) group with post-intervention coverage was analysed to investigate the existence of a ceiling effect. Studies were divided into 2 groups (8 studies in each group), low group with immunisation < 50%and high group with immunisation >= 50%. Effect size for high group was 1.58 (95% CI: 1.34, 1.86) and for the low group was 3.35 (2.56, 4.38)suggesting that the effect of the intervention is greater in those studies in which the control group has a vaccine uptake of < 50%. Difference in log ORs is statistically significant (p < 0.05).

Average random effect sizes were compared by study design, 10 RCTS compared to 6 other designs. The average OR for the RCT studies was lower (1.96, 95% CI: 1.54, 2.49) than for the other study designs (2.31, 95% CI:1.73, 3.08), difference was not statistically significant (p > 0.05).

Authors' conclusions
As vaccine uptake rates increase, single strategy patient-focused interventions are likely to become less effective. Traditional provider reminder systems that have demonstrated effectiveness in low-coverage populations may need to be enhanced. Mixed strategies that combine changes in provider behaviours with organisational changes to increase the probability of patient-provider contact during the flu season are likely to be more effective, particularly in high-coverage populations. Outreach is essential to reach those clients who do not routinely visit a health clinic during the influenza vaccination season. Provider incentives and/or enhanced patient access through walk-in clinics, free vaccination, satellite vaccination sites, or the scheduling of annual physicals during the flu season are possible strategies for increasing patient provider contact.
CRD commentary
An average review of the area. The literature search was limited to one database (MEDLINE) and only studies published in English were included in the review, unpublished studies were not included. This is likely to have resulted in important studies being missed. The selection criteria were clearly laid out and appear appropriate. No validity assessment was conducted and the authors do not provide details on how studies were assessed for relevance or how data was extracted from the studies included in the review. Study details were provided in clearly laid out tables. The authors use an appropriate test to test for heterogeneity but do not act appropriately on the result of this test. The Q-test for heterogeneity showed significant heterogeneity (p < 0.05), thus a meta-analysis should not have been carried out and the reasons for heterogeneity should have been investigated. The authors state that they used the random-effects model to take into account the heterogeneity but this model does not account for heterogeneity, and it is not appropriate to use it in this way. The authors do conduct a sensitivity analysis to investigate the effects of type of intervention, vaccine coverage in the comparison group and study design. This would have been a good opportunity to investigate how these variables affected the heterogeneity between the studies by carrying out a Q-test for the heterogeneity in each of the individual meta-analysis models, this should have been done anyway before the results were pooled. A qualitative analysis or a meta-regression should thus have been used to investigate heterogeneity and combine the data. The authors conclusion are, however, supported by the data. 13/16 studies showed significant positive associations between the interventions investigated and increased vaccine uptake in the intervention group, however the results presented on the size of the effect of the interventions reported by the authors should be interpreted with caution for the reasons outlined above.

Implications of the review for practice and research
The authors state that the most effective mixed-intervention strategy has not been adequately defined in the existing research. The mixed strategy trials introduced several activities simultaneously in a single intervention group, precluding determination of the impact of any specific combination of activities other than the total package. Defining the best combination of intervention strategies for high coverage population is an area requiring further research. Studies that allow for the assessment of the marginal impact and cost of individual programme components would be of significant value as immunisation levels approach the target. The generalisability of the findings to other immunisations and populations is another important area for future research.

Bibliographic details

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This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on
the reliability of the review and the conclusions drawn.