ABSTRACT

OBJECTIVE: To evaluate collaborative efforts and intervention strategies by peer-review organizations (PROs) and long-term-care facilities (LTCFs) for improving pneumococcal vaccination rates among residents of LTCFs.

SETTING: Prospective, before-after quality improvement project.

PATIENTS: All residents of participating LTCFs.

METHODS: Baseline pneumococcal vaccination rates were determined by medical-record review, self-reporting by patient or family members, and review of Medicare claims information. Remaesurement of vaccination rates was accomplished from documentation of vaccination of eligible residents by each LTCF.

RESULTS: 133 LTCFs with 7,623 residents from Alaska, Idaho, Montana, and Wyoming participated in this quality-improvement project. This accounted for 41% (133/321) of the potential nursing homes and resident population in the participating states. Baseline overall vaccination rates were 40% (3,050/7,589).

CONCLUSIONS: Simple and straightforward vaccination strategies implemented in LTCFs over a short period of time can have a significant impact on vaccination rates. Collaborative efforts between state PROs and LTCFs enhance implementation of these strategies and can result in the achievement of national vaccination objectives. Standing orders appear to be one intervention effective in sustaining successful vaccination efforts. Regardless of the specific interventions employed, PROs played a significant role in facilitating vaccination program development and intervention implementation (Infect Control Hosp Epidemiol 2000;21:705-710).

Streptococcus pneumoniae (pneumococcus) is a bacterial pathogen that causes pneumonia, invasive disease (bacteremia, meningitis), complicated local infections (empyema, endocarditis), and death. At highest risk are infants, the elderly, and persons with certain underlying medical conditions. It is the most common cause of pneumonia in long-term-care facilities (LTCFs). Several outbreaks of pneumococcal pneumonia among unvaccinated residents in LTCFs have been reported in recent years, including outbreaks due to multidrug-resistant organisms. Although evidence on the efficacy of pneumococcal vaccine in preventing pneumonia is inconclusive, the currently available vaccine has documented efficacy in preventing invasive pneumococcal disease in older persons.

The Advisory Committee on Immunization Practices (ACIP) recommends pneumococcal immunization for all persons aged >65 years, and others at increased risk for
The Healthy People 2000 goal is a pneumococcal vaccination rate of 60% for those 65 or older and 80% for those residing in LTCFs. Despite this, only 45.5% of all persons aged ≥65 years and less than one half of nursing home residents have been immunized against pneumococcal disease.

Despite the high risk of long-term-care residents and recent emphasis on improving their vaccination status, there are relatively few studies describing vaccination policies, practices, and strategies affecting these individuals. A recent study concluded that “many long-term-care facilities have inadequate policies and practices for ensuring their residents and employees immunity to important vaccine preventable diseases.” In hospitals, systems approaches that incorporate administrative and organizational strategies to promote convenient access to vaccination, rather than education of providers alone, appear to produce durable success. It is reasonable to assume similar success could be achieved in LTCFs. Furthermore, the ACIP recently has strongly recommended the use of standing orders in LTCFs as an effective intervention to improve vaccination rates.

METHODS

Each state PRO independently developed interventions for improving pneumococcal vaccination in LTCFs. There were, however, many common and shared features, which are summarized in Table 1.

<table>
<thead>
<tr>
<th>Feature</th>
<th>Alaska</th>
<th>Idaho</th>
<th>Montana</th>
<th>Wyoming</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mailing introductory information by PROs</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<td>On-site introductory information by PROs</td>
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<td>Physician direct mailings</td>
<td></td>
<td>X</td>
<td>X</td>
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<tr>
<td>Self-reporting of rates</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Medical-chart reviews for rates</td>
<td>X</td>
<td>X</td>
<td></td>
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<tr>
<td>Medicare claims for rate calculations</td>
<td>X</td>
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<tr>
<td>Standing orders mailed prior to vaccination project</td>
<td></td>
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<td>X</td>
<td>X</td>
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<tr>
<td>Standing orders mailed after vaccination project</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Checklist for data collection</td>
<td></td>
<td></td>
<td>X</td>
<td></td>
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<tr>
<td>Chart stickers with pre-printed physician orders</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Facilities administer vaccine</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
</tr>
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<td>Communication and support during project</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td>X</td>
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<tr>
<td>Remeasurement</td>
<td>X</td>
<td>X</td>
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<td>X</td>
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</table>

Abbreviation: PRO, peer-review organization.

pneumococcal disease. The Healthy People 2000 goal is a pneumococcal vaccination rate of 60% for those 65 or older and 80% for those residing in LTCFs. Despite this, only 45.5% of all persons aged ≥65 years and less than one half of nursing home residents have been immunized against pneumococcal disease.14,15

Despite the high risk of long-term-care residents and recent emphasis on improving their vaccination status, there are relatively few studies describing vaccination policies, practices, and strategies affecting these individuals. A recent study concluded that “many long-term-care facilities have inadequate policies and practices for ensuring their residents and employees immunity to important vaccine preventable diseases.” In hospitals, systems approaches that incorporate administrative and organizational strategies to promote convenient access to vaccination, rather than education of providers alone, appear to produce durable success. It is reasonable to assume similar success could be achieved in LTCFs. Furthermore, the ACIP recently has strongly recommended the use of standing orders in LTCFs as an effective intervention to improve vaccination rates.

The Social Security Act, Part B, as amended by the Peer Review Improvement Act of 1982, established the Utilization and Quality Control Peer Review Organization, or PRO program. The PRO program is charged with improving the quality of care for Medicare beneficiaries by assuring that their care meets professionally recognized standards. Each state has a physician-led quality-improvement organization (PRO) with Medicare contracts responsible for a multitude of quality-improvement efforts involving hospitals and other healthcare facilities. These efforts have led to the development of cooperative networks designed to improve the delivery of healthcare quality.

We describe successful collaborative efforts by PROs and LTCFs in four western states (Alaska, Idaho, Montana, and Wyoming) to increase pneumococcal vaccination rates significantly among LTCF residents. Furthermore, we discuss the vaccination strategies employed by each PRO that appear useful in enhancing vaccination rates among this high-risk population.

Recruitment

A packet containing information describing the project, publications about pneumococcal vaccine and disease, data collection tools, and an invitation to participate were generally provided by mail from the PROs to facilities in all states. A copy of a recently published article describing an outbreak of multidrug-resistant pneumococcal pneumonia and bacteremia in unvaccinated nursing home residents was typically included to emphasize the importance of the proposed vaccination program. Information was mailed to facilities by the PROs in Alaska, Idaho, and Montana between June and September 1998. Additionally, the same information regarding the project was provided by the PRO directly during on-site visits to facilities in Wyoming during September and October 1998. Participation in the project was voluntary in all cases but was accompanied by a signed memorandum of agreement between the PRO and LTCF to share confidential patient information.

Baseline Measurements

Facilities were generally responsible for measuring their own vaccination rates by obtaining self-reported information from patients or their families and from review of patient medical records. Medical-record review for baseline measurement was performed by PRO staff in Wyoming and by LTCF staff in other states. Some facilities requested PRO
assistance with chart review in Alaska. No charts from physician offices were reviewed. The vaccination status of all residents participating in Idaho and several patients in Alaska was also checked by review of claims information by the PRO for Medicare beneficiaries. Medicare claims information on selected patients in Alaska was reviewed by the PRO only at the request of some LTCFs. Baseline measurements were obtained between June and September 1998 for all states.

**Interventions**

Each facility was responsible for obtaining and administering vaccine. All facilities followed ACIP guidelines to determine eligibility for vaccination and were encouraged to vaccinate all eligible residents. Subsequent contacts by the PRO with the LTCFs were made by letter or telephone to encourage continued participation and compliance. Vaccinations were administered during October and November 1998, with the majority of vaccinations administered during October 1998.

A schedule for August through October 1998 was developed in all facilities in Alaska, with the assistance of the PRO, for conducting initial review of vaccination status, completing a vaccination program, and remeasuring vaccination status. The Alaska PRO tailored support to each facility based on its situation and needs. Support included education, introduction to a menu of potential interventions, medical-record reviews, and review of Medicare claims. Some LTCFs elected to send letters to attending physicians to encourage vaccination of their patients. No specific interventions, such as standing orders or chart stickers, were uniformly promoted by the PRO to all participating facilities.

Each participating facility in Idaho provided a complete list of residents to the PRO during August and September 1998. Their vaccination status was determined by abstraction of medical records, self-reporting, and review of claims information as outlined above. A chart sticker indicating the pneumococcal vaccination status was completed by the PRO and then placed on the physician’s order sheet in each patient’s medical record of every participating LTCF. The sticker included a pre-printed physician’s order to facilitate easy administration of the vaccine to eligible residents. Reasons for not immunizing particular patients were documented on the sticker in the medical record and reported back to the PRO automatically on the data copy of the sticker.

Each LTCF in Montana and Wyoming was requested to designate October 1998 as “Influenza and Pneumococcal Vaccination Month.” A letter regarding the usefulness of standing orders for pneumococcal vaccination, a standing-orders protocol requiring physician’s signature, and a guideline to assist LTCF personnel in gathering data were sent by the PRO to 652 Montana physicians whose names were provided by LTCFs as their attending physicians. Similar letters were sent directly to Wyoming attending physicians by respective LTCFs. These standing-orders protocols in Montana and Wyoming were signed by each attending physician and returned to the facility. Standing orders for vaccination were typically intended to be used at the time of resident admission and did not require a prior physician examination. Vaccine could be administered by a nurse or pharmacist based on the standing-order protocol.

**Remeasurement**

Facilities were responsible for measuring their own subsequent vaccination rates by recording patients who received vaccine as a consequence of this quality-improvement program. These data were forwarded to the respective state PROs, and a summary report outlining improvements in vaccination rates was returned to all participating facilities at the conclusion of the project. Montana and Wyoming facilities were queried at the time of remeasurement about the implementation of the standing orders previously provided to all physicians and facilities. Remeasurements were conducted during November and December 1998 for all four states.

Facilities in Idaho were provided in November 1998 with written sample standing-orders policies after completion of this initial phase of vaccinations. All participating facilities were encouraged to implement standing orders in order to sustain vaccination efforts. Unlike standing orders in Montana and Wyoming that focused on each physician returning a signed standing-order protocol, LTCFs in Idaho were encouraged to develop the facilitywide policy as part of general admission procedure. Remeasurement was performed again in November 1999 for all participating Idaho facilities, which were queried about the presence or absence of a standing-orders policy, about whether the policy was enforced, and about the vaccination status of all current residents.

**Data Analysis**

The data were entered into an Access database (Microsoft Corp, Redmond, WA) for analysis. Chi-squared analyses comparing baseline and remeasurement proportionate vaccination rates were performed using Epi Info (version 6.02; Centers for Disease Control and Prevention [CDC], Atlanta, GA).

**RESULTS**

Of 321 LTCFs in Alaska, Idaho, Montana, and Wyoming, 133 (41%) participated in this quality-improvement project. State-specific demographic and vaccination information is summarized in Table 2. The proportion of facilities in each state participating in the vaccination effort ranged from 16% to 77% (median, 27%). The total baseline vaccination rate was 40% (3,050/7,589), with a range of 26% to 53% (median, 41.5%) when stratified by state (Table 2).

The proportion of residents in all states reported to have a documented pneumococcal vaccination increased to 75% (5,720/7,623; range, 69%-84%; median, 74%) after the vaccination campaign. Overall, 2,670 unvaccinated residents received vaccine during an intervention period lasting only 2 to 3 months. There was a statistically significant increase in vaccination rates \( P < .001 \) for all states. The impact of the vaccination program may best be reflected in the change in
median vaccination rates for the facilities. The median facility vaccination rates equaled 85% or higher for three of the states after the intervention period (Table 2). This is in stark contrast to baseline measurements, which were generally below 50%. The number of facilities exceeding the Healthy People 2000 goal of an 80% vaccination rate increased from 18% (24/133; range, 0%-31%; median, 13.5%) to 62% (83/133; range, 33%-69%; median, 62%; P < .001).

Information on failures to vaccinate was available only in Idaho. A sticker was placed on the chart of every eligible resident with a pre-printed physician order to facilitate easy administration of the vaccine to eligible residents. Reasons for not providing the vaccination were documented on the sticker and reported back to the PRO. Two hundred two eligible LTCF residents (16%) were not vaccinated. Patient or family refusal accounted for 60% of these failed vaccination attempts, followed by 26% physician refusal. Allergies or unknown reasons accounted for the remainder.

Standing orders were distributed in Montana and Wyoming as part of the recruitment process. At the time of remeasurement, 56 (72%) of 78 of the participating Montana LTCFs had implemented standing orders. The reported pneumococcal vaccination rate in the 56 facilities with standing orders was 2,625 (83%) of 3,175, whereas the rate in the 22 facilities without standing orders was 711 (53%) of 1,334. This difference was statistically significant (P < .001). Two (33%) of six Wyoming facilities reported the presence of standing orders at baseline but stated that these were not consistently used. All 6 (100%) Wyoming facilities had implemented standing orders at the conclusion of the project.

Very few Idaho LTCFs had written policies or standing orders for pneumococcal vaccination at the beginning of this project. Twenty-nine of 89 facilities completed a questionnaire regarding pneumococcal vaccination policies prior to initiation of the vaccination campaign. Only 2 (7%) of 29 had a written policy concerning pneumococcal vaccination. It is unclear whether these included standing orders. An additional 2 (7%) of 29 stated they had no written policy but did have a standing order as part of their admission orders. At the conclusion of the vaccination campaign, a sample written policy with standing orders was sent to all LTCFs in Idaho with a recommendation that these orders be implemented immediately to sustain vaccination efforts as new residents were admitted.

In November 1999, 1 year after this initial vaccination project, the participating LTCFs in Idaho were queried about the presence of a written standing-orders policy, whether the policy was enforced, and the vaccination status of the current residents. Nineteen (86%) of the original participating facilities responded to repeat survey. Sixty-three percent (12/19) had written standing-orders policies that were being enforced. Eleven percent (2/19) had written policies, but they had not been executed. The remaining 26% (5/19) had no written standing orders. Remeasurement of vaccination rates demonstrated a sustained vaccination rate of 70% (606/871) in facilities enforcing a standing-orders policy compared with 54% (87/161) in those facilities with standing orders but no enforcement and 59% (112 of 191) in those without standing orders (P < .001 and P < .003). There was no difference between those facilities with written policies without enforcement and those without a standing-orders policy (P = .386).

Some additional information about documentation of baseline vaccination rates was obtained in Idaho. Of all of the documented baseline vaccination information, 47% (274/579) were obtained from review of the facility chart alone. Medicare claims data alone accounted for 27% (155/579) of the documented vaccinations with 7% (42/579) obtained from Medicare claims data and chart review combined. An additional 19% (108/579) were obtained from patients or their families reporting receipt of the vaccine. Medicare claims review was anticipated to document close to 100% of vaccinations given but captured only 34% of the residents with a documented baseline vaccination. This indicates a significant number of vaccinations given in LTCFs to Medicare beneficiaries are apparently not billed to Medicare.

### Table 2

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Alaska</th>
<th>Idaho</th>
<th>Montana</th>
<th>Wyoming</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Facilities</td>
<td>28 (26/93)</td>
<td>26 (23/89)</td>
<td>77 (78/101)</td>
<td>16 (6/38)</td>
<td>41 (133/321)</td>
</tr>
<tr>
<td>% Residents*</td>
<td>76 (1,099/1,455)</td>
<td>26 (1,274/6,583)</td>
<td>74 (5,671/7,714)</td>
<td>28 (882/3,131)</td>
<td>47 (8,926/18,883)</td>
</tr>
<tr>
<td>Baseline vaccination rate†</td>
<td>53 (584/1,099)</td>
<td>45 (579/1,274)</td>
<td>38 (1,702/4,491)</td>
<td>26 (185/725)</td>
<td>40 (3,050/7,589)</td>
</tr>
<tr>
<td>Final vaccination rate†</td>
<td>74 (813/1,104)</td>
<td>84 (1,064/1,274)</td>
<td>74 (3,336/4,509)</td>
<td>69 (507/736)</td>
<td>75 (5,720/7,623)</td>
</tr>
<tr>
<td>Median before/after§</td>
<td>51/96</td>
<td>47/86</td>
<td>36/85</td>
<td>30/75</td>
<td></td>
</tr>
<tr>
<td>Initial 80% vaccination rate¶</td>
<td>31 (8/26)</td>
<td>9 (2/23)</td>
<td>18 (14/78)</td>
<td>0 (0/6)</td>
<td>18 (24/133)</td>
</tr>
<tr>
<td>Final 80% vaccination rate¶</td>
<td>69 (18/26)</td>
<td>61 (14/23)</td>
<td>63 (49/76)</td>
<td>33 (2/6)</td>
<td>62 (83/133)</td>
</tr>
</tbody>
</table>

*This estimation is calculated from the number of licensed beds and not from actual census data.
†Vaccination rates expressed as percentages.
‡Percentage of facilities meeting 80% vaccination rate (Healthy People 2000 goal) before and after interventions.
§Median before/after interventions.
¶Vaccination rates before and after interventions.
Residents of LTCFs have been the target of pneumococcal vaccination programs promoted by the CDC and ACIP.1 The goal of Healthy People 2000 has been to vaccinate 80% of long-term-care residents with pneumococcal vaccine.13 In spite of these goals, vaccination rates for this high-risk population remain low. Strategies to enhance use of the polysaccharide vaccine have been recommended by the CDC, including age-based, organizational-based, community-based, and provider-based strategies. Residents of LTCFs should be readily available targets for vaccination if the individual facilities implement these basic strategies. We describe a successful collaborative effort by PROs and LTCFs in four western states to increase pneumococcal vaccination rates significantly among LTCF residents by applying these strategies.

Baseline vaccination rates in the participating LTCFs were similar to those reported nationally.15 Review of LTCF practices during baseline measurement indicated that effective vaccination strategies such as standing orders, if available, were being applied inconsistently. Collaboration with the PRO helped facilities to structure and organize their programs to implement effective strategies widely.

The strategies used were simple and straightforward and led to significant improvement within a short period of time. The interventions were performed during October and November 1998. This focused effort resulted in the vaccination of 2,670 LTCF residents from 133 facilities. The mean immunization rate for residents in these facilities increased from 40% at baseline to 75%, and 62% of participating facilities exceeded the Healthy People 2000 goal.13 The median facility vaccination rates were generally less than 50% at baseline but improved to 75% or more after the interventions. The major intervention in all facilities consisted of delivering information about the disease and the vaccine to LTCF staff, physicians, residents, and resident families. In addition, simple tools such as standing-order forms, data collection checklists, and chart stickers were provided to facilitate the vaccination process. Follow-up communications by the PROs during the intervention encouraged ongoing vaccinations, and the required final remeasurement completed the effort in most facilities. PROs played a significant role in facilitating vaccine program development and intervention implementation regardless of the specific interventions employed.

Two intervention tools appeared particularly successful in promoting this increase in pneumococcal vaccination in participating Idaho facilities. Stickers placed on the front of each patient’s chart indicating the need for vaccination and including a pre-printed physician order form resulted in 99.8% of those residents without contraindications or refusals being immunized. This intervention, however, required significant effort by the PRO to complete and disseminate stickers. The final overall vaccination rate achieved by this intervention was 84%.

Standing orders were provided at the beginning of the intervention to all Montana and Wyoming facilities. The vaccination rate among participating Montana facilities that reported use of standing orders was 2,625 (83%) of 3,175, or 1.57 times higher than the rate (711/1,334; 53%) among facilities that did not report use of standing orders. Letters describing standing orders were sent directly to 652 physicians in Montana by the PRO, with similar letters sent to Wyoming physicians by LTCFs. This communication probably did not increase the amount of time spent by individual physicians in the LTCF but probably improved the physician recognition of, and concurrence with, the standing-orders policy. In addition, the efforts to implement standing orders were primarily those of the individual LTCFs and not the PRO. The final overall vaccination rate achieved was 83% among facilities that implemented standing orders. Standing orders, an intervention requiring minimal effort by the PRO, achieved an overall vaccination rate comparable to that of chart stickers, an intervention requiring a much greater effort by the PRO.

The Task Force on Community Preventive Services recently reviewed 118 studies describing interventions designed to improve vaccination coverage in children, adolescents, and adults.21 Key findings of this review were that use of standing orders “improves vaccination coverage whether used alone or as a part of a multicomponent intervention and is effective in settings such as hospitals, clinics, and nursing homes.” Standing orders are strongly recommended for adults by the Task Force. Setia et al showed that education of physicians alone improved influenza vaccination rates in LTCFs by only 4%, whereas inclusion of standing admitting orders increased the vaccination rate from 33% to 95%.22 Citing the Task Force review21 and a similar review conducted for the Health Care Financing Administration (HCFA) by the Southern California Evidence-Based Practice Center-RAND,23 the ACIP recently recommended standing orders for vaccination programs in LTCFs and other healthcare settings.20 Other strongly recommended provider-based interventions are informing vaccine providers that individual clients are due (provider reminder) or overdue (provider recall) for specific vaccinations and retrospective evaluation and feedback to vaccination providers.21

One limitation of our study was the difficulty of reliably ascertaining the vaccination status of LTCF residents. Much of the information was self-reported, and the self-reports require an accurate recollection of vaccine administration by patients or their family members, often as far back as 5 years. Pneumococcal vaccine may be confused with the influenza vaccine by some patients. Chart reviews captured only about 50% of the vaccinated patients in Idaho and were very time consuming. The validity of vaccination rates and the outcomes of quality-improvement interventions could be greatly improved if HCFA or state regulatory agencies would require documentation of vaccination status in the Minimum Data Set upon admission of the resident. Vaccination registries for this population would likewise improve the reliability of vaccination histories.

Review of Medicare claims data for residents of Idaho LTCFs greatly underestimated the vaccination rate by identifying only 34% of the immunized patients. This
suggests that many LTCFs were not billing Medicare. HCFA recently improved the ease of billing by encouraging roster billing and no longer requiring a physician order for payment. These changes were implemented after completion of the PRO interventions described in this report. Future programs designed to increase vaccination rates should focus on reimbursement issues in addition to the other intervention strategies. These changes provide an additional incentive for LTCFs to promote vaccination efforts among their residents.

Analysis of the effectiveness of interventions was limited by several factors. Data were combined from individual states after the completion of their programs. The vaccination programs were developed independently by each state PRO with lack of interstate standardization of either data acquisition at baseline or approach to interventions. Conducted as quality-improvement projects, no state PRO attempted to randomize facilities or adjust for case mix of patients. Each facility served as its own historical control without attempts to monitor secular trends. The recruitment methods used could have resulted in selection bias. In spite of these limitations, the overall effectiveness of the vaccination programs implemented as a result of PRO collaboration appears quite significant.

There were 1,590,763 individuals ≥65 years of age who were residents of LTCFs in the United States in 1990. This number is estimated to grow to 2.9 million by 2020. In 1995 less than one half of LTCF residents were estimated to be vaccinated with pneumococcal vaccine. If all LTCFs nationally implemented the types of interventions described here, with the same success rate, a very large number of additional residents could be successfully vaccinated.

This substantial increase in vaccination rates among such a large population of susceptible individuals is likely, given recognized vaccine efficacy, to prevent a significant number of cases of pneumococcal bacteremia and death. Additionally, a recent study evaluating the cost-effectiveness of vaccination against pneumococcal bacteremia among individuals aged ≥65 years demonstrated that vaccination both reduced medical costs and improved health. It can be presumed that the vaccination of a large number of additional LTCF residents could result in significant cost savings with additional quality-adjusted years of life. The clinical and economic impact of successful pneumococcal vaccination programs on the LTCF population, such as those described in this article, will only increase as the size of this vulnerable population continues to grow.

REFERENCES