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INCREASING INFLUENZA AND PNEUMOCOCCAL VACCINATION AND TUBERCULOSIS SCREENING AMONG RESIDENTS OF COLORADO LONG-TERM CARE FACILITIES

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Persons residing in long-term care facilities are especially vulnerable to potentially preventable morbidity and mortality caused by influenza, S. pneumoniae, and tuberculosis. This project's objective was to increase the rates of pneumococcal vaccination, tuberculosis screening, and annual influenza vaccination. Intervention consisted of staff training videos, sample policies, and educational materials for residents and their families. At baseline during the 1995-1996 flu season, 84% of Colorado long-term care residents were vaccinated for influenza; 16% of residents had ever received pneumococcal vaccination; and 59% had been screened for tuberculosis. At remeasurement during 1997 to 1998, influenza vaccination rates were up to 89%, $p = 0.006$. *The percentage of residents who had ever received pneumococcal vaccination increased to 48% at remeasurement,* $p < 0.001$. *Tuberculosis screening rates increased to 83%,* $p < 0.001$. *Following an educational intervention targeting both residents and staff, residents were significantly more likely to receive all three preventive services.*

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The elderly are the fastest growing population in this society. Currently, 5% of persons older than age 65 and 20% of persons older than age 85 reside in long-term care facilities (Starer & Libow, 1992). The institutionalized elderly are especially vulnerable to the potentially preventable morbidity and mortality caused by influenza, *S. pneumoniae*, and tuberculosis (TB). Factors contributing to morbidity and mortality include advanced age, underlying medical conditions, and residence in a closed population (Centers for Disease Control [CDC], 1990; Nichol, Grimm, & Peterson, 1996; Starer & Libow, 1992; Zimmerman & Clover, 1995).

More than 80% of the annual 10,000 to 40,000 excess deaths due to influenza and 40,000 excess deaths due to pneumococcal disease occur among the elderly (Nichol, Grimm, et al., 1996). Excess hospitalization rates during influenza epidemics range from 150 to 172 admissions/100,000 persons among healthy elderly and 476 to 636 admissions/100,000 persons among elderly with underlying medical conditions (Bentley, 1992). Similarly, hospitalization rates for pneumococcal pneumonia and bacteremia among the elderly may be 130 to 393/100,000 persons (Fedson, 1992). In addition, individuals 65 and older account for 27% of the total U.S. tuberculosis morbidity, although this age group represents only 12% of the total U.S. population (CDC, 1990). Moreover, the TB incidence rate among elderly persons residing in long-term care facilities (39.2 cases/100,000) is higher than the rate among elderly persons residing in the community (21.5 cases/100,000) (CDC, 1990).

Premature deaths and morbidity from influenza and pneumococcal infections can be prevented by vaccination of high-risk individuals (Department of Health and Human Services [DHHS], 1994; Fiebach & Beckett, 1994; Govaert et al., 1994). A controlled trial among community-dwelling elderly persons in the Netherlands demonstrated that the incidence of serological or clinical influenza was halved by influenza vaccination (Govaert et al., 1994). Observational studies have shown the efficacy of influenza vaccine in preventing uncomplicated clinical illness to be relatively low (28% to 37%), but substantial efficacy in reducing complications including hospitalization (47%), pneumonia (58%), and death (76%) has been reported (DHHS, 1994). Similar evidence for the efficacy of pneumococcal vaccine is more

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limited, but case-control studies support an estimated efficacy of 56% to 80% (Fedson, 1992; Hirschmann & Lipsky, 1994).

It has been demonstrated that the cost of influenza vaccination for Medicare recipients ($145 per year of life gained) is well below the cost of other preventive interventions currently recommended (Fiebach & Beckett, 1994). The Office of Technology Assessment (OTA) performed cost-effectiveness studies and concluded that the influenza vaccination of older persons saved medical care costs and improved health (Bentley, 1992). Decision-analysis modeling suggests that optimizing vaccination programs in nursing homes could prevent 70,000 cases of influenza in a typical epidemic and save $15 million in direct costs (Bentley, 1992). A recently reported study from a large health maintenance organization noted that influenza vaccination was associated with a 17% reduction in pneumonia and influenza outpatient visits, a 6.4% reduction in outpatient visits for all respiratory conditions, a 51.2% reduction in pneumonia and influenza hospitalizations, a 30.7% reduction in hospitalization costs for all respiratory conditions and congestive heart failure combined, and a 45% reduction in death from all causes (Nichol, Margolis, Wouremna, & von Sternberg, 1996). Direct cost savings were estimated at $117 per person per year after subtracting the cost of hospitalization for vaccinated persons and the cost of the vaccination program (Nichol, Margolis, Wouremna, & von Sternberg, 1994).

The cost of pneumococcal vaccination in the United States in 1978 was calculated to be $1,000 per year of healthy life gained, which when translated into 1991 dollars is still substantially less than the costs of almost all other preventive and therapeutic interventions used among the elderly (Bentley, 1992). In a more recent cost-effectiveness study of pneumococcal vaccine against pneumococcal bacteremia among elderly people, the cost savings from pneumococcal vaccination was estimated at $8.27 with a gain of 1.21 quality-adjusted days of life per person vaccinated (Sisk et al., 1996).

The Public Health Service's Healthy People 2000 set a goal to increase influenza and pneumococcal vaccination rates to at least 80% among institutionalized persons who are chronically ill or elderly (DHHS, 1990). The Advisory Committee on Immunization Practices

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(ACIP), American Academy of Family Physicians (AAFP), American College of Physicians (ACP), and the U.S. Preventive Services Task Force (USPSTF) recommend that influenza vaccination be provided annually to all individuals 65 years of age or older and recommend vaccination at least once with pneumococcal vaccine (DHHS, 1994). Revaccination with pneumococcal vaccine is recommended by ACIP, ACP, and USPSTF for high-risk adults who received the 23-valent vaccine 6 or more years ago (DHHS, 1994).

Along with influenza and pneumococcal disease, tuberculosis transmission in long-term care facilities can be interrupted with a systematic prevention program. The development of active tuberculosis among residents of long-term care facilities occurs by the following two mechanisms: (a) decreased immune function among persons with latent disease allowing reactivation and (b) increased risk of exposure to tuberculosis within long-term care facilities combined with a high risk of developing active tuberculosis (5% to 10% within 2 years) after recent exposure (CDC, 1992). Approximately 90% of active disease in the elderly is from late reactivation of latent infection acquired in earlier years (Stead & Dutt, 1991).

The importance of tuberculosis screening is realized when persons who are skin-test positive for exposure to tuberculosis are prevented from developing active tuberculosis disease by treatment with chemoprophylaxis. For individuals who complete the course of chemoprophylaxis, efficacy is greater than 98% (Stead, To, Harrison, & Abraham, 1987). This quality improvement project did not attempt to ascertain the percentage of individuals who tested positive for tuberculosis among those who were screened for tuberculosis. However, one study noted as many as 20% of residents admitted to nursing homes had positive tuberculin skin tests (Stead & To, 1987). Results from another study indicated that 30% of residents admitted to a single long-term care facility who had a negative tuberculin skin test on admission became infected, and 17% of infected persons went on to develop progressive primary tuberculosis while residing at the facility because transmission occurred before persons with active tuberculosis were identified (Stead, 1981).

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Healthy People 2000 has established a goal to reduce the incidence rate of tuberculosis to no more than 3.5 cases/100,000 persons (DHHS, 1990). The key strategies of this plan are to identify and treat active cases to prevent further transmission and to identify and treat infected persons with latent disease before they become infectious with active pulmonary tuberculosis (DHHS, 1990). Thus, a pivotal step in the control of tuberculosis is the screening of populations at risk, such as residents and staff of long-term care facilities, using tuberculin skin testing (DHHS, 1994). All major authorities, including AAFP, American College of Obstetricians and Gynecologists (ACOG), American Thoracic Society (ATS), CDC, and the USPSTF recommended tuberculin skin testing for all individuals at high risk. Included in the list of high-risk individuals are residents and staff of acute and long-term care facilities (such as hospitals, nursing homes, and correctional and mental health institutions) (DHHS, 1994).

Despite agreement among authorities, a survey conducted by the National Center for Health Statistics found that in 1990, only 41% of persons 65 years and older received influenza vaccination and only 20% received pneumococcal vaccination (Zimmerman & Clover, 1995). Therefore, the objective of this quality improvement project was to increase the rates of annual influenza vaccination, pneumococcal vaccination, and tuberculosis screening among Medicare beneficiaries in all Colorado long-term care facilities by conducting an educational intervention.

METHODS

SETTINGS

Residents were randomly selected from all 191 Colorado long-term care facilities. Persons who had been residents in Colorado long-term care facilities for at least 1 year were eligible for inclusion in the sample.

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QUALITY INDICATORS

The quality indicators for this quality improvement project were based on consensus statements. The following quality indicators were selected:

1. Influenza vaccination rate: The percentage of long-term care residents without contraindications who received an annual influenza vaccination.
   Numerator: The number of residents without egg allergy who received influenza vaccination in the last one year (1995-1996 influenza season for baseline; 1996-1997 influenza season for the first remeasurement; 1997-1998 for the second remeasurement).
   Denominator: The number of persons without egg allergy who were residents in the facility for at least 1 year
2. Pneumococcal vaccination rate: The percentage of long-term care residents who ever received a pneumococcal vaccination.
   Numerator: The number of persons ever receiving pneumococcal vaccination who were residents in the facility for at least 1 year.
   Denominator: The number of persons who were residents in the facility for at least 1 year
3. Tuberculosis screening rate: The percentage of eligible long-term care residents who were screened for tuberculosis.
   Numerator: The number of persons receiving tuberculosis skin-testing who were eligible for tuberculosis skin-testing and were residents in the facility for at least 1 year.
   Denominator: The number of persons who were eligible for tuberculosis skin-testing and were residents in the facility for at least 1 year.

   Residents eligible for tuberculosis skin-testing were defined as the following:

   (a) persons who had not previously tested positive on a tuberculosis skin test,

   (b) persons who had not received tuberculosis preventive therapy, and

   (c) persons who had not received treatment for active tuberculosis.

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Policy Checklists

To evaluate the correlation between vaccination and tuberculosis screening rates with both the existence of a policy and the attitudes of the facilities' medical directors, a policy checklist was sent to the director of nursing and/or the infection control practitioner of all 191 long-term care facilities in April 1996. Facilities not responding to the initial policy checklist were mailed a second policy checklist approximately 3 months later. The policy checklist was used to determine which Colorado long-term care facilities had policies for influenza and pneumococcal vaccination or tuberculosis screening for residents and/or staff. A modified version of the checklist was sent to the medical directors in May 1996 to evaluate the attitudes and beliefs of the medical directors about vaccination and tuberculosis screening. Medical directors of Colorado long-term care facilities were asked to rate the relative importance of preventive health measures related to residents or staff members receiving influenza vaccination or residents receiving pneumococcal vaccination or tuberculosis screening. Each item was independently ranked from 1 (*not important*) to 5 (*very important*).

INTERVENTIONS

With influenza season as a target, the first dissemination of intervention materials occurred the first week of October 1996. Whereas the timing of the intervention was structured to accommodate the long-term care community's preparations for the 1996 influenza season, the dissemination strategy also incorporated information about tuberculosis screening and pneumococcal vaccination. Intervention included the following components:

1. videotape about the benefits of influenza vaccination for facility residents and their families, featuring Colorado's First Lady, Mrs. Bea Romer;
2. a 20-second television public service announcement;
3. user-friendly information sheets on each of the three targeted areas, which were provided in sufficient quantities to be used to educate

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staff, residents, and residents' families about current vaccination and tuberculosis screening recommendations;
4. posters on which influenza vaccination rates could be tracked for staff and residents; and
5. a description of the project goals, methods, and baseline results.

In April 1997, Colorado Foundation for Medical Care (CFMC) disseminated the second intervention packet. These materials included the following items:

1. educational staff video addressing pneumococcal pneumonia and tuberculosis screening in the long-term care setting;
2. sample policies for both pneumococcal and tuberculosis endorsed by the Colorado Medical Director's Association and the Colorado Department of Public Health and Environment;
3. copies of the Advisory Committee on Immunization Practices' (ACIP) recommendations for pneumococcal vaccination;
4. clippings on 1996/1997 media coverage on pneumococcal outbreaks in nursing homes; and
5. posters encouraging vaccination of facility residents.

BASELINE AND REMEASUREMENT PROCEDURES

Data Collection

Medical record abstraction was completed in a similar manner for baseline and both phases of remeasurement. The project team asked the director of medical records from each facility to complete data collection. The CFMC provided the facilities with the data collection instrument. The data collection instrument listed the names of the selected residents and asked whether the identified individuals had medical record documentation of receiving the following preventive health services: (a) influenza vaccination during the last one year; (b) pneumococcal vaccination in their lifetime; and (c) tuberculosis screening since admission to the long-term care facility.

In addition, data on exclusions (egg-allergy and tuberculosis screening and treatment history) were collected.

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Time Frame

Using the standardized data collection instrument, influenza vaccination baseline data were collected for the 1995-1996 influenza season. Simultaneously, data on lifetime history of pneumococcal vaccination and tuberculosis screening since admission were requested from the director of medical records at each facility. The first intervention packets were mailed October 1996. Data for the first influenza remeasurement for the 1996-1997 influenza season were requested in January 1997. First remeasurement data for pneumococcal vaccination and tuberculosis screening rates were requested in May 1997. The second intervention packets were mailed in April 1997. Second remeasurement data for all three preventive services were again requested from the director of medical records at each facility in January 1998.

Baseline Measurement

Individual residents were used as the unit of analysis. Sample size estimates for baseline and remeasurement were calculated based on a power of .80 with an alpha of .05. The sample for baseline measurement was identified from the Colorado Foundation for Medical Care's long-term care database. Persons residing in Colorado long-term care facilities for more than 1 year and with admission after January 1, 1993, were identified (n = 5,151). Twenty percent of the residents were randomly sampled for a sample of 1,030 residents for whom data was requested.

For influenza, completed data collection instruments were returned for 600 (58%) residents. Five residents were excluded from analysis because of egg allergy. For pneumococcal vaccination, completed data collection instruments were returned for 508 (49%) residents. For tuberculosis screening, completed data collection instruments were returned for 375 (36%) residents. Twenty-six residents were excluded from analysis in the tuberculosis screening quality indicator because of a previous positive tuberculosis skin test (Table 1). One hundred fifty (79%) of the 191 facilities responded to the baseline data request.

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TABLE 1

Number (percentage) of Residents of Long-Term Care Facilities for Whom Data Were Requested, Returned, and Excluded From Analysis by Preventive Service and Measurement Period

	Baseline			*First Remeasurement*			*Second Remeasurement*		
	Requested	*Returned*	*Excluded*	*Requested*	*Returned*	*Excluded*	*Requested*	*Returned*	*Excluded*
Influenza vaccination	1,030	600 (58%)	5 (1%)	578	430 (74%)	185 (43%)	1,238	916 (74%)	257 (28%)
Pneumococcal vaccination	1,030	508 (49%)	0 (0%)	729	383 (53%)	137 (36%)	1,238	890 (72%)	252 (28%)
Tuberculosis screening	1,030	375 (36%)	26 (7%)	729	364 (50%)	143 (39%)	1,238	835 (67%)	278 (33%)

NOTE: Using a standardized data collection form, data were requested from the director of medical records at each Colorado long-term care facility. Completed data collection forms were returned to the study authors. Cases were excluded from analysis because of death, transfer from the facility, egg allergy (for influenza vaccination), or previously positive tuberculin skin test (for tuberculosis screening).

First Remeasurement

In January 1997, the influenza vaccination rate was remeasured for the 1996-1997 influenza season on a new random sample drawn from the same database. Eleven percent of long-term care residents were randomly sampled. In all, 578 residents were selected for chart review. Completed data collection instruments were received for 430 (74%) of selected long-term care residents. Of residents for whom data collection instruments were returned, 184 were excluded because they had either died or been discharged; 1 resident was excluded from analysis because of egg allergy (Table 1).

Remeasurement for pneumococcal vaccination and tuberculosis screening was completed in May 1997 on a random sample selected from a database created from Medicare claims data. The database was queried to identify all beneficiaries who had no date of death and whose mailing address shared the nine-digit zip code of the long-term care facilities. The number of residents needed for the pneumococcal and tuberculosis screening remeasurement sample was calculated to detect an 8% change in the pneumococcal vaccination rate and a 10% change in tuberculosis screening. There were 7,076 beneficiaries identified from the claims database. From this, a 10% random sample was selected. The final selection included 729 residents. Pneumococcal vaccination data were completed for 383 (53%) of the selected long-term care residents, and tuberculosis screening data were completed for 364 (50%) of the selected residents. Of these, 137 residents were excluded from both indicators because they either had died or had been discharged from the long-term care facility. An additional 6 residents were excluded from analysis of the tuberculosis screening quality indicator because of documentation of previous positive tuberculin skin tests (Table 1). Therefore, 246 residents were included in analysis for the pneumococcal vaccination indicator, and 221 residents were included in analysis for the tuberculosis screening indicator. One hundred forty-six (76%) of the 191 facilities responded to the first remeasurement data request.

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Second Remeasurement

In January 1998, data requests for all three quality indicators were distributed to obtain a second remeasurement. Influenza vaccination rate was remeasured for the 1997-1998 influenza season. For the second remeasurement, CFMC obtained a census of long-term care facility residents from the Colorado Department of Health Care Policy and Financing. Ten percent of long-term care residents were selected by systematically selecting every 10th record from a randomly assorted list. In all, 1,238 residents were selected for chart review. Influenza vaccination data were completed for 916 (74%) of selected long-term care residents. Pneumococcal vaccination data were completed for 890 (72%) of the selected long-term care residents, and tuberculosis screening data were completed for 835 (67%) of the selected residents. Of residents for whom data collection instruments were returned, 252 were excluded from all three indicators because they had either died or been discharged; 5 residents were excluded from analysis because of egg allergy. Twenty-six residents were excluded from analysis of the tuberculosis screening quality indicator because of documentation of previous positive tuberculin skin tests (Table 1). Therefore, 659 residents were included in the analysis for the influenza vaccination indicator, 638 residents were included in analysis for the pneumococcal vaccination indicator, and 557 residents were included in analysis for the tuberculosis screening indicator. One hundred fifty (79%) of the 191 facilities responded to the second remeasurement data request.

CHART VALIDATION

A 10% chart validation audit was completed for all 3 years to determine the reliability of the self-reported data. Medical records were requested for 282 persons for whom the facilities' directors of medical records reported as having received either influenza vaccination or tuberculosis screening. Of these, 198 had been reported by the facilities' directors of medical records as having received influenza

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vaccination, and 154 were reported to have received tuberculosis screening. Of requested records, 154 (78%) influenza records were received, and 120 (78%) tuberculosis records were received. Registered nurse abstractors reviewed the records. Supporting chart documentation of influenza vaccination was identified on audit for 143 (93%) of the submitted influenza records. Medical record documentation of tuberculosis screening was identified by nurse abstractors for 105 (88%) of the submitted tuberculosis records. There was no statistical difference in the match rate (self-reported data vs. chart audited data) for either influenza vaccination or tuberculosis screening by measurement period (baseline vs. first remeasurement vs. second remeasurement).

STATISTICAL ANALYSIS

Statistical comparisons of remeasurement rates with baseline rates were made using the Mantel-Haenzel chi-square test for trend. Comparisons between facilities with vaccination or screening policies and vaccination or screening rates were made using a Pearson's chi-square test.

RESULTS

This quality improvement project demonstrated statistically significant and clinically meaningful increases in the utilization rates of all three preventive health measures among residents of Colorado long-term care facilities (Table 2). The data collection instrument allowed for independent responses to each of the three resident indicators. Therefore, the denominators for each indicator are different. At baseline, of 595 responses, 497 (84%) received influenza vaccination. By the second remeasurement, the influenza vaccination rate significantly increased to 89% (586/659, $\chi^2 = 7.7$, $p = 0.006$). Pneumococcal vaccination rates increased from 16% (83/508) at baseline to 48% (305/638) at the second remeasurement ($\chi^2 = 116.8$, $p < 0.001$). Similarly, tuberculosis screening rates increased from 59% (204/349) at

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TABLE 2
Percentage of Colorado Long-Term Care Facility Residents Receiving Influenza and Pneumococcal Vaccination and Tuberculosis Screening at Baseline and Two Remeasurement Periods

	Baseline		*First Remeasurement*		*Second Remeasurement*		*Overall*
	Rate (%)	*(N)*	*Rate (%)*	*(N)*	*Rate (%)*	*(N)*	*Difference (%)*
Influenza vaccination	84	595	84	245	89	659	5*
Pneumococcal vaccination	16	508	47	246	48	638	32**
Tuberculosis screening	59	349	77	221	83	557	25**

*Chi square for trend $p = .006$. **Chi square for trend $p < .001$.

baseline to 83% (460/557) at second remeasurement ($\chi^2 = 62.4$, $p < 0.001$).

Seventy-four percent or 142 of 191 long-term care facilities responded to the policy checklist. One hundred sixteen (82%) of the 142 responding facilities had a policy regarding annual influenza vaccination for residents. Sixty-two (45%) of the 138 responding facilities had a policy regarding resident pneumococcal vaccination. No Colorado long-term care facilities reported not having a policy for tuberculosis screening.

Among residents for whom data were available concerning the presence of policies in the facilities, the presence of pneumococcal vaccination policies was significantly associated with higher vaccination rates. Of 353 residents in facilities with a pneumococcal vaccination policy, 109 (31%) received pneumococcal vaccination compared to 34 (8%) of 413 residents in facilities without a pneumococcal vaccination policy ($\chi^2 = 64.3$, $p < .001$). The presence of a written influenza vaccination policy, however, was not associated with increased influenza vaccination rates.

Of 191 Colorado long-term care facility medical directors, 104 (54%) responded. “All residents receiving a 2-step tuberculosis screening test (PPD) on admission” was ranked as most important with an average rank of 4.5. Interestingly, “All residents receiving annual influenza vaccination,” was scored lowest in importance with an average rank of 1.9. “All staff receiving annual influenza vaccination,” and “All residents receiving one-time pneumococcal

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TABLE 3
Average Score of Various Preventive Health Measures as Ranked by Medical Directors of Colorado Long-Term Care Facilities on a Scale from 1 (*not important*) to 5 (*very important*)

Preventive Service	*Score*
All residents receiving a two-step tuberculosis screening test (PPD) on admission	4.5
All staff receiving annual influenza vaccination	3.7
All residents receiving a one-time pneumococcal vaccination	2.5
All residents receiving annual influenza vaccination	1.9

vaccination" scored intermediately with average scores of 3.7 and 2.5, respectively (Table 3).

DISCUSSION

This quality improvement project demonstrated statistically significant and clinically meaningful increases in the rates of influenza and pneumococcal vaccination as well as tuberculosis screening among residents of Colorado long-term care facilities. Influenza vaccination increases were noted only after the second intervention. This may be attributable to inadequate time allowed between mailing of the first intervention (October 1996) and the first influenza vaccination rate remeasurement (January 1997).

Although the authors found only pneumococcal vaccination rates to be positively correlated with the presence of a written policy, others have reported that a written policy is associated with higher vaccination rates for both influenza and pneumococcal vaccines (Nichol, Grimm, et al., 1996). Other factors that have been found to be associated with higher vaccination rates include standing orders for the administration of vaccine to residents and not requiring written consent for vaccination. Employee vaccination rates have been shown to increase if influenza vaccination is offered on site and free of charge (Nichol, Grimm, et al., 1996). Nursing homes that require written informed consent have influenza vaccination rates of residents of

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around 60% compared with 90% in facilities that do not require consent (Nichol, Grimm, et al., 1996).

There are several limitations in the design of this project. First, long-term care residents included in the demonstration project may not be representative of all Colorado nursing home residents. Second, there may be bias because not all facilities provided data for each of the measurement periods. It may be that facilities with lower vaccination or screening rates did not provide data. However, there was no evidence that this occurred on medical record audit when a validation study was completed after the project was completed. In addition, the response rates of the facilities providing data improved over time (Table 1), which may be partially explained in that this was the first quality improvement project completed as a collaborative project between CFMC and Colorado long-term care facilities. Third, there was no control arm and the changes could be due to some other source or may be reflective of temporal trends in vaccination or tuberculosis screening rates. Nevertheless, the relative increase from 1995-1996 to 1997-1998 demonstrated in this study (31% for influenza and 38% for pneumococcal vaccination) was nearly twice that reported by the Behavioral Risk Factor Surveillance System (BRFSS), which reported a relative increase between 1995 and 1997 of 25% for influenza and 16% for pneumococcal vaccination among noninstitutionalized persons aged 65 years and older (CDC, 1995, 1997). The Behavioral Risk Factor Surveillance System reported influenza vaccination rates of 65.9% in 1995 and 74.4% in 1997 among community-dwelling Coloradans aged 65 and older. Similarly, BRFSS reported the percentage of community-dwelling Coloradans aged 65 and older who ever received a pneumococcal vaccination as 44.6% in 1995 and 53.3% in 1997.

In conclusion, it was possible to significantly increase vaccination and tuberculosis screening rates by partnering with health care providers in developing an interventional program that focused on educating long-term care staff, residents, and the community using a multimedia approach. In addition, facilities were encouraged to adopt proven techniques to increase the utilization of preventive health services such as the adoption of written policies.

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NOTE

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