


Interventions to engage people  
aged 60 years and over in influenza,  
shingles and pneumococcal  
immunisation programmes

This resource may also be made available on request in the following formats:



 **0131 314 5300**

 **[nhs.healthscotland-alternativeformats@nhs.net](mailto:nhs.healthscotland-alternativeformats@nhs.net)**

We would like to thank members of the Review Advisory Group, as well as Dr Henry Prempeh (NHS Forth Valley) and Dr Heather Murdoch (Health Protection Scotland) for their input to the review.

Published by NHS Health Scotland

1 South Gyle Crescent  
Edinburgh EH12 9EB

© NHS Health Scotland 2020

All rights reserved. Material contained in this publication may not be reproduced in whole or part without prior permission of NHS Health Scotland (or other copyright owners). While every effort is made to ensure that the information given here is accurate, no legal responsibility is accepted for any errors, omissions or misleading statements.

NHS Health Scotland is a WHO Collaborating Centre for Health Promotion and Public Health Development.

Corporate member of  
Plain English Campaign  
Committed to clearer  
communication

**489**



## **Contents**

About this briefing .....	2
Key points .....	3
Background.....	6
Evidence overview .....	9
Patient-focused interventions.....	12
Provider-focused interventions.....	28
Limitations.....	33
Discussion .....	35
Conclusions .....	38
References .....	40

## **About this briefing**

This rapid review summarises recent published and unpublished literature on interventions to improve uptake of the influenza, shingles and pneumococcal immunisation programmes among adults aged 60 years and older.

The first section describes the aim of the Vaccination Transformation Programme (VTP). It also outlines the adult immunisation programmes and uptake in Scotland, as well as the objectives of the review. The second section outlines the methodology for this review and an overview of the evidence landscape. The third section sets out the evidence on the impact of patient-focused interventions on adult immunisation, while the fourth section summarises the evidence for interventions aimed at healthcare providers to improve adult immunisation uptake. The final section outlines the limitations of the review, discusses the available evidence and provides conclusions.

# Key points

## Patient-focused interventions

### Enhancing patient access to vaccination

- There is evidence from a well-conducted systematic review that patient outreach (for example home visits or group visits to health professionals) can increase influenza vaccination rates.
- Pharmacy-based services in community settings in which responsibility for vaccinations has been transferred to other staff groups (for example pharmacists and nurses) have the potential to enhance patient access to vaccination. There is some evidence from four studies that national policies for pharmacy-based vaccination services may modestly increase influenza and pneumococcal vaccination rates.
- Multicomponent interventions involving pharmacy-based delivery were examined in two studies. The findings suggest that pharmacy-based services, with flexibility in the number of clinics offered and hours of operation, as well as additional support (for example training, reminders, promotion or education) can help to reduce barriers to vaccination in an older population, particularly in remote and island communities.

### Reminding patients about vaccination appointments

- Evidence from a well-conducted systematic review of randomised trials suggests that reminders for influenza vaccination work. Effective patient recall and reminder communications include postcards, personalised postcards, letters or phone calls, personalised letter or phone call to a standard letter, a letter plus leaflet or postcard to reminder and phone calls to clients and different types of questionnaires for recall. Three additional randomised controlled trials provided some further support for reminders (texts, mailed letters, phone calls plus postcards) in improving influenza vaccination.

- Newer recall/reminder approaches, such as text messaging and a centralised reminder service, may have the potential to improve vaccination uptake but evidence of effect was limited to single individual trials.

### **Raising patient awareness of the importance of vaccination**

- Evidence from a systematic review indicated that health-risk appraisal, nurse- or pharmacist-led education and brief face-to-face interventions are effective in increasing influenza uptake. Three further individual studies which featured patient education, either alone or as part of a multicomponent intervention, showed some improvement in pneumococcal vaccination uptake.
- Promotional communications ranged from local and regional health promotion activities to large-scale national campaigns, and there was mixed effectiveness in terms of vaccination uptake.
- One systematic review suggested that promotional communications for influenza for older adults largely involved mass or personalised communications, either alone or in combination with other strategies, and there was some promising evidence for personalised communications combined with improved service delivery (for example home visits).

### **Provider-focused interventions**

- Evidence to support the use of health information technology was limited to two individual studies. In both studies, it helped to identify eligible patients for shingles vaccination.
- Evidence from two observational studies in a systematic review suggested that case management may help to facilitate influenza vaccination uptake.
- Evidence from a large systematic review indicated that effective provider-based interventions for improving influenza vaccination were: payment to providers, posters in clinics as reminders, facilitator

encouragement to vaccinate, physician feedback and education, and performance review and feedback to physicians plus benchmarking.

- There was some support from individual studies which featured interventions with an education or training component, either alone or in combination with other strategies. These helped to improve provider knowledge of adult immunisation programmes, and patient influenza and pneumococcal vaccination rates.

# Background

The three-year Vaccination Transformation Programme (VTP) began on 1 April 2018. It aims to modernise vaccination delivery across Scotland so NHS Boards can reconfigure services to suit their local populations, geography, workforce and resources.<sup>1</sup> During the transition, the VTP also provides an opportunity to identify ways to improve vaccination coverage in certain programmes and populations, as well as close inequalities gaps.

Older adults are an important high-risk population who benefit from vaccination, as the severity and incidence of infections can increase with age.<sup>2</sup> In this group, seasonal influenza, pneumococcal infections and reactivation of the varicella zoster virus can lead to increased hospital admission, worsening of co-morbidities and, in some cases, they can be life threatening.<sup>3</sup> In Scotland, vaccination against influenza and pneumococcal infection is offered as part of the Scottish Immunisation Programme to adults aged 65 years or over who are healthy, or 18 years or over if they are considered to be high risk due to other health conditions. Shingles vaccination is offered to all adults aged 70–79 years.<sup>4</sup>

Seasonal vaccination against the influenza virus is recommended annually to protect against predominant strains. National uptake for seasonal influenza vaccination is slightly below the World Health Organization target of 75%.<sup>5</sup> The estimated overall vaccine uptake for Scotland is 73.7% in people aged 65 years and over (provisional data, week 15 2019), which is identical to the figure for 2017–2018.<sup>6</sup>

Pneumococcal and shingles vaccines are one-off injections which provide lifetime protection. The pneumococcal vaccination provides some protection against a form of bacterial meningitis and other conditions such as severe ear infections.<sup>7</sup> National figures for pneumococcal uptake (2017–2018) have been published for the first time and show that 67.9% of those aged 65 years have received this vaccination since the start of the programme, which is broadly comparable to 69.5% for England and Wales.<sup>8</sup>



Shingles vaccination was introduced in 2013. The vaccine boosts pre-existing immunity but also can decrease the risk and severity of shingles, reduce complications or limit the duration of symptoms.<sup>9,10</sup> Shingles is a live vaccine which is not recommended for use in people who are immunocompromised.<sup>10</sup> Uncertainty over who can safely be given the vaccine may affect uptake. In contrast to other adult immunisation programmes, shingles uptake rates are relatively low. Uptake in the routine cohort was 41.9% and 39.9% in the catch-up cohort in 2018–(August) 2019. There is also wide variation in vaccine coverage by NHS Board (and GP practices within Board areas), ranging from 31.8% to 63.1% for the routine cohort and from 33.5% to 63.5% for the catch-up cohort in 2018–(August) 2019.<sup>11</sup>

## **Objectives**

The objectives of this evidence review are twofold. First, this rapid evidence review sought to identify strategies to improve the engagement of adults aged 60 years and over in influenza, shingles and pneumococcal immunisation programmes, given that the national uptake for adult immunisation programmes is below target levels. A number of high-level studies have looked at interventions to improve vaccination rates among older adults.<sup>12,13,14</sup> These focus on specific immunisation programmes or intervention types, and are important sources of evidence. This review aims to update the currency of the evidence in light of service redesign in years 2 and 3 of the VTP.

Some populations may experience barriers to accessing vaccination and be at greater risk of vaccine-preventable diseases. Therefore, the review also looked for evidence to engage the following populations in adult immunisation programmes:

- those in nursing homes, care homes, assisted living or sheltered housing
- those with reduced cognitive ability, for example people with dementia, people with Alzheimer's disease
- those with reduced mobility or housebound individuals

- those living in remote/rural areas
- carers of older adults.

Second, the evidence review looked for interventions aimed at healthcare providers to increase their knowledge of adult vaccination programmes to increase vaccination uptake among the selected populations. Healthcare providers are an important population as they can play an influential role in a patient's decision to get vaccinated.

## Evidence overview

Systematic methods were used to identify, critically appraise and synthesise published and unpublished research on ways to improve engagement with immunisation programmes among adults aged 60 years and older. Although 65 years is the earliest age to receive pneumococcal and influenza immunisation in adults who do not have a chronic medical condition (non-high-risk adults) based on the Scottish Immunisation Programme, scheduled ages for these vaccines vary worldwide.<sup>2,15</sup> Therefore, the inclusion criterion for age was lowered to 60 years. Early intervention might ensure that people receive the full public health benefit by increasing knowledge and raising awareness of the immunisation programmes before they are eligible.

A literature search of nine electronic bibliographic databases found English-language studies that were published between January 2013 and June 2019. A search of unpublished literature was also undertaken. The databases, search terms and strategies can be found in a [technical appendix](#).

Studies were selected if they were conducted in high-income countries and assessed an intervention:

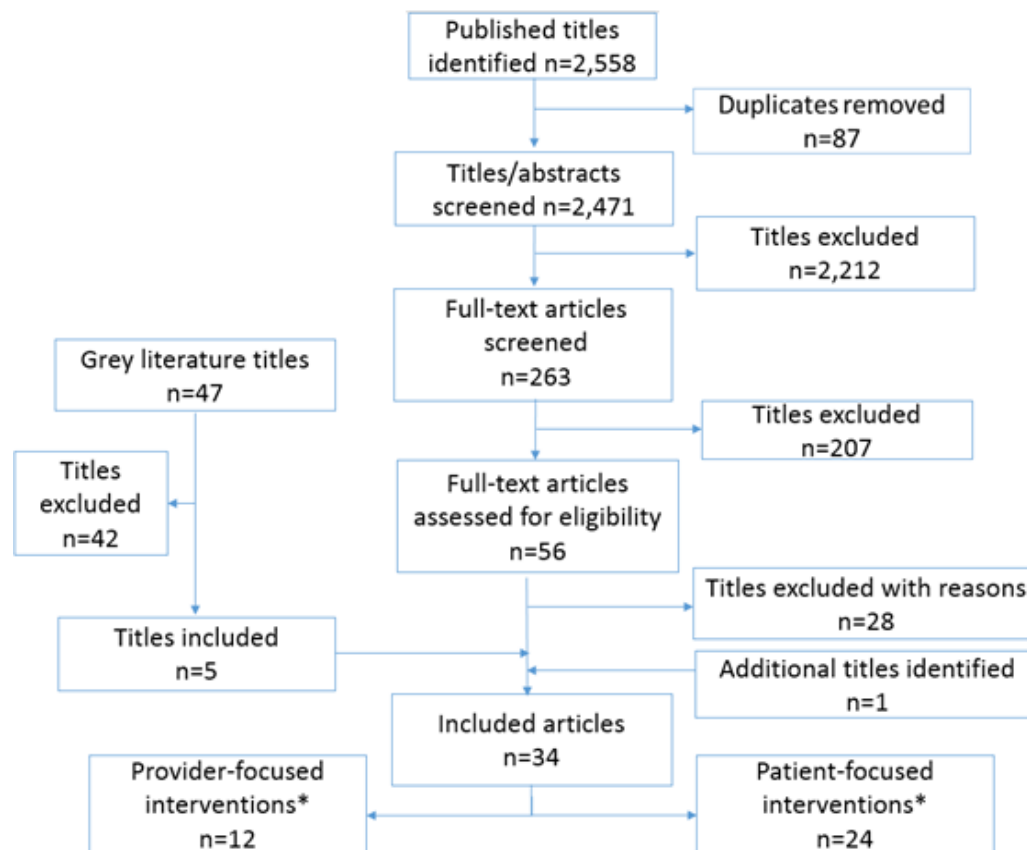
- to improve immunisation uptake or change an intention to vaccinate in the defined adult populations
- to increase knowledge of healthcare providers delivering adult immunisation programmes.

Interventions for adults focused on vaccination delivery in the community to maximise relevance to the VTP; however, the settings were extended to hospital and outpatient care for interventions aimed at healthcare providers.

Of the 2,558 published studies identified, 28 studies met the inclusion criteria and an additional study was identified from reference lists of selected papers. Of 47 unpublished studies identified, five were selected according to the inclusion/exclusion criteria. A Preferred Reporting Items for Systematic

Reviews and Meta-Analyses (PRISMA) diagram outlines the selection process and shows that 34 studies were included in this review (**Figure 1**).

**Figure 1:** Flowchart outlining the selection process



Notes: \* Number of studies is greater than 34 because there are duplicate studies for provider- and patient-focused interventions.

The majority of the evidence was from the US (n = 19), but studies were also conducted in Canada (n = 3), UK (n = 4), Australia (n = 1), France (n = 1), Germany (n = 1), the Netherlands (n = 1) and Hong Kong (n = 1). There were also three reports looking at more than one country in Europe. Much of the evidence focused on influenza, with 22 out of 34 studies focusing on the influenza immunisation programme alone or in combination with other vaccination programmes. The remaining studies focused on shingles (n = 6) or pneumococcal immunisation (n = 6).

The studies varied in research design. Evidence from systematic reviews is considered to be more robust because the results are synthesised using methods to reduce bias and random error. When carried out well, they provide reliable estimates about the effects of an intervention and greater confidence that the conclusions are valid. The results of individual primary studies may show effectiveness but these may be atypical, and potentially biased. Therefore, systematic review-level evidence is summarised first, followed by the findings of individual studies.

The quality of studies also varied but, in general, the systematic reviews were well conducted and the primary research studies were low or moderate quality, with key limitations discussed in the narrative.

A range of interventions were identified, which were targeted at patients (n = 24 studies) and healthcare providers (n = 12 studies). The evidence is summarised thematically around intervention types for each population.

# Patient-focused interventions

## Interventions to enhance patient access to vaccination

### Key points

- There is evidence from a well-conducted systematic review that patient outreach (for example home visits or group visits to health professionals) can increase influenza vaccination rates.
- Pharmacy-based services in community settings in which responsibility for vaccinations has been transferred to other staff groups (for example pharmacists and nurses) have the potential to enhance patient access to vaccination. There is evidence from four US and Canadian studies that national policies for pharmacy-based vaccination services may modestly increase influenza and pneumococcal vaccination rates.
- Multicomponent interventions involving pharmacy-based delivery were examined in two studies. The findings suggest that pharmacy-based services, with flexibility in the number of clinics offered and hours of operation, as well as additional support (for example training, reminders, promotion or education) can help to reduce barriers to vaccination in an elderly population, particularly in remote and island communities.

Interventions to improve access to vaccination in the community were identified in nine studies of variable design (one systematic review, one randomised controlled trial, three evaluations, two quasi-experimental studies, one retrospective analysis and one cross-sectional survey).

### Patient outreach

A large systematic review of randomised controlled trials brings together evidence of effective interventions to improve influenza uptake in people living in the community who were aged 60 years and older.<sup>16</sup> This was a well-conducted review of moderate-quality studies assessed using the Grading of Recommendations Assessment, Development and Evaluation (GRADE) approach. Strategies that focused on improving patient access came from

eight randomised controlled trials, and featured home visits (n = 5), group visits to healthcare providers (n = 1) and free vaccination (n = 2). Cost can be a key barrier to vaccination; however, vaccination is available for free in the UK so this intervention is not relevant to the review. Data on home visits from two studies could be combined and suggested there was some evidence of effectiveness, with the likelihood of influenza vaccination significantly increasing by 30% (p = 0.01). Data from other individual home visit studies could not be combined because of study heterogeneity. However, two studies of home visits by nurses plus a physician care plan had a positive effect and were significant (i.e. the entire 95% confidence interval was greater than 1). One moderate-quality study of group visits of participants to a physician and nurse compared to usual care reported significant results.

## **Pharmacy-based delivery**

Pharmacies are well placed to provide immunisation services and the impact of pharmacy-based delivery was determined in eight studies. Early models of community pharmacy vaccination involved nurse administration, but pharmacists have expanded their scope of practice to offer preventative care services, which includes administering and educating patients about vaccinations.<sup>17,18</sup>

Four studies examined the impact of implementing a national policy for influenza pharmacy-based vaccination services in the US and Canada,<sup>17,18,19,20</sup> and one study evaluated a UK-based community pharmacy pilot<sup>21</sup> which would inform programme rollout.

In the US, a national programme was introduced in 1996 to expand pharmacist vaccination to community settings. By 2009, all US states allowed trained pharmacists to vaccinate against influenza. Chun et al<sup>17</sup> examined the impact of a pharmacy-based service over time to compare influenza vaccination rates by adopter status (pre 1996/early 1996–1998/late 1999–2004/2007 onwards). A retrospective analysis found that for adults aged 65 years and older, there was no significant difference in vaccination rates

between adopter categories in any year, which undermines any change associated with the intervention. In this group, influenza vaccination rates rose between 1993 and 2008 from 49% to 72%, but tailed off to 63% in 2013. The authors note that the decrease was consistent with published rates and noted fluctuation since 2009 when the H1N1 pandemic occurred. By contrast, vaccination rates steadily increased in younger adults (aged 18–64 years) throughout the period that pharmacy-based immunisation was adopted (from 12% in 1993 to 36% in 2013). Diffusion patterns suggested that innovative interventions to improve access to preventive care may be especially useful when targeted at this population.

A further US study focused on a five-year period (2006–2010) when retail pharmacy chains scaled up the national programme and examined the association between pharmacy-based immunisation services and the likelihood of adult influenza and pneumococcal vaccination.<sup>18</sup> A subgroup analysis showed that for adults aged 65 years and older, the availability of pharmacy-based immunisation services significantly increased the likelihood of getting immunised against influenza and pneumococcal by 2.5% and 2.6% percentage points respectively over the study period (significance thresholds were  $p < 0.001$  and  $p < 0.01$  respectively).

The effect of the US national pharmacist immunisation policy on uptake over time in people aged 65 and over was variable but, overall, there were some modest increases. Analyses in both studies share a number of limitations, such as using datasets collated from responses to a national telephone survey which may be subject to a number of sources of error, and using self-reported vaccination data. Furthermore, both studies did not record other initiatives that occurred during the same time period, so it is not possible to attribute the results solely to the intervention.

Canada also implemented a policy permitting pharmacists to deliver a publicly funded influenza vaccine across some provinces in 2009.<sup>19</sup> During 2007–2014, the policy was associated with modest increases in people aged 65 and over across 9 out of 13 provinces, with influenza uptake marginally higher in



provinces with a pharmacist policy (62.9%) compared with those without (61.3%). The increases in influenza uptake in people aged 65 and over were in contrast to a steady decline in national influenza coverage rates over the study period. This study benefited from a large sample size, adjustment for confounders and the inclusion of pre- and post-policy data, but excluded people living in remote areas and on reserves, and residents living in institutions. At a provincial level, a study from Nova Scotia further supports pharmacists as immunisers.<sup>20</sup> An evaluation comparing influenza vaccine coverage before and after policy implementation in 2013 demonstrated the addition of pharmacists led to increased coverage in people aged 65 and over in the first and second years of implementation at 71.6% and 73.2% respectively, followed by a decrease in the third year at 68.4%. Over the same period, there was a steady decline in the delivery of vaccinations by physicians and public health. However, issues with data, and potential confounders such as the 2009 H1N1 pandemic and decreased public confidence in the vaccine for the 2015–2016 season may have affected the results.

In the UK, a before-and-after study of a community pharmacy initiative in which pharmacists administered seasonal influenza vaccinations to high-risk groups across all London boroughs showed that there was no significant change in uptake in people aged 65 years and older, and carers under 65 years in the first year of the initiative (2011–2012 and 2012–2013).<sup>21</sup> There was a slight reduction in influenza vaccine uptake between 2013–2014 and 2014–2015. The probability that registered individuals received their influenza vaccine in pharmacies was approximately 3% for older adults and 22% for carers. The study was limited by the use of two separate recording systems which led to time-consuming data entry, errors in recording and missing vaccine data. In addition, the results may also not be generalisable to other areas of the country.

Geographical barriers can affect patient access to vaccination. The effectiveness and acceptability of pharmacy-based clinics was evaluated in two multicomponent studies in remote and island communities, which

enhanced patient access by increasing the number of clinics or extending clinic hours.<sup>22,23</sup>

A well-conducted trial randomised 29 small rural communities in the Canadian province of British Columbia to an intervention where pharmacies offered one to two clinics per week during the influenza vaccination period. These clinics had a dedicated and trained nurse or pharmacist to educate and deliver free vaccination. These strategies were not available in the control arm.<sup>22</sup>

Personalised written invitations from pharmacists, opportunistic verbal invitations from the pharmacist to eligible patients presenting to a pharmacy during flu season, and community-wide promotion using posters and the local media were used to recruit eligible patients. Although mean influenza immunisation rates were broadly similar in 2009 (but below the 90% target goal), a significant difference in influenza immunisation rates was observed between the intervention and control communities in 2010 (80.1% versus 56.9% respectively,  $p < 0.01$ ). However, data issues, particularly around the denominator data (resulting in rates over 100%), limited the reliability of the results. Convenience was most commonly cited as the reason for attending the pharmacist-based clinic. The results of this study suggest that multiple strategies, such as training of pharmacists and nurses, personal invitation, public promotion of immunisation programmes and improving access to immunisation can help to reduce barriers to vaccination.

On the Isle of Wight, offering community pharmacist vaccination alongside a general practice (GP) vaccination service notably boosted vaccination rates among people over 65 years and carers.<sup>23</sup> The intervention involved raising public awareness through posters and leaflets to high-risk groups (including those over 65 years of age), vaccination administered by appropriately trained pharmacists and a flexible service (six-day-a-week service 9 am–6 pm; a Sunday service offered by two providers; no patient appointments were required). This study benefited from accurate real-time reporting through an electronic system. Although the number of vaccinations varied across pharmacies, they accounted for 9.7% of all influenza vaccination on the island, and improved the influenza rate among over-65s to 70.3% from 64.1%

(GP-administered vaccine rate only). Of eligible carers, only half were vaccinated, and 46% were through pharmacies; these figures were higher than regional and national averages for carers. The pharmacy-based service was well received, with patients reporting accessibility due to expanded hours in pharmacy clinics as a major advantage over their GP practice. Just over half of the island community pharmacies participated in this study and its representativeness may be questioned but wider pharmacy involvement may have boosted vaccination rates.

An appointment-based model which delivered vaccination at the time of assessed need was evaluated in a US study.<sup>24</sup> At scheduled face-to-face appointments, which were synchronised with collection of repeat prescriptions, a pharmacist obtained a complete vaccination history and administered outstanding vaccinations. A total of 24 pharmacies were randomised to the intervention and 78 control pharmacies provided usual care. Of all immunisation programmes, significantly more shingles and influenza vaccinations were given in the intervention pharmacies compared with the control pharmacies (shingles: 166.9 versus 139.1 respectively,  $p = 0.04$ ; influenza: 1,337.7 versus 1,061.8, respectively,  $p = 0.01$ ), but the difference was inconclusive for influenza due to a statistical difference in the mean number of influenza vaccines between control and intervention pharmacies at baseline. Despite the potential for selection bias and issues with data completeness, the appointment-based model: covered a range of immunisation programmes; focused on obtaining vaccination history; facilitated dedicated pharmacist time to allow conversations with patients about vaccination; and provided the convenience of receiving vaccination during the appointment.

## Interventions to remind patients about vaccination appointments

### Key points

- Evidence from a well-conducted systematic review of randomised trials suggests that reminders for influenza vaccination work. Effective patient reminder communications include postcards, personalised postcards, letters or phone calls, personalised letter or phone call to a standard letter, a letter plus leaflet or postcard to reminder and phone calls to clients and different types of questionnaires for recall. Three additional randomised controlled trials provided some further support for reminders (texts, mailed letters, phone calls plus postcards) in improving influenza vaccination.
- Newer recall/reminder approaches, such as text messaging and a centralised reminder service, may have the potential to improve vaccination uptake but evidence of effect was limited to single individual trials.

Recall/reminder interventions serve to engage with the target population and remind them that vaccination is now due or has been missed. A comprehensive Cochrane review on reminder and recall systems to improve vaccination rates in children, adolescent and adult participants in outpatient, community-based, primary care settings was recently updated.<sup>25</sup> Adults aged 18 years or older were included in this review (those who were high-risk patients with medical conditions). This was broader than our population of interest, however, it was not possible to isolate individual studies included in the review that were specific to adults aged 60 years and over. It also included all types of immunisation programmes, and developing as well as developed countries. However, the findings of the review are important. It concluded that reminder and recall systems increase the number of adults receiving any kind of immunisation and there is high-quality evidence that postcards, text messages and computerised telephone calls are all effective methods for delivering reminders.

Recall/reminder interventions for vaccination in older adults were identified in five studies (one systematic review and four randomised controlled trials).

The first of these was the well-conducted Cochrane review by Thomas et al<sup>16</sup> which updates the 2014 review<sup>14</sup> and summarises the evidence on client reminders and recall interventions for influenza vaccination in adults aged 60 years and over. In the review, reminders and recalls were classified as an intervention to increase community demand for vaccination. This large review pulled together evidence on a variety of client recall and reminder interventions. These included patient reminder postcards (17 studies of which 11 had significant results, i.e. the 95% confidence interval was entirely above 1, implying that all these interventions increased vaccination rates); letters, postcards, or phone calls personalised to the participant's health status (16 studies of which 12 had significant results); a reminder letter plus leaflet or postcard (three studies could be meta-analysed, of which two reported significant results); personalised letter or phone call to a standard letter (four trials of which two reported significant vaccination rates); telephone calls to clients (two studies, both with significant increases in uptake); and an intervention involving different types of questionnaire for recall (one study, which reported significant results).

Although many individual trials reported significant results, marked heterogeneity in the studies meant data for many interventions could not be combined. However, data from three studies could be combined for the intervention comparing a letter plus leaflet or postcard to a letter only (three studies, 64,200 participants) which showed that there was evidence of significant improvement in influenza vaccination uptake (11% increase,  $p < 0.001$ ). The authors also concluded that interventions to increase community demand for vaccination varied in intensity and effective ones involved postcards and personalised phone calls at low and moderate levels of intensity respectively.

Four recently published randomised controlled trials were identified which were not included in the Cochrane review.<sup>26,27,28,29</sup> These provided reminders

in a range of formats, and some were personalised.<sup>26,28</sup> The studies are summarised below.

An Australian randomised controlled trial, with some methodological limitations, assessed the use of text message reminders.<sup>26</sup> A subgroup analysis of people aged 65 years and over indicated a significant increase in seasonal influenza vaccination uptake of 26% among those sent text reminders compared with no reminders ( $p < 0.05$ ). Electronic messaging may be limited by delivery failure due to low mobile coverage (particularly in rural areas) and access or usage in the target population.

Mailed communication tailored with behavioural science techniques was evaluated in a large US trial.<sup>27</sup> A total of 228,000 participants aged 66 years and over, who were part of the Medicare national insurance programme, were randomised to one of five treatment arms: no letter (control); a letter from the National Vaccine Programme Office; a letter from the acting US Surgeon General; a letter with an implementation intention prompt from the acting US Surgeon General; and a letter with an active-choice enhanced implementation prompt from the acting US Surgeon General. No difference in vaccination rates across the four different tailored letters was seen but a single mailed letter significantly increased the likelihood of influenza vaccination compared with no letter ( $p < 0.001$ ). This was a large study and, while the Medicare population might not be comparable to the UK, it does support the use of letters as reminders.

A pharmacy-based study looked at the effect of a mailed letter or a phone call on influenza and pneumococcal vaccination uptake rates in people with chronic obstructive pulmonary disease and/or asthma.<sup>28</sup> In participants aged 65 years and over, a mailed letter or a phone call did not significantly increase influenza or pneumococcal rates compared with controls. The results are specific to a single US city and a population with chronic disease which may have greater immunisation needs.

A US study employed an immunisation information system to identify patients who were deficient in at least one of three vaccines (influenza, tetanus/diphtheria/pertussis and pneumococcal). A total of 5,332 adults aged 65 years or over were randomised to centralised reminder and recall for vaccination, or usual care.<sup>29</sup> Participants in the intervention arm received up to two autodial phone calls followed by a postcard and were contacted up to three times over the course of three to four months, while usual care comprised no sent reminders. In adults aged 65 years and over, a centralised service increased influenza rates over a short period of time (32% intervention versus 28.6% control). A smaller increase was noted for pneumococcal rates (9% intervention versus 8.4% control) which may have in part been due to a high baseline institutional rate. The study results have limited generalisability to other sites and healthcare systems but a centralised reminder service has the potential to reduce the burden of coordinating recall and reminders at practice level.

## Interventions to raise awareness of the importance of vaccination

### Key points

- Evidence from a systematic review indicated that health-risk appraisal, nurse or pharmacist-led education and brief face-to-face interventions are effective in increasing influenza vaccination uptake.
- Three further individual studies which featured patient education, either alone or as part of a multicomponent intervention, showed some improvement in pneumococcal vaccination uptake.
- Promotional communications ranged from local and regional health promotion activities to large-scale national campaigns, and there was mixed effectiveness in terms of vaccination uptake.
- One systematic review suggested that promotional communications for influenza for older adults largely involved mass or personalised communications, either alone or in combination with other strategies, and there was some promising evidence for personalised communications combined with service delivery (for example home visits).

Strategies to raise awareness of vaccination through education and promotional communications were identified in 12 studies with varying designs (three systematic reviews, two randomised controlled trials, one non-randomised study, one pre-post test study, two case studies, one before-and-after study, one qualitative study and one observational study).

### Education

A lack of patient knowledge is a notable barrier to vaccination, particularly around which vaccinations are required, whether individuals are eligible and addressing misconceptions about the risks and benefits. Patient education can empower people to make an informed decision. Five studies of varying study design (one systematic review, one before-and-after study, one



qualitative study, one observational study and one randomised controlled trial) employed a range of educational resources.

The Thomas et al<sup>16</sup> review reported three types of patient education-based interventions to improve influenza vaccination rates in seven randomised controlled trials. Health-risk appraisal plus an offer of influenza vaccination was assessed in four trials, which all reported significant results (i.e. confidence intervals were greater than 1). However, because of study heterogeneity it was not possible to combine the results. A meta-analysis of data for nurses or pharmacists educating and nurses vaccinating patients significantly increased the likelihood of influenza vaccination by 229% ( $p < 0.001$ ). However, it is important to note that although the effect size was large, the 95% confidence interval was wide (1.91% to 5.66%) and the analysis included only two studies, of which one was significant. Individual studies for nurses educating and vaccinating patients (same study as nurse-led education) and medical students counselling patients in brief face-to-face interventions were also effective at increasing vaccination rates. A further intervention that included an educational component was a patient outreach intervention comprising a telephone call from retired teacher plus educational brochure, and this was effective at increasing influenza vaccination rates.

Four further primary studies were identified that included patient education in an intervention, either alone,<sup>30,31,32</sup> or as part of a multicomponent educational programme.<sup>33</sup> Of these, three showed some improvement in uptake rates of pneumococcal vaccination.<sup>31,32,33</sup>

One US study assessed whether an education programme delivered by student pharmacists and supported by written information about shingles and shingles vaccination in 51 community pharmacies changed a patient's interest to vaccinate.<sup>30</sup> It found that nearly three quarters of 501 unvaccinated people aged 60 years and over were interested in speaking to their pharmacist or physician after receiving the information; however, post-intervention vaccination data were not recorded in this study.

The effect of a video promoting pneumococcal vaccination delivered during a clinic visit was evaluated in a small qualitative study of 73 patients.<sup>31</sup> The video elicited a positive response, with participants finding it informative, easy to understand, engaging and credible. On the day of viewing, 47.9% received the vaccine; an additional 2.7% reported previous receipt of vaccine. The study used a convenience sample with small participant numbers, and was limited to single centre. Providing education at the point of patient care may be feasible in some settings and allow providers to spend time discussing patient concerns.

A further primary study evaluated a face-to-face educational intervention in a cluster randomised controlled trial.<sup>32</sup> Patients aged 65 years and over with chronic disease attending five outpatient clinics in Hong Kong were randomised to either the intervention group comprising a three-minute nurse-led telephone education intervention before and a three-minute face-to-face intervention during scheduled medical appointments, or standard care of health education leaflets of pneumococcal vaccination and/or a video shown at the clinics. Compared with standard care, the intervention increased pneumococcal uptake by 8.6%. This study benefited from a rigorous study design and was generally well conducted; although the generalisability of these results to healthy older populations or other healthcare systems should be considered.

An observational study assessed an educational programme, which comprised a presentation by a pharmacist, a 10-minute theatre skit involving community centre members and pharmacist-led small group discussions.<sup>33</sup> The novel approach took place in a senior community centre and participants were predominantly African Americans (80.5%). Although the study recruited people aged 50 years and over (which was younger than our inclusion criteria for age), the mean age was 74.3 years (standard deviation 8.9, range 54–101 years). After the intervention, 42 out of 113 (37.2%) patients who were unvaccinated or did not know their vaccination status planned to vaccinate and all reported to receive pneumococcal vaccination three months after the programme (including 18 patients who received on-site vaccination). This

small study has a number of methodological limitations. However, the community setting enabled the programme to reach its target audience in an environment that is accessible, familiar and involved peers of the participants in its delivery, which may have enhanced engagement with the intervention.

## **Promotional communications**

Promotional communications are an important means to raise awareness and modify behaviour. Six studies (two systematic reviews, one randomised controlled trial, two evaluations and one case study) evaluated interventions which featured promotional communications ranging from small-scale local promotions to national campaigns.

Two well-conducted systematic reviews looked for evidence of effective communications for influenza vaccination across Europe. The first of these focused on evaluations of European health communication campaigns.<sup>34</sup> Only one study focused on a campaign for an older population; Luthi et al<sup>35</sup> assessed a prevention programme against influenza in Switzerland, in which activities included information meetings among senior associations. Communications included video, leaflets, brochures, articles in the lay press, a website and a press conference as well as adverts on a local TV network. Although the intervention had a nominal effect on vaccination uptake (from 58.0% to 58.4%), a significant increase of 6.5% was observed in a subgroup aged 65–69 years ( $p = 0.008$ ).

The second review looked for effective practice in promotional communication for seasonal influenza vaccination.<sup>36</sup> MacDonald et al identified 12 evaluation studies from three European countries (Switzerland, Sweden and UK) undertaken in people aged 65 years and over; it also included the Luthi et al<sup>35</sup> study. Promotional communications for older adults primarily involved printed mass communications (for example letters, leaflets and posters) or personalised communications (for example written invitations and face-to-face communications through outreach visits), either alone or in combination with other strategies, and the study results suggested mixed evidence of

effectiveness. The authors concluded that there was some promising evidence for personalised communications combined with changes in service delivery (for example home visits) to enhance uptake rates in older adults.

Three studies looked at the impact of local and regional promotion campaigns, with varying effects on vaccination. The first of these was a small Welsh case study in which promotion of the shingles vaccines through posters and leaflets was optimised through partnership working with local community groups and forums and helped to increase shingles vaccination across a GP cluster by 10% (range 2.5% to 17.2%).<sup>37</sup> The second study was a large French single-blinded cluster randomised controlled trial in which 25 GP waiting rooms in the Lille-Douai district were used as sites for an advertising campaign involving posters and pamphlets. They were compared with 50 control waiting rooms containing standard mandatory information. An increase in influenza uptake in both intervention and control groups, compared with national and regional decreases, may suggest participant behaviour may have changed when under observation.<sup>38</sup> The third study assessed a pharmacist-led intervention involving a press release in local newspapers, a flyer accompanying each prescription and a personalised letter mailed to eligible patients. This was marginally effective in encouraging shingles vaccination in three independent community pharmacies in Tennessee during the intervention period compared to control months (1.2% versus 0.37%, respectively).<sup>39</sup> However, the study had a number of methodological problems caused by convenience sampling, patient eligibility and confounding.

At a national level, a large Dutch organisation supporting the interests of older adults undertook an extensive communications campaign involving media coverage, parliamentary questions, a petition, patient research, adverts and an animated video. This was to push for a national vaccination schedule for elderly people (specifically, but not limited to, influenza, pneumococcal and shingles vaccination).<sup>40</sup> Through this multipronged approach, they engaged a range of stakeholders, increased awareness of vaccination among the target population and succeeded in getting older adult vaccination onto the political agenda. However, it did not secure a routine schedule for older adult

vaccinations. Access, notably cost for unfunded vaccines (pneumococcal and shingles vaccination) remain ongoing challenges. Although the campaign had clear aims, it had no planned outcomes, so it is difficult to say whether the results are unbiased or valid. The authors note that although other European healthcare systems are different, their approach may be transferable.

In terms of ongoing research in this area, we identified the Vaccination60+ trial which is a non-randomised multi-methods intervention study. It will assess the implementation of an evidence-informed campaign to increase rates of influenza and pneumococcal vaccination in the residents aged 60 years and over of the German state of Thuringia.<sup>41</sup> An evaluation of knowledge and attitudes of the target population has been completed and will inform campaign development.<sup>42</sup>

# Provider-focused interventions

## Key points

- Evidence to support the use of health information technology (web-based decision support tools and electronic health records) was limited to two individual studies. In both studies, it helped to identify eligible patients for shingles vaccination.
- Evidence from two observational studies in a systematic review suggested that case management may help to facilitate influenza vaccination uptake.
- Evidence from a large systematic review indicated that effective provider-based interventions for improving influenza vaccination were as follows: payment to providers, posters in clinics as reminders, facilitator encouragement to vaccinate, physician feedback and education, and performance review and feedback to physicians plus benchmarking.
- There was some support from individual studies which featured interventions with an education or training component, alone or in combination with other strategies, to improve provider knowledge of all adult immunisation programmes and resulted in improving patient influenza and pneumococcal vaccination rates.

Healthcare providers play an important role in promoting the benefits of vaccination to patients and helping to inform their decision-making. Twelve studies of varying design (three systematic reviews, two randomised controlled trials, one quasi-randomised study, one quasi-experimental study, two before-and-after studies and three evaluations) were identified and evaluated a range of provider-focused interventions that included the use of technology, case management or education or training.

## Technology

The use of technology is explored in two US studies to improve rates of shingles vaccination among adults aged 60 years and over. A before-and-after study assessed the effect of a web-based clinical decision support tool to alert the provider of patient eligibility. Increases in shingles vaccinations of 42.5% and 53.8% were reported by two primary care practices.<sup>43</sup> This study gave a snapshot of vaccination rates in both practices but had no controls to determine any intervention effect and insufficient resources to assess the number of practice patients who would have been eligible for the vaccine. A well-conducted randomised controlled trial assessed whether using an electronic medical record to identify patients who were eligible to receive the shingles vaccine and contacting them through their personal health record (user) or standard mail (non-user) improved the shingles vaccination rate when compared with standard care.<sup>44</sup> For users (26%) and non-users (74%) of personal health records, vaccination rates were significantly greater among the intervention groups compared with the controls (users: 13.2% versus 5%,  $p = 0.0007$ ; non-users: 5.2% versus 1.8%,  $p = 0.0001$ ). This study may have limited generalisability being a single-centre study and to healthcare systems where patient-accessible records are not used. There was also a poor response rate, which may have compromised internal validity. However, communication outside of face-to-face consultations, by both electronic messaging and information by mail, may be a practical way to improve preventative health care.

## Case management

A systematic review on barriers and facilitators to seasonal influenza immunisation highlighted the potential role for a case manager in improving influenza vaccination uptake in older adults.<sup>45</sup> Moderate-quality evidence from one case-control study involving 11 European countries suggested that having a case manager in an interdisciplinary team might help to facilitate higher uptake of influenza vaccine in older adults. This finding is also supported by evidence from a cross-sectional survey in 795 UK GP clinics,

particularly for identifying eligible patients. Clear leadership and effective communication play a key role in this type of intervention.

## **Education and training**

Two systematic reviews<sup>16,36</sup> reported interventions which targeted healthcare providers to improve uptake of influenza vaccination in older adults. The Cochrane review combined the results of two trials for interventions that involved payment to physicians, which would significantly increase the likelihood of influenza vaccination by 122% ( $p < 0.001$ ).<sup>16</sup> VTP aims to move away from physician-led delivery; however, this intervention may be effective for other healthcare providers. Other effective provider-based interventions which could not be meta-analysed due to study heterogeneity were: reminders to physicians (four trials of which two had significant results) and facilitator encouragement to vaccinate (three trials of which two had significant results). Successful interventions which were only supported by individual studies were: posters in clinics as reminders, physician feedback and education, and performance review and feedback to physicians plus benchmarking. The MacDonald et al<sup>36</sup> systematic review identified one study evaluating an educational outreach visit to primary care providers plus feedback compared with written feedback to practices. However, the Siriwardena et al<sup>46</sup> trial was included in the Thomas et al review and reported no evidence of effectiveness for influenza vaccination.<sup>16</sup>

Further to the evidence from systematic reviews, we identified seven primary studies evaluating provider-focused interventions. Three studies of varying design featured education or training to improve knowledge and skills of healthcare providers<sup>47,48,49</sup> and four studies looked at multicomponent interventions which featured provider education.<sup>50,51,52,53</sup>

The first of these evaluated an educational programme designed for pharmacists in a randomised design and showed that increases in the number of pneumococcal vaccinations were significantly greater among pharmacies that received coaching as well as self-directed learning compared with



pharmacies in the self-directed training group (average increase of 32.9 doses versus 13.3 doses respectively,  $p < 0.03$ ).<sup>47</sup> However, this study lacked a true control group and was susceptible to selection bias due to a financial incentive.

A quasi-experimental study of a 60-minute educational programme improved nurse practitioner understanding of shingles vaccination, with a significant difference between pre- and post-test knowledge scores (3.4 versus 4.7,  $p < 0.05$ ).<sup>48</sup> However, a key limitation of the study was that it did not measure a quantifiable improvement in vaccination delivery. An evaluation focused on the role of nurse practitioners in administering vaccination and showed improvements in uptake across all three adult programmes after delivery of a 45-minute presentation to four US nurse practitioner-owned primary care clinics. Mean knowledge scores improved for six out of 10 questions, but there was no improvement in scores for how providers access information and a decline in scores for advocacy for vaccination.<sup>49</sup>

Four studies undertook multicomponent educational interventions and reported some progress in terms of improving staff compliance with vaccination recommendations, vaccination uptake rates and increasing knowledge and awareness.

The first of these was a hospital-based multifaceted initiative comprising an email-disseminated educational slide set, an interdepartmental competition and partnership with quality improvement staff.<sup>50</sup> The initiative aimed to improve compliance rates for inpatient vaccination to more than 96% and yielded a significant improvement in average compliance from 78% to 96% for pneumococcal vaccination ( $p = 0.001$ ) and 84% to 97.5% for influenza vaccination ( $p = 0.002$ ). This study had a number of data issues that could have affected the accuracy of the results and did not take place in a primary care setting, which may limit transferability of the intervention and generalisability of the results. The second study evaluated a state-wide pharmacist-led educational intervention which targeted both providers of immunisation (using a campaign promoting a clinical decision support

pathway, provider education as well as resources) and residents (through community outreach).<sup>51</sup> Although there were a number of shortcomings with the study, the intervention yielded positive results, with 92% of surveyed respondents (n = 413) reporting improved knowledge of the pneumococcal vaccine and a significant increase of 3.9% in uptake after the intervention (p = 0.01).

Finally, two US studies evaluated the effectiveness of an immunisation toolkit based on strategies to address convenience, patient communication, enhanced office systems (for example electronic records) and motivation through immunisation champions, and showed mixed results. In a before-and-after study of four primary care practices which employed different strategies from the toolkit, uptake increased in adults aged 65 years and older in three out of four practices for influenza, and in all four practices for pneumococcal vaccination. However, only two of these increases were statistically significant for pneumococcal and influenza vaccination (p < 0.006 and p < 0.03 respectively).<sup>52</sup> The toolkit was also assessed in a study and included coaching of practice-based immunisation champions and provider education using a cluster randomised design of 25 practices. It showed increases in pneumococcal vaccination among adults aged 65 years and older in both control and intervention groups.<sup>53</sup>

## Limitations

The study population for this review was older adults, many of whom had chronic disease. Some studies specifically recruited this higher-risk population which may have greater immunisation needs, so the generalisability of these study results to healthy older populations should be considered. In many studies, the disease state of the population was often mixed and how this affected vaccination uptake was unknown.

Many of the studies were conducted in non-UK countries which have different healthcare systems, so the transferability of the results may be questionable.

The evidence was thematically analysed by intervention type. Categories were not always clear, and grouping was not mutually exclusive, particularly around promotion, where communications for older adults predominantly involved mass communications (for example letters, leaflets or posters) or reminders (for example invitations). This was also problematic for multicomponent interventions.

It is important to note that a number of the interventions were studied during influenza pandemics (for example H1N1 scares) which is likely to have changed the level of awareness and concern among the general public and healthcare providers, and influenced seasonal influenza uptake.<sup>16,20</sup> It was noted as a potential confounder in a number of studies evaluating pharmacy-based services<sup>18,19,20</sup> but only formally evaluated in the Buchan et al study.<sup>19</sup> In this study the core finding was attenuated after adjustment for multiple covariates, of which pandemic flu vaccination was one, and remained significant despite this. The results of these studies should be interpreted with some caution.

The majority of studies recorded vaccination rates as the main outcome; however, a small number of intervention studies looked at improving knowledge about vaccination, and/or changing a patient's intention to

vaccinate. These are proxy outcomes and are not particularly reliable, as intentions are not always acted on and may not result in vaccination.

It is important to note that objective measurement of vaccination recorded through electronic data systems is more reliable than self-reported rates. Self-reported immunisation status might be subject to over- or underreporting by participants and is less reliable.

This review did not assess the economic value of the interventions.

## Discussion

A variety of interventions to engage adults aged 60 years and older in immunisation programmes were identified, and these strategies aimed to:

- enhance patient access to vaccination in the community through changes in personnel delivering vaccination (for example pharmacists and nurses) and settings (for example patient's home and pharmacies)
- prompt patients about vaccination appointments
- increase awareness of the importance of vaccination through education and promotional communications.

Much of the evidence on interventions to improve vaccination uptake in older adults has focused on influenza as an immunisation programme. The recently updated Cochrane review provides the mainstay of the evidence base on access, community demand and provider-based interventions to increase influenza uptake in adults aged 60 years and older. The types of interventions identified in this review are broadly consistent with those of the Lau et al review, which also included pneumococcal vaccination.<sup>12,13</sup> It is likely that effective approaches for influenza may be transferable to other immunisation programmes, and vice versa. For example, evidence of benefit for health information technology was only identified for shingles vaccination but this intervention could plausibly be extended to other immunisation programmes.

Multicomponent interventions were a common type of approach to improve rates of older adult immunisation and increase the knowledge and skills of healthcare providers. This evidence is in line with National Institute for Health and Care Excellence guidance on increasing influenza vaccination,<sup>54</sup> in which multicomponent interventions are recommended to be developed and delivered. Pharmacy-based services, reminders, educational programmes and promotional communications featured in multicomponent interventions. Multicomponent interventions were usually designed to address knowledge gaps as well as other immunisation barriers such as accessibility. Multifaceted interventions to raise patient awareness of vaccination involved education and promotion of key messages using a variety of communications as well as

opportunistic patient discussion with providers. In a multifaceted approach, it is difficult to know the value of each individual component and which combination had the greatest impact on uptake because they were initiated concurrently, allowing for synergistic effects.

Evidence for interventions to improve vaccination uptake among selected populations who may experience barriers to accessing vaccination was limited, with only four studies on interventions for people living in remote and rural areas, and for carer populations. For carers, this may be because they can be difficult to identify, and people who provide care may not always identify themselves as carers. The Carers (Scotland) Act<sup>55</sup> is designed to support carers' health and wellbeing; providing vaccination as part of a carer support plan may be an opportunity to promote vaccination in this group. For these groups, access is an important barrier to vaccination and pharmacy-based delivery was used to improve vaccination uptake, with some success. Pharmacy-based services in community settings have the potential to enhance accessibility due to greater pharmacy availability, geographical proximity (particularly in remote areas) and greater flexibility in terms of opening hours, although there is currently limited evidence in this area. Accessibility to vaccination services is a key factor for the general public as identified in the qualitative research study commissioned by NHS Health Scotland to ascertain views on optimal vaccination service delivery.<sup>56</sup>

Pharmacists played a key role in models of community-based vaccination provision. There is some evidence to suggest modest increases in influenza and pneumococcal vaccination rates for pharmacist-led strategies which have been adopted in the US and Canada, although this was not seen in a UK-based pilot. The evidence on patient-focused interventions shows pharmacists involved as educators, advocates, facilitators and providers of immunisation. Community pharmacists are well placed to increase awareness of vaccine recommendations and to provide personalised reminders as they come into regular contact with older patients, particularly those with chronic disease.

Recall and reminder interventions are well-established approaches to improve vaccination uptake among children, adolescent and adult populations.<sup>25</sup> Evidence of effectiveness for reminders among older adults was only reported for influenza immunisation, and randomised controlled trial-level evidence suggested that reminders in a variety of formats worked. There is some evidence that personalised reminders could improve vaccination uptake; these varied in frequency and degree of personalisation. Formal personal invitations were also encouraged by a sample of older and high-risk adults across Scotland who participated in the qualitative research exploring public views of vaccination service delivery.<sup>56</sup>

Endorsement from a pharmacist or doctor has been shown to increase the likelihood of vaccination.<sup>45</sup> Barriers to a provider recommendation can include lack of knowledge and awareness of vaccination indications, attitudes of healthcare providers, and perception of risk and disease burden. These may be overcome by effective provider-focused interventions highlighted by this review, either alone or alongside patient-focused interventions. In their role as educators, providers are looking to identify eligible people for vaccination, raise awareness of the importance of vaccination and make the most of opportunities of patient contact to discuss any concerns they have and facilitate vaccination. Health information technology and case management may potentially have a role to play in achieving this but there is some limited evidence for these interventions.

## Conclusions

The evidence from this review illustrates a range of approaches to engage adults aged 60 years and over in influenza, pneumococcal and shingles immunisation. It suggests that combining more than one type of approach may help to promote vaccination uptake.

Evidence for patient-focused interventions was underpinned by several well-conducted systemic reviews, and a range of low- to moderate-quality primary studies, which primarily focused on influenza vaccination. There is some evidence of effectiveness for:

- patient outreach (for example home visits) and pharmacy-based services (in which vaccination delivery has been transferred to non-physician members of the primary care team) to improve patient access to vaccination
- patient reminders in many formats to prompt patients to attend vaccination appointments
- nurse- or pharmacist-led education, health-risk appraisal and brief face-to-face interventions to increase patient awareness of the importance of vaccinations.

It is likely that effective approaches may be applicable to other vaccination programmes.

The review highlighted that empirical evidence for patient-focused interventions among certain older adult populations who may experience barriers to accessing vaccination is lacking. Pharmacy-based services may be important but more research is needed on community-based provision to inform future interventions.

There was a smaller evidence base for provider-focused interventions, with evidence for some interventions limited to one or two individual studies.

Effective interventions could include:

- payment to physicians



- reminders to providers
- encouraging facilitators to vaccinate
- performance review and feedback to physicians plus benchmarking
- physician feedback and education
- case management.

The VTP is an opportunity to develop and pilot interventions as part of the transformation process. Individual Health Boards may wish to:

- assess the applicability of effective interventions and their resource implications
- select those interventions that best meet the needs of their local populations of older adults and their circumstances
- consider adopting a comprehensive approach involving patient and provider-focused interventions to optimise vaccination uptake.

## References

---

- <sup>1</sup> Scottish Government, 2017. GMS contract: 2018, [www.gov.scot/Publications/2017/11/1343/347431](http://www.gov.scot/Publications/2017/11/1343/347431)
- <sup>2</sup> Ciabattini et al. Vaccination in the elderly: The challenge of immune changes with aging. *Seminars in Immunology* 2018;40:83–94.
- <sup>3</sup> British Geriatrics Society. Vaccination programmes in older people. [www.bgs.org.uk/resources/vaccination-programmes-in-older-people](http://www.bgs.org.uk/resources/vaccination-programmes-in-older-people) (accessed 10 December 2019)
- <sup>4</sup> NHS Inform. Older adults over 65 years. [www.nhsinform.scot/healthy-living/immunisation/when-to-immunise/older-adults-over-65-years](http://www.nhsinform.scot/healthy-living/immunisation/when-to-immunise/older-adults-over-65-years) (accessed 10 December 2019)
- <sup>5</sup> Health Protection Scotland. Scottish vaccine update, Issue 70. [https://hpspubsrepo.blob.core.windows.net/hps-website/nss/2505/documents/1\\_issue70-2018-09.pdf](https://hpspubsrepo.blob.core.windows.net/hps-website/nss/2505/documents/1_issue70-2018-09.pdf) (accessed 10 December 2019)
- <sup>6</sup> Health Protection Scotland. HPS weekly national seasonal respiratory report. [https://hpspubsrepo.blob.core.windows.net/hps-website/nss/2794/documents/1\\_2019-05-19.pdf](https://hpspubsrepo.blob.core.windows.net/hps-website/nss/2794/documents/1_2019-05-19.pdf) (accessed 10 December 2019)
- <sup>7</sup> NHS Inform. Pneumococcal vaccine for adults. [www.nhsinform.scot/healthy-living/immunisation/vaccines/pneumococcal-vaccine-for-adults](http://www.nhsinform.scot/healthy-living/immunisation/vaccines/pneumococcal-vaccine-for-adults) (accessed 10 December 2019)
- <sup>8</sup> Personal correspondence. Health Protection Scotland, 1 September 19.

---

<sup>9</sup> Scottish Government. Details of the shingles (Herpes Zoster) vaccination programme 2019/20. [www.healthscotland.scot/media/2693/immunisation-programmes-shingles-cmo-letter.pdf](http://www.healthscotland.scot/media/2693/immunisation-programmes-shingles-cmo-letter.pdf) (accessed 10 December 2019)

<sup>10</sup> Health Protection Scotland. Shingles. [www.hps.scot.nhs.uk/a-to-z-of-topics/shingles](http://www.hps.scot.nhs.uk/a-to-z-of-topics/shingles) (accessed 10 December 2019)

<sup>11</sup> Personal correspondence. Health Protection Scotland, 11 October 2019.

<sup>12</sup> Lau et al. Interventions to improve influenza and pneumococcal vaccination rates among community-dwelling adults: A systematic review and meta-analysis. *Annals of family medicine* 2012;10(6):538–546.

<sup>13</sup> Jacobson Vann et al. Patient reminder and recall interventions to improve immunization rates. *Cochrane Database of Systematic Reviews*; 2005.

<sup>14</sup> Thomas RE, Lorenzetti DL. Interventions to increase influenza vaccination rates of those 60 years and older living in the community. *Cochrane Database of Systematic Reviews*; 2010.

<sup>15</sup> UK Government. UK and international immunisation schedule comparison tools. [www.gov.uk/government/publications/uk-and-international-immunisation-schedules-comparison-tool](http://www.gov.uk/government/publications/uk-and-international-immunisation-schedules-comparison-tool) (accessed 10 December 2019)

<sup>16</sup> Thomas RE, Lorenzetti DL. Interventions to increase influenza vaccination rates of those 60 years and older living in the community. *Cochrane Database of Systematic Reviews*; 2018.

<sup>17</sup> Chun et al. Diffusion of pharmacy-based influenza vaccination over time in the United States. *American Journal of Public Health* 2016;106(6):1099–1100.

- 
- <sup>18</sup> Patel et al. The impact of pharmacy-based immunization services on the likelihood of immunization in the United States. *Journal of the American Pharmacists Association* 2018;58(5):505.
- <sup>19</sup> Buchan et al. Impact of pharmacist administration of influenza vaccines on uptake in Canada. *CMAJ* 2017;189(4):E146–E152.
- <sup>20</sup> Isenor et al. Evaluation of the impact of immunization policies, including the addition of pharmacists as immunizers, on influenza vaccination coverage in Nova Scotia, Canada: 2006 to 2016. *BMC Public Health* 2018;18(1):787.
- <sup>21</sup> Atkins et al. Seasonal influenza vaccination delivery through community pharmacists in England: Evaluation of the London pilot. *BMJ Open* 2016;6(2).
- <sup>22</sup> Marra et al. Pharmacy-based immunization in rural communities strategy (PhICS): A community cluster-randomized trial. *Canadian Pharmacists Journal* 2014;147(1):33–44.
- <sup>23</sup> Warner et al. Increasing seasonal influenza vaccination uptake using community pharmacies: experience from the Isle of Wight, England. *The International Journal of Pharmacy Practice* 2013;21(6):362–367.
- <sup>24</sup> Luder et al. An appointment-based model to systematically assess and administer vaccinations. *Journal of the American Pharmacists Association*, 2018. 58(3):290–295.
- <sup>25</sup> Jacobson Vann et al. Patient reminder and recall interventions to improve immunization rates. *Cochrane Database of Systematic Reviews*, 2018.
- <sup>26</sup> Regan et al. Randomized controlled trial of text message reminders for increasing influenza vaccination. *Annals of Family Medicine*, 2017;15(6):507–514.

---

<sup>27</sup> Yokum et al. Letters designed with behavioural science increase influenza vaccination in Medicare beneficiaries. *Nature human behaviour* 2018;2(10): 743–749.

<sup>28</sup> Klassig et al. Evaluation of pharmacist-initiated interventions on vaccination rates in patients with asthma or COPD. *Journal of Community Health* 2018; 43(2):297–303.

<sup>29</sup> Hurley et al. Centralized vaccine reminder/recall to improve adult vaccination rates at an urban safety net health system. *American Journal of Preventive Medicine* 2017;32(2):231–239.

<sup>30</sup> Teeter et al. Factors associated with herpes zoster vaccination status and acceptance of vaccine recommendation in community pharmacies. *Vaccine* 2014;32(43):5749–5754.

<sup>31</sup> Brown et al. Development and evaluation of a patient education video promoting pneumococcal vaccination. *Patient Education and Counselling* 2017;100(5):1024–1027.

<sup>32</sup> Chan et al. A nurse-delivered brief health education intervention to improve pneumococcal vaccination rate among older patients with chronic diseases: A cluster randomized controlled trial. *International journal of Nursing Studies*, 2015;52(1):317–324.

<sup>33</sup> Pizzi et al. Knowledge, activation, and costs of the Pharmacists' Pneumonia Prevention Program (PPPP): A Novel Senior Center Model to Promote Vaccination. *Annals of Pharmacotherapy* 2018;52(5):446–453.

<sup>34</sup> Sixsmith J, Fox K-A, Doyle P, Barry MM. A literature review on health communication campaign evaluation with regard to the prevention and control of communicable diseases in Europe. Stockholm: ECDC; 2014.

- 
- <sup>35</sup> Luthi J-C et al. Evaluation of a population-based prevention program against influenza among Swiss elderly people. *Swiss Medical Weekly* 2002;1:592–597.
- <sup>36</sup> MacDonald et al. Promotional communications for influenza vaccination: A systematic review, *Journal of Health Communication: International Perspectives* 2013;18(12):1523–1549.
- <sup>37</sup> Jones and Hopkins. Improving shingles vaccination uptake. Working with VAMT; 2019.  
[www.wales.nhs.uk/sitesplus/documents/888/1st%20prize%20Shingles%20Uptake%20Working%20With%20VAMT%20%282019%29.pdf](http://www.wales.nhs.uk/sitesplus/documents/888/1st%20prize%20Shingles%20Uptake%20Working%20With%20VAMT%20%282019%29.pdf)  
(accessed 10 December 2019)
- <sup>38</sup> Berkhout et al. Randomized controlled trial on promoting influenza vaccination in general practice waiting rooms. *PLoS One* 2018;13(2).
- <sup>39</sup> Wang et al. Effect of pharmacist intervention on herpes zoster vaccination in community pharmacies. *Journal of the American Pharmacists Association* 2013;53(1):46.
- <sup>40</sup> KBO-PCOB. Vaccination program for senior citizens. Description of an intervention delivered in the Netherlands, 2015-2017.  
[https://ec.europa.eu/health/sites/health/files/ngo\\_award/doc/summary\\_report\\_kbo-pcob\\_en.pdf](https://ec.europa.eu/health/sites/health/files/ngo_award/doc/summary_report_kbo-pcob_en.pdf) (accessed 10 December 2019)
- <sup>41</sup> Betsch et al. The Vaccination60+ trial.  
<http://apps.who.int/trialsearch/Trial2.aspx?TrialID=DRKS00012653> (accessed 10 December 2019)
- <sup>42</sup> Betsch et al. Increasing influenza and pneumococcal vaccine uptake in the elderly: study protocol for the multi-methods prospective intervention study Vaccination60+. *BMC Public Health*, 2018;18:885.

- 
- <sup>43</sup> Chaudhry et al. Improving rates of herpes zoster vaccination with a clinical decision support system in a primary care practice. *Journal of evaluation in clinical practice* 2013;19(2):263–266.
- <sup>44</sup> Otsuka et al. Improving herpes zoster vaccination rates through use of a clinical pharmacist and a personal health record. *American Journal of Medicine* 2013;126(9).
- <sup>45</sup> European Centre for Disease Prevention and Control. Review of scientific literature on drivers and barriers of seasonal influenza vaccination coverage in the EU/EEA. Stockholm: ECDC;2013.
- <sup>46</sup> Siriwardena et al. Cluster randomised controlled trial of an educational outreach visit to improve influenza and pneumococcal immunisation rates in primary care. *British Journal of General Practice* 2002;52(482):735–740.
- <sup>47</sup> Westrick et al. Impact of the RxVaccinate program for pharmacy-based pneumococcal immunization: A cluster-randomized controlled trial. *Journal of the American Pharmacists Association* 2016;56(1):29.
- <sup>48</sup> O'Donnell et al. Improving herpes zoster vaccination rates: The impact of a target educational program. *Journal of the American Association of Nurse Practitioners* 2018; 30:435–440.
- <sup>49</sup> Wright et al. Improving vaccination rates in older adults: A quality improvement project. *The Nurse Practitioner* 2019;44(4):40–49.
- <sup>50</sup> Peterson et al. The power of involving house staff in quality improvement: An interdisciplinary house staff-driven vaccination initiative. *American Journal of Medical Quality* 2015;30(4):323–327.
- <sup>51</sup> Caffrey et al. A pharmacist-driven academic detailing program to increase adult pneumococcal vaccination. *Journal of American Pharmacists Association* 2018;58(3):303–310.

---

<sup>52</sup> Nowalk et al. Success of the 4 pillars toolkit for influenza and pneumococcal vaccination in adults. *Journal for Healthcare Quality* 2014;36(6):5–15.

<sup>53</sup> Zimmerman et al. Using the 4 pillars practice transformation program to increase pneumococcal immunizations for older adults: A cluster-randomized trial. *Journal of the American Geriatrics Society* 2017;65(1):114–122.

<sup>54</sup> National Institute for Health and Care Excellence (NICE). Flu vaccination: increasing uptake. [www.nice.org.uk/guidance/ng103/resources/flu-vaccination-increasing-uptake-pdf-66141536272837](http://www.nice.org.uk/guidance/ng103/resources/flu-vaccination-increasing-uptake-pdf-66141536272837) (accessed 10 December 2019)

<sup>55</sup> HM Government. Carers (Scotland) Act UK. [www.legislation.gov.uk/asp/2016/9/contents](http://www.legislation.gov.uk/asp/2016/9/contents) (accessed 10 December 2019)

<sup>56</sup> Bishop R et al. Exploring public views of the vaccination service delivery; 2019. [www.healthscotland.scot/media/2492/exploring-public-views-of-vaccination-service-delivery.pdf](http://www.healthscotland.scot/media/2492/exploring-public-views-of-vaccination-service-delivery.pdf) (accessed 10 December 2019)



