

Perceived Needs and Barriers to Adult Pneumococcal Vaccination Among Primary Care Providers

Andrew W. Urban, MD,¹ Heidi K. Moore, PhD,² Chris Larrison,³ Sheila Robertson, MPH, CHCP,⁴ Marianna B. Shershneva, MD, PhD^{1,4}
 1 University of Wisconsin School of Medicine and Public Health, Madison, Wisconsin, USA; 2 Achieve3000, Madison, Wisconsin, USA; 3 Healthcare Performance Consulting, Inc, Zionsville, Indiana, USA; 4 Forefront Collaborative, Carmel, Indiana, USA

ABSTRACT

Background: Dissemination of needs assessment findings advances the evidence base that informs educational research and practices. This needs assessment study explored perceptions and factors influencing clinicians' behavior around pneumococcal vaccination.

Methods: This study utilized interviews with 32 primary care physicians (PCPs) and other clinicians, and an online survey answered by 97 PCPs, and 54 physician assistants (PAs) and nurse practitioners (NPs). Data collection focused on competencies, current practice, and barriers to improvement relative to adult pneumococcal vaccination. Qualitative analysis of the interview notes was followed by statistical analysis of survey responses, including PCPs versus PAs/NPs comparisons. The study was conducted in July 1, 2011 through January 31, 2012.

Results: Reported challenges included unfamiliarity with guidelines, providing vaccine during acute care visits, lack of reliable vaccination records, limitations of electronic medical records, and patient resistance. Analysis of competencies indicated multiple gaps, with the greatest gaps for implementing systems to remind about vaccinations, documenting vaccination plans, and using immunization registries. No significant differences were found between PCPs and PAs/NPs.

Conclusion: Continuing education and healthcare system changes are needed to improve pneumococcal disease prevention in primary care.

INTRODUCTION

Analysis of the gap between desired and current clinical practice and identifying areas for improvement in professional knowledge, skills, and behavior are integral parts of continuous planning and assessment in systematic continuing education [1]. Similar to publishing evaluation reports [2], dissemination of needs assessment findings advances the evidence base that informs educational research and practices. In particular, it facilitates sharing new methods and tools that complement traditional approaches [3] and provides education planners and other stakeholders with data they can utilize in developing educational and quality improvement interventions.

Consistent with this perspective, this article presents the results of a needs assessment study in a clinical area of pneumococcal vaccination in adults.

The burden of human infectious disease caused by the bacteria *Streptococcus pneumoniae*, also known as pneumococcus, remains great despite an understanding of the risk factors for pneumococcal infection and preventive strategies to decrease risk. Pneumococcus is a major cause of respiratory tract infections in all age groups. Invasive pneumococcal disease (IPD), represents the most severe infections characterized by the isolation of *S. pneumoniae* from normally sterile body sites, as in bacteremia or meningitis. Strategies to prevent IPD have focused

on smoking cessation and immunization for at-risk populations. Pneumococcal vaccination was first recommended by the Centers for Disease Control and Prevention (CDC) Advisory Committee on Immunization Practices (ACIP) in 1978, and since 1997 the ACIP has recommended the 23-valent pneumococcal polysaccharide vaccine for adults with certain risk factors [4]. In 2008, asthma and cigarette smoking were added as risk factors that warrant pneumococcal vaccination [5]. In 2012, the ACIP recommended the use of a 13-valent pneumococcal conjugate vaccine in certain high risk adults, and expanded the recommendation in 2014 to include all adults 65 years of age and older [6].

Authoritative clinical practice guidelines on the management of community-acquired pneumonia [7] recognize the importance of pneumococcal vaccination in preventing IPD. Despite such endorsement, rates of pneumococcal vaccination fall short of established goals. Based on data from the 2013 National Health Interview Survey, the rate of pneumococcal vaccination in noninstitutionalized adults 65 years of age and older was 59.7%, far below the Healthy People 2020 target of 90% [8]. Younger adults fared even worse, with a vaccination rate of 21.2% for noninstitutionalized high-risk adults 19 to 64 years of age compared to the target of 60% [8]. A recent comprehensive report outlined many complex factors that contribute to the gaps between actual and target adult immunization rates [9]. It is clear that barriers to successful adult vaccination exist on many levels, including healthcare providers, healthcare delivery systems, and patients. However, patient surveys have indicated that a recommendation from their healthcare provider to receive immunizations remains one of the most powerful influences on their decision [10,11].

Since primary care providers manage preventive health services for adults, a rigorous examination of the competencies and barriers surrounding adult immunization, as seen through the eyes of these providers, is essential for designing strategies best suited to effectively close the gaps in care. Our study sought to develop a better understanding of the practice gaps pertaining to pneumococcal vaccination. The ultimate goal was to establish a data-driven foundation from which impactful educational interventions could be planned to close practice gaps on pneumococcal immunization.

METHODS

We designed a mixed methods study to explore the factors associated with adult pneumococcal vaccination in primary care settings. The study was focused on family medicine (FM) physicians, internal medicine (IM) physicians, nurse practitioners

(NPs), nurses, and physician assistants (PAs). Qualitative and quantitative data were collected using in-depth interviews, a focus group, and an online survey. This study was performed in July 1, 2011 through January 31, 2012, prior to the ACIP recommendations for pneumococcal conjugate vaccine use in adults.

Recruitment

Clinicians were recruited for interviews via e-mail invitation from lists of past participants of medical education activities. Participants were offered a \$200-\$250 honorarium (based on their specialty) for the one-hour interview. Focus group participants were drawn from the project team contacts and offered an honorarium of \$500 for participation in the two-hour session. Both the interviews and the focus group were convenience samples. The survey was distributed to 169 prequalified and validated members of the target audiences.

Telephone Interviews

In-depth interviews were conducted to identify the obstacles associated with pneumococcal disease prevention. Respondents were asked to describe recent practice changes in this area, the reasons for making those changes, and any barriers that might have impeded the ability to make changes. Questions also explored clinician attitudes toward patient-related and practice management issues that impact decision making in this area.

Interview notes were organized in a spreadsheet, with each row representing a topic area (eg, "concerns about patient resistance," "process for administering"), and each column dedicated to a participant. Themes were derived from the data and presented to clinical experts for interpretation. The data were combined with clinical practice guidelines, current literature, and expert opinion to develop a series of clinical competencies and a list of barriers (Table 1) needed to successfully manage pneumococcal disease prevention, which were incorporated in the survey.

Focus Group

A two-hour focus group with IM and FM physicians was conducted to obtain additional input. Facilitators engaged participants in a discussion of the themes that emerged from the interviews regarding needs, barriers, and gaps in care. Notes from the focus group were summarized for clinical and education expert review that resulted in refined survey questions.

Online Survey

After demographics questions, respondents were asked to indicate their desired and present levels of ability (on a five-point scale from 1=low to 5=high) for each of the competency statements. When responses were analyzed, the difference between ratings for present and desired levels of ability was interpreted as a perceived need or a gap. Based on one author's (CL) extensive experience with use of this competency assessment approach in multiple clinical areas, a gap of 0.5 was presumed to be important, and gaps of 1.0-2.0 were considered ideal for motivating clinicians to change some aspect of their practice.

The survey also included barrier statements relative to achieving vaccination goals. Respondents rated the extent to which each was perceived as a barrier (on a scale from 1=low to 5=high). They were also shown a list of complicating factors (eg, pregnancy) and asked whether each factor would decrease, increase, or have no effect on the likelihood of vaccine administration.

A section of the survey was designed for clinicians to report their agreement (on a scale from 1=low to 5=high) with statements relative to satisfaction with current practices and the need for change. Other survey questions were related to knowledge and clinical practice patterns.

Statistical analyses were conducted on scaled data and quantified categorical data using IBM SPSS Statistics Version 21. Analyses included descriptive statistics and examination of mean differences on selected questions for clinician groups—PCPs versus

Table 1. Perceived Needs (Gaps) reported by Primary Care Clinicians in Respect to Pneumococcal Disease Prevention Competencies.

Competency Statement	Clinician Group	Level of Ability*		Desired Level of Ability*		Perceived Need (Gap)	
		Mean	SD	Mean	SD	Mean	SD
Utilize all clinical encounters to promote pneumococcal prevention including vaccination and smoking cessation	PCP	3.93	0.99	4.57	0.72	0.64	0.81
	PA/NP	3.54	1.02	4.43	0.88	0.89	1.02
Administer pneumococcal vaccine at each clinical encounter unless true contraindications exist	PCP	3.76	1.15	4.39	1.03	0.63	0.81
	PA/NP	3.41	1.14	4.31	1.01	0.91	1.09
Educate patients on the importance of pneumococcal immunization, the recommended schedule, and the need to maintain a personal record of immunization	PCP	3.69	1.11	4.44	0.94	0.75	0.89
	PA/NP	3.61	0.96	4.46	0.79	0.85	1.05
Document reasons for not administering the pneumococcal vaccine when clinically indicated	PCP	3.69	1.21	4.34	1.01	0.65	0.97
	PA/NP	3.56	1.21	4.37	0.94	0.81	1.15
Implement systems to remind patients and providers when the vaccine is due and recall patients who are overdue	PCP	3.18	1.28	4.39	0.94	1.22	1.14
	PA/NP	2.93	1.29	4.33	1.08	1.41	1.46
Document the future plan for administering the pneumococcal vaccine	PCP	3.22	1.20	4.20	1.09	0.98	1.11
	PA/NP	3.35	1.14	4.41	0.98	1.06	1.31
Report the pneumococcal immunization to immunization registries	PCP	2.69	1.42	3.79	1.36	1.10	1.31
	PA/NP	3.04	1.27	4.20	1.17	1.17	1.31

*on a scale from 1=low to 5=high

**PCP=Primary Care Physicians (n=97)

***PA/NP=Primary Care Physician Assistants/Nurse Practitioners (n=54)

primary care NPs and PAs, and clinicians who used electronic medical records (EMRs) versus clinicians who used paper records. The first comparison was done using one way analysis of variance (ANOVA) to compare mean competency gaps, attitudes toward change, and barriers by group (PCPs versus PAs and NPs). The second comparison was done using two-tailed independent samples t-tests. The significance level was set at $P = .05$.

RESULTS

Study Participants

A total of 28 clinicians participated in interviews including physicians, PAs, NPs, and nurses from FM practices (n = 13) and IM practices (n = 11); pharmacists (n = 2); and infectious disease specialists (n = 2). The focus group consisted of two IM and two FM physicians. There was diversity among the participants, including geographic

location, practice type, and practice setting. Pneumococcal vaccine coverage rates estimated by interviewees ranged from 10% to 95% for different patient populations.

The survey response rate was 89%, and it took on average 12.2 minutes to complete. There were 151 completed, valid surveys with respondents representing PCPs, including general IM physicians (n = 51), FM physicians (n = 46), and primary care PAs/NPs (n = 54). Ninety-four percent of PCPs and 82% of PAs/NPs reported administering the pneumococcal vaccine in their offices. Most respondents (84%) practiced in urban or suburban settings and those in rural settings (16%) tended to be FM physicians and PAs/NPs. Practice types were single-specialty groups (46% of respondents), multispecialty groups (22%), solo practices (15%), hospital-based (11%), and other (6%). Most respondents (78%) reported the number of patients seen per week to be 50-100 or 101-150. More than half (58%)

used EMR, while 30% used paper records. Twelve percent reported using both types.

Major Findings from Interviews and Focus Group

Five themes relevant to practice challenges and perceived needs in respect to pneumococcal disease prevention emerged from the interviews: (1) unfamiliarity with guideline recommendations, (2) struggling to provide the pneumococcal vaccine during acute care visits, (3) limitations of EMR immunization reminder capabilities, (4) lack of reliable records of previous vaccines, and (5) unfamiliarity with vaccine effectiveness. The focus group participants confirmed these themes and elaborated on the underlying issues (Table 2).

Survey Results

Knowledge. A series of five clinical vignettes explored questions of pneumococcal vaccination indication, revaccination, and use

Table 2. Clinician Reflections on Challenges Related to Pneumococcal Disease Prevention.

Themes from Interviews (28 participants)	Issues Identified during Focus Group (4 participants)
Unfamiliarity with guideline recommendations on both initial and revaccination schedules for pneumococcal vaccination	<ul style="list-style-type: none"> • Identification of populations appropriate for the vaccine • Lack of knowledge on revaccination • Lack of knowledge on special situations (eg, patient feels ill, pregnancy). • Updates in vaccine schedules are perceived to be disseminated through various sources
Struggling to provide the pneumococcal vaccine on sick visits	<ul style="list-style-type: none"> • Lack of time during sick visits
Electronic medical records were mentioned as being only mildly helpful in reminding clinicians of the need for vaccination	<ul style="list-style-type: none"> • Ineffectiveness of the electronic medical records in identifying patients less than 65 years old where the vaccine is indicated • Paper charts lack a trigger for a reminder when vaccines are due
Lack of reliable records of previous vaccines	<ul style="list-style-type: none"> • Patient confusion on previous vaccination and lack of access to previous records • State registries lack information for adults
Unfamiliarity with vaccine effectiveness	<ul style="list-style-type: none"> • Lack of knowledge on effectiveness of the pneumococcal vaccine

in pregnancy. Figure 1 shows the percentage of correct responses by clinician group. Overall, respondents scored lower on questions dealing with revaccination issues and better on issues dealing with primary indications for the pneumococcal vaccine.

Competencies and Perceived Needs. Clinical competency statements are shown in Table 1. Both groups of respondents rated their desired level of ability high for

each competency, except for “Report the pneumococcal immunization to immunization registries,” which was rated by PCPs on average below 4.

Perceived needs indicated important gaps for all seven competencies (all > 0.5). Three gaps were in the ideal range for motivating change (1.0 - 2.0). The area of highest perceived need was “Implement systems to remind patients and providers when

vaccinations are due and recall patients who are overdue.” Two other competencies that were in the ideal range for motivating change were “Document the future plan for administering the pneumococcal vaccine” and “Report the pneumococcal immunization to immunization registries.” Comparisons of PCP gaps with corresponding PA/NP gaps did not reveal statistically significant differences.

Barriers and Complicating Factors.

Perceived barriers to best practices in pneumococcal disease prevention varied for individual clinicians. However, on average, PCPs and PAs/NPs gave four barrier statements the highest ratings: “Patients resist tobacco cessation efforts,” “Patient visits for acute care do not provide adequate opportunities for preventive care,” “Patients feel that pneumococcal immunization is not necessary,” and “It is difficult to obtain accurate vaccination records for patients” (Table 3). We found no significant differences between PCPs and PAs/NPs in their responses about barriers.

Another survey question listed five factors that may influence a decision to administer the pneumococcal vaccine. Based on PCP and PA/NP combined responses, the average response distribution was fairly even between “decreases the likelihood of vaccine administration” and “no effect” for two factors: “Patient states an allergy to eggs” and “Patient states an allergy or concern about

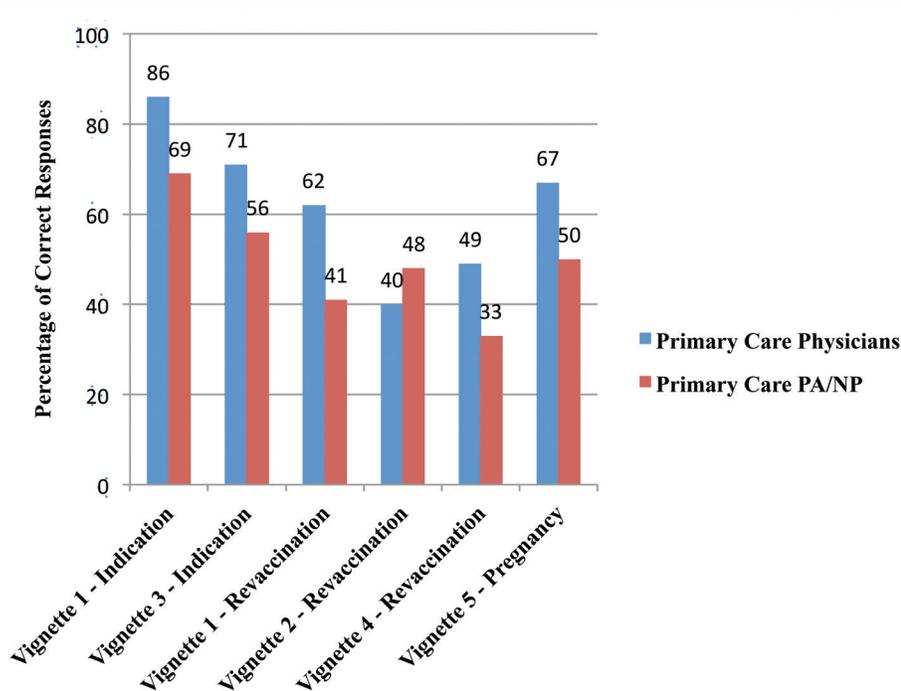


Figure 1. Percentage of correct responses by clinician group.

thimerosal.” Sixty percent of respondents reported that “Patient feels ill” and “Patient believes they are up-to-date but there is no verification” would “decrease the likelihood of administration.” Distribution of average responses for “Patient is pregnant” was: 55%—“decrease of the likelihood of administration,” 40%—“no effect,” and 5%—“increase the likelihood of administration.”

Systems of Records, Registries, and Reminders. A series of survey questions explored systems of records, registries, and reminders. Eighty-five percent of PCPs reported that they determine a specific patient’s immunization status, and those with EMRs reported a higher ability. However, only 65% of PAs/NPs reported this ability. Less than half of clinicians in both groups indicated the ability to “identify (or produce a list of) all patients in your practice panel for whom the pneumococcal vaccine is indicated,” and there was no statistical difference in the responses between those practices with EMRs and those with paper records. Less than half of the respondents indicated an awareness of a state registry system and a high number in each group indicated they did not know if their state had an immunization registry. Of the respondents who indicated an awareness of their state registry, less than half reported using the registry system for the pneumococcal vaccine.

Respondents perceived themselves ineffective in reminding patients when they were due for the pneumococcal vaccine. On a scale from 1=not effective to 5=very effective, the average response was 3.4. Similarly, respondents perceived themselves as being ineffective in bringing patients back for revaccination if the vaccine was given prior to age 65 (the average response was 3.1). Statistical analysis showed no significant differences on these two questions between respondents using only EMRs and those using only paper records.

Professional Development. The majority of clinicians surveyed in each group did

Table 3. Barriers to Pneumococcal Disease Prevention Reported by Primary Care Clinicians.

Barrier Statement	Clinician Group*	Mean**	Standard Deviation
Patient visits for acute care do not provide adequate opportunities for preventive care	PCP	3.36	1.17
	PA/NP	3.35	1.01
Patients resist tobacco cessation efforts	PCP	3.80	0.96
	PA/NP	3.67	0.80
The cost of the pneumococcal vaccine to patients	PCP	2.61	1.21
	PA/NP	2.74	1.10
Physician reimbursement for the vaccine is not commensurate with the effort	PCP	2.52	1.31
	PA/NP	2.70	1.24
Patients feel that pneumococcal immunization is unnecessary	PCP	3.03	1.05
	PA/NP	3.00	0.97
Patient resistance to the pneumococcal vaccine due to side effects	PCP	2.45	0.95
	PA/NP	2.39	0.86
It is difficult to decide which patients are in need of the pneumococcal vaccine	PCP	1.80	0.95
	PA/NP	2.02	1.00
I have no system in place to remind me about pneumococcal immunization	PCP	2.41	1.13
	PA/NP	2.74	1.31
It is difficult to obtain accurate vaccination records for patients	PCP	3.15	1.14
	PA/NP	3.15	1.17

*PCP= Primary Care Physicians (n=97); PA/NP=Primary Care Physician Assistants/Nurse Practitioners (n=54)

**On a scale from 1=low barrier to 5=high barrier

not have a system in place to keep up-to-date regarding changes in pneumococcal immunization practices. Aligned with this, none of the clinician groups indicated being effective in keeping up-to-date with changes in pneumococcal immunization practices.

Attitude Toward Change. There was no statistically significant difference between PCP and PA/NP responses relative to satisfaction with current practices and the need for change. On a scale from 1=low level of agreement with the statement to 5=high level of agreement, the average responses for the two groups together demonstrated the highest rating for satisfaction with current practice (3.92), followed by acknowledgment of a possibility to examine one or more of the respondent’s clinical practices in this area (3.07). The lowest rating was for having a plan to change practices in this area (2.85).

DISCUSSION

Our study utilized mixed research methods to examine primary care clinicians’ perceptions and behaviors related to the use of pneumococcal vaccination in adult patients. Three broad themes emerged from our study: (1) the existence of knowledge and competency gaps regarding specific pneumococcal vaccine recommendations, (2) the need for healthcare delivery system changes to enhance the ability of clinicians to administer pneumococcal vaccine to adults, and (3) ambiguity in clinician attitudes toward practice improvement in this clinical area.

We found that clinicians lacked familiarity with aspects of the CDC/ACIP recommendations for pneumococcal polysaccharide vaccine use in adults [5], especially in the area of revaccination. Furthermore,

when complicating factors were presented, such as pregnancy or concerns about preservatives or egg allergy, there was uncertainty around whether or not to vaccinate. Importantly, the majority of surveyed clinicians did not have a system in place to stay up-to-date with pneumococcal vaccination recommendations. Although a limitation of our study is that the survey questions only applied to the pneumococcal polysaccharide vaccine, we would expect our findings to be even more relevant in the context of current CDC/ACIP recommendations, which integrate a second pneumococcal vaccine (the 13-valent conjugate vaccine) into adult practice and expand the immunization schedule to include all adults aged 65 years or older [6]. We would expect the updated recommendations to create an additional gap in knowledge and barriers to implementation in practice due to complexity of timing and sequencing of the two adult pneumococcal vaccinations. Thus, consistent with previous studies [11,12], our findings support the need for education addressing different fundamental elements of vaccine recommendation and administration.

We heard in the focus group that clinicians tended to lump the influenza and pneumococcal vaccinations together because of the commonality of respiratory tract disease caused by these two pathogens. Because so much effort is directed towards influenza vaccination campaigns in the fall, we agree with other researchers [12] that dovetailing a discussion of adult pneumococcal vaccination recommendations onto the highly visible and successful patient and clinician oriented influenza vaccination efforts could prove successful.

While knowledge and competency gaps provide ample opportunities for educational interventions, previous research [13] and our study confirmed major systems issues that must be addressed in order to increase vaccination rates. Although EMR systems have potential to be excellent resources for vaccine reminders and repositories of accurate records, we learned that

room for improvement exists. For example, there was no difference between clinicians using EMRs and those using paper records in their ability to identify all patients in a given practice for whom the pneumococcal vaccine was recommended. Optimizing the functionality of EMR to retrieve data at the individual patient level and practice level could allow EMR to be leveraged to help clinicians meet vaccination targets. Using EMR to generate alerts and highly visible immunization status reports have been shown to be effective strategies for improving influenza and pneumococcal vaccination rates in adults [14,15].

Our study also discovered underutilization of state immunization registries for adult immunizations. Such registries are beneficial not only in assessing vaccine utilization trends at the population level, but they can also be very helpful at the point of care in providing an immunization history for an individual patient [16]. Linking registries with EMR has emerged as a component of helping providers achieve meaningful use criteria of certified EMR platforms [17], and this may encourage more providers and healthcare systems to participate.

An important systems barrier identified by our study was the underutilization of acute care visits as opportunities for reviewing vaccinations. One possible solution well supported in the literature [18,19] is the adoption of standing orders for vaccine administration by another member of the healthcare team. This intervention is one of the most impactful for increasing vaccination rates, and would allow acute care visits to transition from a missed opportunity to an effective implementation strategy.

Finally, our study indicated that clinicians' desire for optimizing patient outcomes was a motivating factor for improving their clinical practices. However, a relatively high satisfaction level with current practices stands in contradiction to suboptimal rates of pneumococcal vaccine delivery reported in the literature as well as practice patterns and competency gaps reported by clinicians

in our study. Educating clinicians on the importance of achieving a higher standard of practice for pneumococcal vaccination is important. Showing clinicians data regarding their performance, and emphasizing the connection between their behavior and improved patient outcomes are recommended strategies to make such education more impactful [20].

To conclude, this study focused on one vaccine preventable disease and strived to understand the factors influencing clinician perceptions and behavior in the context of the contemporary healthcare practice environment. We used a competency-based framework to guide the inquiry, which increases applicability of the study findings to competency-based continuing professional development. Our results support the development of strategic educational and organizational interventions to address the competence and practice gaps that impede the administration of pneumococcal vaccination to at-risk adults. Such interventions could be part of a systematic, targeted approach to help decrease the burden of pneumococcal disease in adults.

DISCLOSURES

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