**Interventions to improve influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among high-risk adults: Evidence and Implications for public health**

**Review Quality Rating:** 9 (Strong)

**Review on which this evidence summary is based:**

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This is an evidence summary written to condense the work of the authors of this systematic review, referenced above. The intent of this summary is to provide an overview of the findings and implications of the full review. For more information on individual studies included in the review, please see the review itself.

**Review content summary**
This review evaluated 35 studies for the effectiveness of interventions designed to increase targeted vaccination coverage for influenza, pneumococcal polysaccharide and hepatitis B virus (HBV). The targeted populations were adults (aged 18 to 64 years) with risk conditions, occupational exposures, or risk behaviors (e.g., injection drug users, multiple sex partners). The interventions reviewed included: clinic-based client education, client reminder systems, community-wide education, client or family incentives, and vaccination requirements. The majority of the retrieved studies were based in a healthcare setting, either to improve coverage among healthcare workers or among high-risk patients. Review authors found strong evidence to support combination interventions, which were assessed in a total of 16 qualifying studies. Within this subset of studies, vaccination coverage improved by a median of 16.5 percentage points. This review identified only two qualifying studies of interventions directed at populations with risk behaviors, and they provided insufficient evidence to determine the effectiveness of interventions or intervention combinations in improving HBV vaccination coverage in these populations. As such, future research in this area is needed.

**Comments on this review’s methodology**
This is a methodologically strong review. A clear research question was employed and inclusion criteria discussed. The reviewers searched 12 electronic databases for studies published between 1980 and 2001, along with the reference lists from retrieved papers. Randomized and non-randomized trials were included, as were time series and cohort studies. Disagreements in study quality assessment were resolved through discussion. A narrative approach was used to synthesize evidence, and review authors organized the available information according to the intervention or combinations of interventions evaluated. The evidence on effectiveness identified in this review is divided among the three vaccines, a number of targeted populations with different indications for vaccination, and a variety of community and healthcare settings. Individual study populations, settings, designs and outcomes are thoroughly described in the appendix along with study quality.

**Why this issue is of interest to public health**
Prioritizing enhanced influenza, pneumococcal polysaccharide and HBV vaccination coverage in vulnerable populations would be of immense benefit to public health given that increased vaccination coverage in the general population has markedly reduced incidence of infection.\(^1\)\(^2\) For instance, in approximately 70% to 90% of healthy children and adults, a well-matched influenza vaccination appears to prevent influenza illness. Similarly, the pneumococcal polysaccharide vaccine has an efficacy rate of 80% in healthy young adults, and an efficacy rate of 50% to 80% among the elderly and in specific patient groups (e.g., those with diabetes mellitus).\(^3\) Statistics show, however, that vaccination coverage in vulnerable populations tends to remain low.\(^1\)\(^2\) Although the annual incidence of influenza in Canada varies widely, influenza virus is usually the predominant cause of serious respiratory infections in a community.\(^3\) Pneumococcal disease imposes an additional burden on the healthcare system. For children under age five, it is estimated that pneumococcal disease causes 15 deaths, 65 cases of meningitis, 700 cases of bacteremia, 2,200 cases of pneumonia requiring hospitalization, and 9,000 cases of pneumonia not requiring hospitalization every year in Canada.\(^4\) At its most serious, *Streptococcus pneumoniae* can lead to meningitis which is fatal in up to 26% of cases.\(^3\) Moreover, prevention of pneumococcal disease through vaccination is important, as it is one of the emerging antibiotic-resistant bacteria.\(^3\) Notably, by vaccinating adults greater than 65 years of age against influenza and
pneumococcal diseases, the government actually saves money.\textsuperscript{2} HBV warrants attention as well because HBV is an estimated 100 times more infective than HIV.\textsuperscript{5} While Canada is considered an area of low endemicity, initial HBV infection may be asymptomatic in up to 50\% of adults and 90\% of children, making preventive efforts essential.\textsuperscript{2} Acute illness has a case fatality rate of 1\% to 2\%, which increases with age.\textsuperscript{2} Moreover, an individual with either acute symptomatic or asymptomatic HBV infection may become a chronic carrier and is, consequently, infectious.\textsuperscript{2} Of significance, progressive liver disease, including cirrhosis, occurs in 15-30\% of those with chronic HBV infection.\textsuperscript{6}

**Evidence and implications**

Evidence points are not weighted or ranked according to strength.

<table>
<thead>
<tr>
<th>What’s the evidence?</th>
<th>Implications for practice and policy:</th>
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</thead>
<tbody>
<tr>
<td><strong>1. Interventions to increase community or client demand for vaccinations when implemented alone</strong></td>
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<tr>
<td>Interventions to increase demand for vaccination services provide information, advice, or both to individual clients or to at-risk community members.</td>
<td>1.1. There is insufficient evidence to determine whether the following interventions are effective in increasing demand for utilization when implemented alone</td>
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<tr>
<td><strong>1.1. Clinic-based client education</strong> (2 studies)</td>
<td>1.1.1. Clinic-based client education</td>
</tr>
<tr>
<td>These interventions provide information to clients served in specific medical or public health clinic settings using a variety of formats including letters, newsletters, brochures, and posters.</td>
<td>1.1.2. Client reminder systems</td>
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<tr>
<td>1.1.1. Clients with chart-documented high risk conditions (not defined in studies) who received a brochure were significantly more likely (16.1% higher vaccination rates) to receive pneumococcal vaccination than clients in controls (p&lt;0.001; RR 5.28, 95% CI 2.8 to 9.93).</td>
<td>1.1.3. Client or family incentives</td>
</tr>
<tr>
<td>1.1.2. While the proportion of clients screened or vaccinated for HBV increased from 2% (brochure only) and 10% (brochure + individualized decision support) in comparison to controls, the result was not statistically significant.</td>
<td>1.2. Decisions to implement any of these interventions on their own should be taken with caution.</td>
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<tr>
<td><strong>1.2. Client reminder systems</strong> (1 study)</td>
<td>1.3. Rigorous program evaluation and high quality research studies should be conducted in order to add to the limited body of knowledge on this issue. This should include studies on community-wide education and vaccination requirements.</td>
</tr>
<tr>
<td>These interventions provide information or advice directly to individual clients to inform or encourage them to obtain an appropriate vaccination. The reminder system in this study involved notifying individual high risk clients or included an individualized recommendation about vaccination from the client’s health care provider. In this study the reminder was provided via postcard with a personal message signed by a physician.</td>
<td>1.4. Targeting specific vaccinations may be an effective strategy; more research is required.</td>
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<tr>
<td>1.2.1. Self-reported vaccination for influenza was 3.7% higher in the intervention group compared with the clients who did not receive a postcard reminder.</td>
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<tr>
<td>However, the statistical significance of this finding is not reported.</td>
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<tr>
<td><strong>1.3. Community-wide education</strong> (no studies identified)</td>
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<tr>
<td><strong>1.4. Client or family incentives</strong> (1 study)</td>
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<td>These interventions seek to motivate people to accept vaccinations by providing either rewards (money or discount coupons) or penalties (being excluded from participating in a program). The incentive evaluated in this study was the implementation of a $10 incentive to increase HBV vaccination coverage among recruited injection drug users.</td>
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<tr>
<td>1.4.1. The proportion of participants who received the first dose of HBV vaccine was 35% higher for those who received incentives compared to those who did not (p&lt;0.001)</td>
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<tr>
<td>1.4.2. Participants who received the $10 incentive were 8.43 times more likely to receive the first dose of the HBV vaccine as compared with controls. The true intervention effect ranged between 4 to 18 times more likely (OR 8.43, 95% CI 3.95 to 18.0).</td>
<td></td>
</tr>
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</table>
1.5. **Vaccination requirements** (no studies included)
   These interventions are laws or policies that require vaccinations or documentation of reasons for declining as a condition of attendance, participation, or employment. One study was identified that evaluated vaccine requirements for high risk people (e.g. healthcare workers, drug users); however, this study did not meet methodological quality requirements to be included in the review.

2. **Interventions to enhance access to vaccination services when implemented alone**
   2.1. These interventions are designed to improve access by reducing client out-of-pocket costs or expanding access in healthcare settings to enhance the convenience of obtaining vaccinations. However, no studies were identified in this review that identified the effectiveness of these interventions.

3. **Provider- or system-based interventions when implemented alone**
   These interventions change the organization of healthcare delivery systems or the practice of health professionals in order to reduce missed opportunities for vaccination.
   3.1. **Provider reminder systems** (7 studies, 9 study arms)
   All provider reminder interventions in this review were implemented in healthcare settings among physicians and nurses. All of the reminders in this review gave information to the provider at the time of a client’s scheduled appointment.
   3.1.1. Across 9 study arms, participants receiving interventions were reported to have a median increase in vaccination coverage of 18% (the median increase ranged from 1% to 72%). However, the statistical significance of this finding is not reported.
   3.1.2. No harms associated with provider reminder systems were reported in the 7 studies.
   3.2. **Standing orders** (no studies identified)
   3.3. **Provider assessment and feedback** (1 study)
   This study evaluated the effect of annual chart reviews and feedback to resident physicians on influenza and pneumococcal vaccine coverage.
   3.3.1. The vaccination coverage of high-risk patients of physicians who were exposed to annual chart review and feedback improved by 32% for influenza vaccine and 18% for pneumococcal polysaccharide vaccine. However, the statistical significance of this finding is not reported.
   3.4. **Provider education** (no studies identified)

4. **Interventions to increase vaccine coverage when implemented in combination**
   This analysis included combinations of interventions from within the same conceptual categories, as well interventions from different conceptual different categories.
   4.1. **Client education and client reminders** (1 study)
   Participants who received reminders were significantly more likely to report, at 12 months follow-up, having been immunized than those who did not. (13.6%; p=0.001)
   4.2. **Provider education and provider assessment and feedback**
   4.2.1. At 12 months follow-up, the mean percentage of participants who had received their influenza vaccine did not differ between intervention and control groups (p=0.2)
   4.3. **Interventions to increase client demand for vaccinations combined with provider- or system-based interventions** (5 studies, 7 measures of change)

2. **Interventions to enhance access to vaccination services when implemented alone**
   2.1. Rigorous program evaluation and high quality research studies that evaluate interventions to enhance access to vaccination services are required.

3. **Provider- or system-based interventions when implemented alone**
   3.1. Overall program implications
   3.1.1. Public health programs that aim to improve vaccination rates among health care providers may consider including provider reminders as a single intervention.
   3.1.2. Public health programs that aim to improve vaccination rates may consider provider assessment and feedback interventions as a single intervention; however, this recommendation is based on the results of only one study and should be taken with caution.
   3.2. Rigorous program evaluation and high quality research studies should be conducted in order to add to the limited body of knowledge on this issue.
   3.3. As no studies were found that related to the effectiveness of standing orders or provider education when implemented alone no recommendations can be made at this time.

4. **Interventions to increase vaccine coverage when implemented in combination**
   4.1. Public health programs that aim to improve vaccination rates should consider including
   4.1.1. Combinations of interventions from within the same or different conceptual categories.
   4.1.2. Combinations of interventions that include one or more interventions to enhance access to vaccination services with one or more interventions from one or both of the other two categories used in this review (community or client demand for vaccination and provider or system based interventions).
   4.2. Any decision to include combinations of interventions from within the save category should be taken with caution due to the limited number of studies in this area.
   4.3. Rigorous program evaluation and high quality
4.3.1. The median change reported in these studies was 3.7% (range -2 to 28.9%). However, the statistical significance of this finding is not reported. Key findings from individual studies include:

4.3.2. Relative to controls the vaccine rate among participants who were exposed to the intervention increased 8.9% for influenza vaccine and 1.9% for pneumococcal polysaccharide vaccine. However, the statistical significance of these findings is not reported.

4.3.3. Relative to controls the increase in influenza vaccination rate over the study period was 28% among diabetic patients aged 40–65 years. The true difference in vaccination rates ranged from 16% to 40% (95% CI 16-40) and 17% among high-risk patients aged <65 years.

4.3.4. Participants with pre–post measures receiving the intervention were no more or less likely to have reduced HBV vaccination rates as compared with controls.

4.3.5. Participants exposed to client and provider reminders for each of influenza and pneumococcal vaccination experienced an increase of 18% (p <0.002) vaccination coverage as compared with those who received only provider reminders.

4.4. **One or two interventions to increase client demand combined with one or two interventions to enhance access to vaccination services** (9 studies, 9 measures of change)

4.4.1. Positive intervention effects were noted in all 9 studies. The median change was an improvement of 14% (range 3.1% to 46%). Statistical significance was reported in 7 studies, all of which reported statistically significant impacts.

4.5. **One or two provider- or system-based interventions combined with one or two interventions to enhance access** (3 studies)

4.5.1. Vaccination coverage increased in 2 studies (31% and 27.8%)

4.5.2. Vaccination coverage declined in one study by -0.5%

4.6. **Interventions to increase community or client demand for vaccinations combined with provider- or system-based interventions** (4 studies, 6 measures of change)

4.6.1. Median change in vaccination coverage was an increase of 22.8% (range -5.9% to 67%)

4.7. **One or more interventions to enhance access to vaccination services combined with one or more interventions from one or both of the other two categories** (16 studies, 19 study arms)

4.7.1. Vaccination coverage improved by a median of 16.5% (range -5.9% to 67%)

5. **Methodological Issues**

5.1. Self report measures of vaccination rates

5.2. Lack of research on the effectiveness

5.3. Community-wide education

5.4. Vaccination requirements

5.5. Reducing client out-of-pocket costs

5.6. Expanding access in health care settings

5.7. Provider education

5.8. Standing orders

6. **Cost Benefit or Cost-effectiveness Information**

6.1. No cost related information was included in the review

5. **Program Evaluation and Research**

5.1. Rigorous program evaluation and high quality research should be conducted in order to add to the limited body of knowledge on this issue.

6. **Cost Benefit or Cost-effectiveness Information**

6.1. Future research should assess cost benefit or cost-effectiveness of the interventions.
General Implications

- Public health programs that aim to improve vaccination coverage among high risk adults should include combinations of interventions from within the same or different conceptual categories such as increasing community demand for vaccinations, enhancing access to vaccination services, and provider- or system-based interventions.
- Interventions that include enhancing access to vaccination services should be combined with interventions that address increasing community / client demand for vaccination or provider / system based interventions
- Provider reminder systems, when implemented alone, can be effective in increasing targeted vaccination coverage.
- Due to the limited number of studies related to the effectiveness of specific interventions implemented alone, rigorous program evaluation and high quality research studies should be conducted in order to add to the limited body of knowledge on this issue.

Legend: CI – Confidence Interval; OR – Odds Ratio; RR – Relative Risk
**For definitions see the healthevidence.org glossary http://www.healthevidence.org/glossary.aspx

References used to outline issue


Other quality reviews on this topic


Related links

- Centers for Disease Control and Prevention (CDC) An Ounce of Prevention http://www.cdc.gov/epo/prevent.htm
- Guide to Community Preventive Services http://www.thecommunityguide.org/
- National Microbiology Laboratory http://www.nml-lnm.gc.ca/index-eng.htm

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