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Using a Telephone Reminder System to Improve Pneumococcal Vaccination Rates for Medicare Recipients

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USING A TELEPHONE REMINDER SYSTEM TO IMPROVE PNEUMOCOCCAL VACCINATION RATES FOR MEDICARE RECIPIENTS

by

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DEDICATION

This project is dedicated to my husband and children who have served as my personal Sherpa, carrying more than their share of the load. We've reached the summit. The journey ends here!

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Carole Pepa, PhD, RN, provided continuous guidance during project development, implementation, and data analysis; this project could not have been completed without her support.

The collaborative efforts of support staff and healthcare providers within the office of Dr. Michael Kovacich were essential to project success. These individuals have been my colleagues and friends for a number of years. I wish Connie Ramirez all the best as she moves on to “greener pastures”. And for those remaining, who are stuck with the porcupine, may we refrain from being pricked by the “quills”.

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ABSTRACT

Despite recent advances in healthcare, Streptococcus pneumonia-associated infections contribute to significant morbidity and mortality in older adults. Because of the pneumococcal vaccine's efficacy for preventing invasive disease, guidelines for vaccinating older adults have been developed; yet, the nation has not met immunization goals. The purpose of this EBP project was to determine if a telephone reminder, as compared to provider recommendation, would increase pneumococcal vaccination rates. The Iowa model and Kotter's eight stages of change guided this project within a multi-provider office in Northwest Indiana. Within the practice, Medicare patients scheduled from September 1 to November 10, 2010 received a phone call reminding them of vaccine coverage and advising them to ask their provider about vaccine benefits. Following the visit, immunized patients were queried to determine the trigger for vaccine acceptance. During the 10-week project, 133 patients were immunized: a 6-fold increase in administration; a rate increase of 9.13 percentage points. A final chart audit, which included those immunized plus those whose records were updated during the project, revealed that 61.76% of patients were up-to-date, a 28.31 percentage point increase. Chi-square analyses were used to determine effectiveness of the telephone reminder and to evaluate variables of interest. Eighty percent of patients immunized during a physician visit reported the telephone reminder as trigger (X^2 = 14.400, p = .000); but the phone call was less effective for patients seen by the NPs. Regardless of provider or patient age and gender, Blacks and Hispanics were less likely to be immunized than Whites (p = .000). These findings support incorporating telephone reminders into practices with limited patient education activities, but additional investigation is needed to identify effective strategies for increasing immunization rates in minority populations.

Keywords: pneumococcal vaccine, immunization rates, older adults, telephone reminder

CHAPTER 1

INTRODUCTION

Streptococcus pneumoniae-associated infections cause significant morbidity and mortality in older adults. Twenty percent of older adults with pneumococcal pneumonia die within the first week of hospitalization despite improvements in supportive intensive care and availability of numerous antibacterials (Kruspe et al., 2003; Rubins & Janoff, 2001). While significant mortality results from localized respiratory infection, invasive pneumococcal disease poses a more ominous threat to older adults, and the emergence of drug-resistant bacterial strains creates additional challenges. Nearly 40,000 cases of invasive pneumococcal infection (e.g., sepsis and meningitis) occur annually (Centers for Medicare & Medicaid Services [CMS], 2009). Fatality rates can soar to 80% in cases of bacterial meningitis in older adults (Immunization Action Coalition [IAC], 2007; Kruspe et al., 2003).

Not surprisingly, pneumococcal disease represents a substantial target for vaccine-preventable, bacterial death in those 65 years and older (Kruspe et al., 2003). Recent studies have shown that pneumococcal immunization prevents invasive infection and reduces disease severity in vaccinated older adults (O'Malley & Forrest, 2006; Vila-Corcoles, 2007). Currently, the pneumococcal vaccine contains 23 capsular polysaccharide antigens of Streptococcus pneumoniae, more than 80% of serotypes that cause invasive disease (Flanders, 2001).

Because of the vaccine's efficacy in preventing invasive pneumococcal disease, the Centers for Disease Control and Prevention (CDC)'s Advisory Committee on Immunization Practices (ACIP) has developed guidelines for immunizing older adults. The guidelines focus on primary immunization at the age of 65, but also address re-immunizing those who are considered "high risk" and those who were initially immunized

prior to age 65. The ACIP recommends that all individuals receive a dose of pneumococcal polysaccharide vaccine (PPSV) when or after they reach age 65; if the vaccine status in uncertain or unknown, the individual should be immunized (ACIP, 2009). Provided that at least five years have passed since receipt of initial PPSV, revaccination may be administered to those who were immunized prior to their 65th birthday. Those age 65 and older who are at highest risk of serious pneumococcal infection or likely to have a rapid decline in pneumococcal antibody levels may also be revaccinated (ACIP, 2009; CMS, 2009; Goebel & Mufson, 2008). Candidates for reimmunization include individuals with functional or anatomic asplenia (e.g., sickle cell disease or splenectomy), human immunodeficiency virus infection, leukemia, lymphoma, multiple myeloma, generalized malignancy, chronic renal failure, nephrotic syndrome, or other conditions associated with immunosuppression (e.g. organ or bone marrow transplantation, long-term corticosteroid therapy, and chemotherapy) (ACIP, 2009; CMS, 2009; Goebel & Mufson, 2008). Repeat PPSV immunizations typically boost antibodies to levels lower than those obtained after primary vaccination, and post-vaccination pneumococcal antibody titer levels do decline to pre-vaccination levels in approximately 10 years (Goebel & Mufson, 2008). But, current evidence regarding further boosting of PPSV remains controversial.

Historically, strategies to address barriers to PPSV administration have been well-documented. To overcome financial barriers, the federal government initiated Medicare payment for PPSV in 1981. Vaccinations are paid at 100%; co-insurance and deductible do not apply (CMS, 2009). For reimbursement, providers are not required to have the patient present an immunization record, nor are they required to review the patient's complete medical record if it is not readily available (CMS, 2009). Provided the patient is competent, practitioners can rely on the patient's verbal history to determine prior vaccination status (CMS, 2009). As Medicare streamlined reimbursement policies,

PPSV immunization rates modestly increased in the 1980s. Still, only 14.1% of adults 65 years and older reported ever having received a PPSV by 1989 (CDC, 2010). To strengthen provider awareness, the U.S. Department of Health and Human Services (USDHHS) established the Healthy People 2000 goal of 60% pneumococcal and influenza vaccination rate; by 1991, more than 20% of older adults had been vaccinated (CDC, 2010). Rates further increased in the 1990s, as the CDC and Health Care Financing Administration (HCFA) developed an action plan targeting hospital-based vaccination policies (Flanders, 2001). By 2000, Americans had achieved the Healthy People goal for influenza, but only 52.9% of older adults reported having received a PPSV (CDC, 2010). Healthcare providers were then challenged by the new Healthy People 2010 goal of 90% coverage for both influenza and pneumococcal vaccines. Yet, research indicated that even with Medicare coverage and a national action plan, PPSV was still underused. In response to vaccine underutilization, CMS enacted regulation allowing the use of standing orders within hospitals and long-term care facilities (Fields & Nicastri, 2004). Yet, two-thirds of patients who developed a serious pneumococcal infection had been hospitalized at least once in the previous three to five years (Flanders, 2001).

Statement of Problem

While current policies have improved the number of individuals immunized in hospital settings, overall vaccination rates have tapered off in recent years (CMS, 2009). Despite the federal mandates regulating inpatient immunization, the nation failed to achieve the Healthy People 2010 goal of a 90% immunization rate for persons 65 years and older (CMS, 2009). Only 56.7% of Hoosiers 65 to 74 years of age and 75.9% of those 75 and older report ever having received a PPSV (Indiana State Department of Health [ISDH], 2008). Racial and ethnic disparities remain remarkable; Blacks and

Hispanics have been immunized at significantly lower levels than their White counterparts (Winston, Wortley, & Lees, 2006). Nationwide, 64.3% of Whites 65 years and older reported having previously received a PPSV, compared with 44.6% of Blacks and 36.4% of Hispanics within this population (CDC, 2010).

Without further intervention, aging American demographics are anticipated to magnify this problem. In 2030, the older adult population is projected to be twice as large as in 2000, representing nearly 20% of the total population (Federal Interagency Forum on Aging-Related Statistics, 2008). Healthcare providers need to make significant improvements to vaccination procedures in order to decrease the number of cases of invasive pneumococcal infection from 40.4 per 100,000 adults aged 65 and older in 2008 to the Healthy People 2020 goal of no more than 31 new cases per 100,000 older adults (USDHHS, 2011). Furthermore, although Russo and Elixhauser (2006) noted that older adults account for one-third of all hospitalizations, targeting this population misses the majority of older adults who remain at risk for invasive pneumococcal infection—those who are not hospitalized during any given year, yet remain unimmunized.

Clinical Agency Data

The office of Dr. Michael Kovacich has served the primarily blue-collared, middle-class population of Lake and Porter Counties. More than 75% of patients reside in Lake County (M. Kovacich, personal communication, February 19, 2010). Although the office has been designated as family practice, the patient population is more reflective of an internal medicine specialty: approximately 90% of the patients seen are adults; more than 30% are Medicare recipients with chronic health conditions. (M. Kovacich, personal communication, February 19, 2010). Medicare recipients account for approximately 60% of all office visits (M. Kovacich, personal communication, February 19, 2010). The patient mix within the practice is reflective of the diversity of Lake County. Hispanics have been welcomed as the physician, receptionist, and radiology technician speak

fluent Spanish. In addition, many Blacks have been in the practice since Dr. Kovacich assumed the practice of a retiring Gary family physician in 1982 (M. Kovacich, personal communication, February 19, 2010).

Within the practice, productivity has been a major objective. Although positive patient outcomes are expected, the main focus has been the volume of patients seen per day by the physician (M. Kovacich, personal communication, May 24, 2010). The added time necessary for patient education has been identified as a barrier to health promotion activities. PPSV rates have been impacted by time constraints within the office setting. In 2009, only 22 patients received the PPSV during influenza immunization season (M. Kovacich, personal communication, August 3, 2010). A chart audit completed on July 12, 2010 revealed that 32.5% of the 4480 patients were Medicare recipients. Of these 1456 patients, only 487 (33.45%) had documented records of up-to-date pneumococcal vaccine. Thus, a time-efficient evidence-based practice project was needed to improve PPSV coverage for Medicare recipients within this practice.

Purpose of the Evidence-Based Practice Project

This evidence-based practice (EBP) project was designed to determine a time-efficient approach to improving pneumococcal vaccination coverage within Medicare recipients of Michael Kovacich, MD; Connie Ramirez, BSN, RN, ANP-BC; and Julie Ann Koch, MSN, RN, FNP-BC. Following an assessment of needs of the practice and an abbreviated review of background literature, the PICO format (i.e., patient population, intervention or interest, comparison intervention or status, and outcome) was used to guide the project and facilitate obtaining the most relevant and best evidence. The following PICO question developed: For Medicare recipients, does the addition of a telephone reminder, as compared to standard practice of brief education and provider recommendation, increase pneumococcal vaccination rates?

Significance of the Evidence-Based Practice Project

Pneumococcal infection poses a significant health threat to older adults. Although the vaccine may not prevent pneumonia, evidence supports the vaccine's efficacy in reducing the incidence of invasive pneumococcal disease (e.g., sepsis and meningitis) that attributes to the death of nearly 2,000 older adults each year (CMS, 2009).

Numerous authors have identified significant patient-focused barriers to immunizing older adults: (a) belief that a healthy person does not need to be vaccinated, (b) concern about side effects, (c) uncertainty about when to be immunized, and (d) lack of recommendation from their provider (Holmboe et al., 2001; Johnson, Nichol, & Lipczynski, 2008; Mieczkowski & Wilson, 2002; Nowalk et al., 2004; Santibanez et al., 2002; Winston et al., 2006). Provider-focused barriers also exist: (a) lack of an effective reminder system, (b) limited support staff, and (c) minimal time for health promotion activities (Johnson et al., 2008; Mieczkowski & Wilson, 2002; Nowalk, Bardella, Zimmerman, & Shen, 2004). Considering these barriers, it is not surprising that Americans did not reach the Healthy People 2010 goal of 90% pneumococcal immunization rate for individuals 65 years and older. Disparities within race have continued to exist despite a number of interventions designed to eliminate or minimize the difference in immunization rates (Hebert, Frick, Kane, & McBean, 2005; Winston et al., 2006). The advanced practice nurse (APN), with knowledge of these barriers and disparities, as well as evidence of an effective strategy for improving immunization coverage, is in a prime position to affect practice change that will improve patient outcomes.

This EBP project will provide additional depth to the current body of knowledge regarding pneumococcal immunization in older adults. Results may be used by other APNs to institute simple, patient-focused strategies and improve patient outcomes.

CHAPTER 2

THEORETICAL FRAMEWORK AND REVIEW OF LITERATURE

Evidence-Based Practice Model

The Iowa Model of Evidence-based Practice to Promote Quality Care (Titler et al., 2001) was used to guide the development of this EBP project. The Iowa model was initially developed at the University of Iowa Hospitals and Clinics to serve as a framework to improve patient outcomes, enhance nursing practice, and monitor healthcare costs (Taylor-Piliae, 1999). Although the original model was research focused and appropriately titled The Iowa Model of Research-based Practice to Promote Quality Care, the Iowa model was revised in 2001 to (a) reflect changes in the healthcare environment as the term *evidence-based practice* became widely adopted, (b) incorporate the EBP terminology and additional feedback loops, and (c) encourage use of other types of evidence when research findings are unavailable to guide practice (Titler et al., 2001).

Within the Iowa model, EBP projects are initiated by problem focused or knowledge focused triggers. Within the clinical setting of this EBP project, a problem focused trigger provided major impetus for the change process. As part of doctoral education, the APN project facilitator reviewed national guidelines regarding pneumococcal vaccination of older adults. This led to the identification of a clinical problem: within the practice targeted for this project, far fewer than the Healthy People 2010 goal of 90% of adults aged 65 and older have documentation of receiving pneumococcal vaccine within the past five years. The practice's inability to meet Healthy People 2010 goals was reviewed with key stakeholders within the office setting who determined this goal as a priority for the practice.

Following confirmation of the topic's priority within the organization, a team was formed. The team included the project facilitator, a family nurse practitioner (FNP) completing doctoral studies, an adult nurse practitioner (ANP), and their collaborative physician. The family nurse practitioner completed two additional steps of the Iowa model: (a) assembling relevant research and related literature and (b) critiquing and synthesizing research for use in practice. The evidence and critique included within this paper was presented to the team, who determined there was a sufficient research base to pilot a change in practice.

Theoretical Model

In addition to the Iowa model, the proposed change in practice was guided by Kotter's eight steps of change. As a professor of leadership at Harvard business school, John Kotter studied well over 100 business companies. In the 1990's he determined that more than 50% of all major changes in organizations failed and then identified strategies to manage change (Kotter, 1996). Kotter (1996) noted that factors key to facilitating change include (a) identifying why the organization resists the needed change, (b) determining what process can be used to overcome the inertia, and (c) understanding why the leadership skills to drive the change are so important. Kotter suggested never underestimating the magnitude of forces within an organization that reinforce complacency and help to maintain stagnation or status quo.

Findings from Kotter's initial studies have been used to develop eight steps, divided into three stages, to facilitate the change process. Kotter's three stages are similar to Kurt Lewin's (1951) unfreezing, moving, and freezing/refreezing and must be completed in proper order to ensure success. But, Kotter (1996) provided additional guidance through eight steps: (1) acting with urgency, (2) forming a guiding coalition, (3) developing a change vision, (4) communicating the vision buy-in, (5) empowering a

broad-based action plan, (6) generating short-term wins, (7) continuing the progress, and (8) maintaining the change.

In the first step, Kotter (1996) noted it is imperative to create a sense of urgency to overcome the stagnation and complacency. Crisis is considered a positive impetus for change. The second step, similar to the Iowa model, involves creating a coalition to guide the process. Kotter posited that coalitions are best guided by individuals with position power, credibility, expertise, and leadership skills. Consistent with Lewin's unfreezing, Kotter's third step involves the development of a vision to guide the direction of change and a strategy to coordinate action and motivate others. Within the fourth step, the leader recognizes that the vision and strategy are most effective when there is a common understanding of goals and direction. Kotter noted that the vision needs to be communicated by a simple, clear message. A broad-based action plan, in step five, allows change agents to use the talents and resources of members to move through the change process and improve organizational performance. Because major change takes considerable time, the sixth step focuses on short-term successes that will provide momentum to continue the progress through step seven. Similar to Lewin's freezing/refreezing, Kotter's eighth step then solidifies or maintains the change, in part, by identifying the connection between the recent change and organizational success.

A strength of Kotter's (1996) eight steps of change lies within the tips and key points readily available within the literature. Kotter has provided multiple examples of what the change agent can do within each step to facilitate the process. The steps themselves can be used as a checklist to monitor progress. The steps do provide some flexibility and multiple steps could take place simultaneously during a larger organizational change. Because of the ease of use, Kotter's model has been used within a variety of healthcare organizations and other industries.

An additional positive aspect of using Kotter's change model within this EBP was the seamless fit with the Iowa model. Within this designed project, the knowledge that the practice did not meet Healthy People 2010 objectives provided an impetus for change, but the recent chart audit created a sense of urgency. This urgency was magnified by the upcoming influenza vaccination season and the anticipated need of ordering additional pneumococcal vaccine supplies. A coalition, consisting of the collaborative physician and the two nurse practitioners (NPs), was formed. Within this office, the coalition possessed the position power, credibility, expertise, and leadership skills to move the project forward. The coalition reviewed the evidence and used the developed procedure to guide the direction of change in a coordinated fashion. Short-term successes within this EBP were measured simply by maintenance of the procedure and were easily monitored by evaluating the number of doses or vials of vaccine that were utilized. A small reward system (e.g., home baked goods) was used to ensure the medical assistant (MA) and providers remained focused on the goal during the 10-week project.

Kotter's change model did have limitations for use within this EBP project. One major disadvantage was that creating a sense of urgency may have actually altered the standard practice of brief education and provider recommendation for immunizations. Providers who were now aware of the deficiency in immunization standards may have provided more detailed education or a more passionate recommendation for immunization. Nonetheless, these changes in practice could simply have occurred as a result of taking part in the EBP project and would be apparent with the use of other models as well. But more importantly, the time limitation for the project made it difficult to evaluate the ability to solidify the change. In this instance, the project director's role as a healthcare provider within the organization afforded an opportunity to evaluate the maintenance of the change process well after completion of the project.

Literature Search

A search for relevant literature was undertaken to assemble, critique, and synthesize the best available evidence relating to increasing pneumococcal vaccination rates through the use of reminder systems. Database sources examined included CINAHL, Proquest Nursing and Allied Health Source, MEDLINE via PubMed, Sociological Abstracts, PsycARTICLES, and the Cochrane Library. The MeSH (medical subject heading terms) system was used to explore key words for consistency and applicability. The key words “vaccine or immunization” and “reminder or reminder systems” were used to search databases for literature with human subjects published in English within the past ten years (if searching required a specific number of years) or from January 1, 2000 to June 1, 2010 when specific dates could be entered. Searches included peer-reviewed, systematic reviews, meta-analyses, practice guidelines, clinical trials, randomized controlled trials (RCTs), qualitative studies, descriptive studies, and EBP. Within the Cochrane Library, the search was limited to literature that had the defined search terms listed within the title or abstract or designated as keywords. Within PubMed, the combination of MeSH terms “vaccine and reminder systems” resulted in 14 hits; the combination of MeSH terms “immunization and reminder systems” resulted in 21 total hits (only seven of these hits were duplicates). After elimination of duplicate citations among all searched databases, a total of 50 abstracts were initially reviewed.

Following a review of abstracts, full text articles were obtained for review. Although this project targeted Medicare recipients, age was not used as an excluding factor for the primary literature search because the recipient of telephone reminders, regardless of the targeted population, is most commonly an adult. Additionally, a significant body of literature has focused on improving primary immunization of children through strategies or interventions targeting adults and older adults as caregivers who influence the acceptance of vaccination. Furthermore, as the “sandwich generation” has

become more prominent, older adults may have younger caregivers who influence their immunization decisions.

Of the full text articles included, one systematic review cited on PubMed was no longer available for review within the Cochrane database; it had been replaced with an updated review published in 2005. Five studies were excluded because the research was included within the data analysis of obtained systematic reviews. Thirty-seven additional studies were excluded because they addressed (a) inpatient intervention (e.g., standing orders), (b) school-based programs, (c) electronic health record interventions, (d) mobile phone strategies (e.g., text messages), (e) interventions that did not include a telephone reminder component, and/or (f) outcomes that were not measured by increased immunization rate (e.g., number of days to vaccination). Articles with any of these topics as a focus were excluded because of limited applicability to the targeted population or organizational system. Specifically, studies focusing on inpatient interventions were excluded because the collaborative physician for this project already used standing orders and organizational system guidelines for pneumococcal vaccination administration for inpatients. Additionally, within the office implementing this EBP project, transition to electronic medical records was scheduled to take place early in the spring of 2011. This transition was not anticipated to impact this project's data collection and evidence dissemination.

A hand search of the reference list of acquired full text articles was also undertaken. Two systematic reviews and one controlled trial meeting inclusion and exclusion criteria were obtained through the search. Additional websites reviewed to obtain guidelines, task force recommendation, and expert opinion included the Joanna Briggs Institute, National Guideline Clearinghouse, CDC, CMS, ACIP (linked from CDC site), IAC, and the Task Force on Community Prevention Services. Two task force recommendations were obtained through this search.

Appraisal of Relevant Evidence

The Agency for Healthcare Research and Quality [AHRQ] (2003) task force's grade definitions and the rating system for hierarchy of evidence derived from Melnyk and Fineout-Overholt (2005) were used to appraise each piece of evidence. Thirteen pieces of evidence were included for final appraisal: five systematic reviews (Level I), one meta-analysis (Level I), two RCTs (Level II), one controlled trial without randomization (Level III), two cohort studies (Level IV), and two task force recommendations (Level VII). A summary of evidence from Levels I-IV is included within Appendix A.

Level I Evidence

Szilagyi et al. (2000) used methodological review criteria established by the Cochrane Collaborative to systematically review studies of patient reminder/recall interventions to assess their effectiveness and to delineate interventions that appeared most effective in improving immunization rates. Forty-one of 109 identified studies met eligibility criteria: RCTs, controlled before-after studies, or interrupted series that measured immunization rates and were published from the inception dates of databases through 1998. Databases, search terms, and methods for retrieving additional literature were clearly identified. To be included in the review, studies needed to (a) report primary research which included a patient reminder/recall system in at least one study arm, (b) evaluate common nationally or internationally recommended childhood or adult vaccines, (c) provide immunization coverage data, and (d) be written in English. Reminder/recall systems could be delivered by letter, postcard, telephone, autodialer, or in person; interventions that involved physician reminders (e.g., medical chart or computer prompts) were not evaluated unless they were used in combination with patient reminders. Studies that used combined interventions or also included other preventive services were analyzed separately from studies evaluating only patient

reminders for immunizations. All eligible studies were reviewed independently by two reviewers, who were not blinded to authors, using a standardized checklist. Disagreements between reviewers were resolved by a formal reconciliation process to achieve consensus; this process was not delineated within the systematic review. Primary outcome measures were percentage of patients who were immunized at the end of the study and difference in absolute percentage points in vaccination rates between control and intervention groups; using absolute change rather than relative rates allowed for comparisons among studies. Combining studies added power to the analysis and allowed Szilagyi et al. (2000) to evaluate key subgroups defined by patient age, practice setting, dates of study, type of vaccination, type of reminder/recall intervention, and frequency of intervention. The possibility of publication bias was addressed through a funnel plot analysis of effect of intervention against sample size. Pooled results, weighted by sample size of each study, were calculated using a fixed-effects model for reminder type, patient age, and major vaccine category. Heterogeneity was tested using a chi-square distribution with a .10 level of significance. Pooled results were ultimately computed using a random-effects model with a wider 95% CI than the fixed-effects model, producing more conservative estimates of effects of interventions.

Of the 41 studies reviewed by Szilagyi et al. (2000), seven evaluated use of telephone reminders in adults: five with influenza vaccine and two for other vaccines (pneumococcal and tetanus). Telephone reminders increased influenza vaccination rates in adults a median of 25.6% (range, 5.5 to 27.2%), *OR* = 4.27. Telephone reminders increased other vaccine rates 24.1% (range, 20.8 to 27.4%), *OR* = 9.61. Regardless of age, Szilagyi et al. (2000) found that all types of patient reminder/recall systems were effective; reminder/recall interventions (not specified) in two studies of adults 65 years and older increased pneumococcal immunization rates a median of 10.0% (range 0.0 to 20.0%; *OR* = 2.79). The findings of this systematic review provided

support for practice change; findings supporting use of telephone reminders in those 65 years and older were rated as good.

Jacobson Vann and Szilagyi (2005) reviewed and updated the 2000 systematic review (Note: This review was also updated with a review and analysis of literature in 2007, but no conclusions of significance were found. Therefore, the recommended citation remains 2005). For the 2005 review update, a search of the Effective Practice and Organisation of Care Group (EPOC) Register was performed; the 2007 update included a search of the EPOC Register, CINAHL, and PubMed. Search terms were clearly identified. For these updated reviews, only one author reviewed titles and abstracts to select articles for full review. Numerous quality criteria were assessed for each study design and clearly labeled within the publication. Within the initial review, Excel 2005 was used to (a) track the process, (b) manage the study-level and comparison-level data, (c) compute *OR*s and 95% CIs for each study arm as a reliability check of results computed in Meta View and RevMan, (d) sort studies, (e) record absolute changes in immunization rates, and (f) prepare funnel distribution displays to assess for potential publication bias. A table of comparisons was structured to examine study results' odds ratios by type of patient reminder. Subgroup analyses were performed by major immunization category (e.g., childhood, preschool, adult influenza, and other adult immunizations); the 2007 update included an adolescent subgroup for autodialer interventions and patient reminder summaries. Results were then tested for heterogeneity using chi-square distribution. Pooled measures were ultimately computed using the random effects model, which revealed that patients receiving a reminder or recall intervention were 1.57 times more likely to have been immunized or up-to-date with immunizations as compared to control subjects. Of 18 studies of patient reminders for adult influenza immunization, data from six were not entered in RevMan analysis because of unit of analysis errors. One study of telephone reminders with modest

relative increases in influenza immunization was added to the 2005 review update. No additional studies were added to subanalyses in 2007. The pooled random effect summary without unit of analysis errors was 1.66, 95% CI [1.31, 2.09]. For other adult vaccines (e.g., pneumococcal, tetanus, and hepatitis B), all six studies demonstrated higher immunization rates in patient reminder or recall intervention groups as compared to controls. One study was added to this subgroup for the 2005 review update. No additional studies were added to subanalyses in 2007. The pooled random effect summary without unit of analysis errors was 2.19, 95% CI [1.21, 3.99]. Findings of this revised systematic review provided fair additional support for the proposed practice change.

Stone et al. (2002) quantitatively assessed the relative effectiveness of approaches for improving adherence to adult immunization and cancer screening guidelines in a meta-analysis sponsored by CMS. Of 552 abstracts and articles, 108 met initial eligibility criteria: randomized or controlled clinical trials that assessed interventions to increase use of immunizations for influenza and pneumococcal pneumonia and/or and screening for colon, breast, and cervical cancer in adults that were published through February 1999. Other inclusion criteria were not well-defined within the article, but Stone et al. noted these were available within an on-line appendix that was no longer available with the published URL link. Databases were clearly identified, but search terms and methods for retrieving additional literature were only reportedly available in the on-line appendix. All eligible studies were reviewed independently by two trained physician reviewers, not blinded to authors, using a standardized checklist. Disagreements between reviewers were resolved by consensus or third-party adjudication; details of the process were noted to be included in the on-line appendix. The reviewers excluded studies that did not include information on the number of patients studied and research whose unit of analysis was not the patient. Eighty-one studies contained a usual care or

control group and were included in the meta-regression; twenty-nine of these studies focused on immunizations. Stone et al. noted that a full description was available on the CMS website; a link was provided, but was not functional at the time of this critique.

Stone et al. (2002) presented meta-regression analyses in a table format and included adjusted odds ratio and 95% CIs for improving care delivery for each intervention component. The reviewers noted some consistent patterns across all regressions: (a) organizational change was consistently one of the most effective (*OR* = 16.0), yet most diverse, intervention components; (b) patient financial incentives were highly effective across types of preventive care; (c) patient reminders consistently improved care (*OR* = 2.52 for immunizations); (d) patient education was consistently moderately effective; and (e) provider feedback consistently appeared relatively ineffective. Phone call reminders were not separated from other reminder interventions; older adults were not segregated from the general adult population. The findings of this review provided good support for the proposed practice change. Although there were no clear findings supporting the use of telephone reminders in those 65 years and older, patient reminder systems were noted to be effective in increasing immunization rates in adults.

Ndiaye et al. (2005) used methods developed for the Guide to Community Preventive Services to conduct systematic reviews to evaluate the effectiveness of single and multicomponent interventions to improve targeted vaccination coverage: influenza, pneumococcal polysaccharide, and hepatitis B. Three groups of experts served on the systematic review development team, representing the National Immunization Program of the CDC, the Community Guide researchers, and the Task Force on Community Preventive Services. The team initially identified 2,461 titles and abstracts in database searches from 1980 to August 2001. Databases and methods for retrieving additional literature were clearly identified, but search terms were not explicitly

reported. Sixty articles met initial inclusion criteria: (a) were primary studies, not guidelines or reviews; (b) included a comparison to an unexposed or less-exposed population; (c) were conducted in an established market economy; (d) were written in English; (e) measured differences or changes in immunization coverage; (f) were studies of influenza, pneumococcal, or hepatitis B vaccines; and (g) were studies that either focused on or included individuals under 65 years if age and at high risk for infection. Of the original 60 articles, 25 were excluded because of limitations in their design or execution. The remaining 35 studies meeting quality criteria were reviewed to determine intervention effectiveness on the primary outcome measurement of change in vaccination coverage rates. Two reviewers using a standardized abstraction form evaluated each eligible study. Differences between reviewers were resolved by consensus of the review team. The reviewers focused on three categories of interventions: (1) increasing community or client demand for immunization, (2) enhancing access to vaccination services, and (3) targeting healthcare providers and healthcare systems. Once measures of effectiveness were confirmed for individual studies, an overall median was calculated across the qualifying body of evidence as the summary effect measure. Bodies of evidence were characterized as strong, sufficient, or insufficient based on the (a) number of studies, (b) suitability of study design, (c) quality of study execution, (d) consistency of results, and (e) determination of a sufficient median effect size.

Of the 35 studies reviewed by Ndiaye et al. (2005) only one study evaluated the effectiveness of patient reminder systems when used alone; the reminder was a postcard with a personal message signed by the physician. Twenty-three studies evaluated interventions implemented in combination. Sixteen of these included client reminders plus other interventions. The median difference in vaccination coverage among these studies was 14% (range, -2 to 28.9%). One study included in the

systematic review (Brimberry, 1988) noted a 9.3% increase in vaccination rate when telephone reminders were combined with expanded office hours for vaccination. The reviewers rated the evidence on effectiveness for the combination of these 16 studies as strong. There were no clear findings supporting the use of telephone reminders specifically in those 65 years and older, but patient reminder systems, in combination with other interventions (e.g., provider assessment and feedback, client education) were noted to be effective in increasing immunization rates in adults who were at high risk for infection, morbidity, or mortality.

Thomas, Russell, and Lorenzetti (2010) conducted a systematic review evaluating interventions to increase influenza vaccination in those 60 years and older. The reviewers utilized the Task Force on Community Preventive Services' three categories of interventions to increase vaccination (interventions to increase community demand, interventions to enhance access, and provider- or system-based interventions) and added a fourth category: societal interventions (e.g., differing administrative frameworks and campaigns between societies). Databases, search terms, and methods for retrieving additional literature were not clearly identified; instead, the authors provided a flow diagram of studies considered for review. Three hundred ninety-one full text articles met initial inclusion criteria: (a) RCTs, cohort, case-control, or interrupted time series studies and (b) in languages which the reviewers read (English, French, German, Italian, Portuguese, and Spanish) or with an adequate English-language abstract. Additionally, the full text articles (a) documented influenza rates, (b) evaluated an intervention in one of the four categories; and (c) included individuals 60 years and older (studies focusing on those 65 years of age and older were included if data on 60 years of age and older could not be extracted from the study or obtained from the authors). Studies (N = 323) were excluded if older adults were not separable from the rest of the subjects or vaccination was measured only by unvalidated self report. An

additional 24 studies which had non-comparable controls and unknown confounders or used prior years as historical controls were also excluded from the review. Methods of study review and processes for resolving disagreement between reviewers were not delineated within the systematic review. Thomas et al. (2010) did report that the reviewers assessed for risk of bias in the remaining 44 studies using the Cochrane Risk of Bias Tool and evaluated overall quality of evidence with the Cochrane GRADEPro software. Results of these analyses were presented in tables and figures. Funnel plots were used to evaluate publication bias for interventions with five or more RCTs; funnel plots did not reveal evidence of publication bias. All analyses then used a random effects model. Because reviewers grouped studies by type of intervention using the PICOS (population, intervention, comparison, outcome, and study design) format, only eight studies could be pooled.

Of the 13 studies categorized by Thomas et al. (2010) as tailored reminders to patients, three used telephone reminders in combination with other interventions. Odds ratio for these studies ranged from 0.94 to 1.27. But marked heterogeneity was noted and the data were not pooled. Thomas et al. noted that researchers tended to test out unique interventions without replicating existing interventions. One study included in the review (Hull, Hagdrup, Hart, Griffiths, & Hannessy, 2002), graded as “high” with the Cochrane GradePro software, evaluated a phone call reminder for those 65 years and older to attend a vaccination clinic. In this United Kingdom study, the control group received no phone call, but received letters sent to all patients 65 years and older advising them to contact their healthcare provider during a national campaign promoting influenza vaccination. Hull et al. (2002) found a significantly increased immunization rate in the intervention group (*OR* = 1.27, *p* = .03). Of the four studies categorized as “other patient reminder and recall”, two studies used phone call reminders. Krieger, Castorina, Walls, Weaver, and Ciske (2000) used senior volunteers to call participants using a

standardized script; patients also were mailed an educational brochure. The control group received no phone call or education brochure, but could be exposed to community immunization newspaper articles, pamphlets and brochures at a health fair, and mailed letters from the regional Medicare office. Krieger et al. found an increased immunization rate in the intervention group (*OR* = 3.33, *p* = .0002). Findings of this systematic review provided insufficient evidence to support the proposed practice change, but findings from individual studies included in the review provided fair support of the use of telephone reminders for those 65 years and older.

Briss et al. (2000) evaluated evidence to improve vaccination coverage in children, adolescents, and adults in a systematic review of the effectiveness, applicability, other effects, economic impact, and barriers to use of selected population-based interventions. The reviewers focused on interventions intended to improve routine delivery of universally recommended vaccinations and chose not to target high risk groups. Three categories of interventions were evaluated: community demand for vaccination, access to vaccination services, and provider-based interventions. Selected interventions within these three categories were characterized by (a) nature of activities involved, (b) manner of delivery of activities, (c) type of people targeted, and (d) setting in which the intervention was applied. Interventions could be either single-component or multi-component. Although search terms were not identified, databases and methods for retrieving additional literature were clearly delineated. To be included within the review, studies needed to (a) have a publication date from 1980 through 1997, (b) address universally recommended adult, adolescent, or childhood immunizations, (c) be a primary study (guidelines and reviews were excluded), (d) take place in an industrialized country, (e) be written in English, (f) meet the definition of intervention and provide information on one or more outcomes, and (g) compare an exposed group to a group that had not been exposed or who had been less exposed. Studies were also

reviewed that did not meet criteria, but had been recommended by one or more experts. Each study meeting inclusion criteria was read by two reviewers who used a standardized abstraction form. Disagreement between reviewers was reconciled by consensus among the development team members. Quality of study execution was systematically assessed and characterized as good, fair, or limited based on the number of limitations in eight categories. Outcomes of interest included (a) measures of vaccination (i.e., percentage point changes from baseline), (b) disease outcomes, and (c) other outcomes (e.g., knowledge or attitude change).

Sixty studies evaluated the effectiveness of client reminder or recall interventions. Eighteen of these were excluded from further analyses because of limited execution or least suitable designs. Details of the 42 qualifying studies were readily available within an appendix. Two qualifying studies provided data that could not be expressed as a percentage point change from baseline. The remaining qualifying studies reported on 31 single-component and 23 multi-component intervention arms. Overall, the studies documented a median vaccination rate percentage point increase of 12% (range, -8% to 47%). Single-component studies revealed a median percentage point increase of 8% (range, -7% to 31%); studies that evaluated reminders or recalls as part of a multi-component intervention documented a median percentage point increase of 16% (range, -8% to 47%). Both telephone and mailed (i.e., letters or postcards) reminders were evaluated. Two studies directly compared mailed reminders with telephone reminders and did not find a difference regarding effectiveness between them. The findings of this systematic review provided good support for the use of patient reminders to change practice; findings supporting use of telephone reminders in those 65 years and older were rated as fair.

Level II Evidence

Winston, Mims, and Leatherwood (2007) completed an RCT within a managed care network to determine effectiveness of a telephone reminder in increasing pneumococcal vaccination rates. The study population consisted of patients at five managed care general medicine clinics in Atlanta, Georgia who were (a) 65 years or older without a chronic medical condition (elderly group, *N* = 2395) or 18 years or older with a chronic medical condition (chronic disease group, *N* = 3711) and (b) unvaccinated according to the administrative database. Older adults were identified as eligible for inclusion based on their date of birth and participation in Medicare managed care insurance. The chronic disease group included patients who had diabetes mellitus, chronic heart failure, or coronary artery disease. All patients had received reminder letters in the spring as part of a routine quality improvement project; the letters encouraged patients to schedule a visit for pneumococcal vaccination or to return the enclosed postcard if they had previously been vaccinated elsewhere. Patients who were vaccinated in the clinics or replied by postcard that they had been vaccinated elsewhere were excluded from randomization. Within each of the five clinics, a random number generator was used to allocate patients to intervention or control arms at a 1:1 ratio. Randomization was completed with the patient's primary care physician and clinic staff members blinded. Intervention and control groups were not statistically different in age, length of enrollment in the managed care network, or presence of specific chronic disease. The intervention arm of the chronic disease group did contain proportionally more men than the control arm, 945 compared with 894 ($p < .05$); gender was not statistically different in the older adult group.

Patients in the intervention arm of the Winston et al. (2007) study received a clearly described intervention. Letters were sent providing contact information for the study and stating that a nurse would call them in the next few weeks. Patients were

given the option of opting out by calling the study coordinator. Nurses were trained, given a script, and provided a standardized data collection instrument. At least four attempts were made to contact all patients randomized to telephone intervention. Nurses explained the recommendations for immunization and detailed that the vaccine was a covered benefit with no required copayment. Unvaccinated patients were asked if they would like to receive the vaccine and could schedule an immunization visit during the same phone call. Randomized controls received no additional outreach beyond the exposure to preventive services reminders regularly posted in all medical offices and the mailed reminders as noted above.

The primary outcome for intent-to-treat analyses evaluated by Winston et al. (2007) was pneumococcal vaccine administration within the 6-month period following intervention as documented by the appropriate current procedural technology (CPT) code in the administrative data base. The researchers tested categorical differences between groups using chi-square tests for proportions. Continuous data were compared using *t*-tests for means. Kaplan-Meier estimates were calculated to compare intervention and control arms. In the chronic disease group, 16% of intervention patients were vaccinated compared with 6% of controls ($p < .001$). Of the older adults, 17% of intervention patients were vaccinated compared with 8% of controls ($p < .001$). Among the chronic disease and older adults groups combined, patients in the intervention arm were 2.3 times as likely, 95% CI [2.0-2.7] to obtain immunization than patients in the control groups ($p < .001$). The intervention effect was unchanged after multivariate adjustment for age, sex, length of enrollment, and clinic group. The effect of telephone intervention versus control was similar across clinics and chronic disease and older adult strata. This study's relatively large population, practice site(s), and designed intervention provided good support for the proposed practice change.

Hambidge, Phibbs, Chandramouli, Fairclough, and Steiner (2009) conducted an RCT with 811 infants to evaluate a stepped intervention of reminder/recall/case management to increase well-child visits and immunization rates. Step 1 (all infants) involved language-appropriate reminder postcards for well-child visits (including those for immunizations). In step 2, caregivers of infants who missed an appointment or immunization received telephone reminders, a postcard, and a telephone recall. Step 3 involved intensive case management and home visitation for infants who were still behind on preventive care after steps 1 and 2. Eligibility criteria were clearly delineated. All eligible infants underwent block randomization. The randomization sequence was generated by an analyst who was not otherwise involved in the study; research assistants who opened numbered nontranslucent envelopes to assign control (n = 402) and treatment (n = 409) arms were blinded to the randomization sequence. Intent-to-treat analyses were used throughout the study. Comparisons of the intervention and control groups used bivariate techniques, including chi-square analyses for all categorical variables, t-tests for normally distributed, continuous variables, and Wilcoxon tests for non-normally distributed variables. Standard statistical software was used to conduct all analyses. Overall, 4812 postcards were sent (M = 12 per infant); 2675 telephone calls were made (M = 6.6 per infant), and 275 home visits were conducted (M = 0.7 per infant). Even with these intense interventions, results were moderate. The proportion of infants who received the recommended two vaccines for influenza increased from 31% to 43% ($p < .01$). Although improvement in vaccination rates was noted, specific data on efficacy of telephone reminders could not be extrapolated, and the intensity of this study's interventions is not congruent with the focus of the planned EBP project. Therefore, the support for the proposed project was rated as fair.

Level III Evidence

Irigoyen, Findley, Earle, Stambaugh, and Vaughan (2000) completed a controlled trial to determine if appointment reminders, blinded to vaccination status, improved kept-appointment and immunization coverage rates within a pediatric clinic serving a low-income community in New York City. Vaccination coverage was based on the harmonized schedule of the ACIP, The American Academy of Pediatrics, and the American Academy of Family Physicians; a 1-month grace period was allowed for the child to be considered up-to-date. Each patient, sequentially listed in the appointment book, was systematically assigned to one of four study groups: (a) control (*n* = 346), (b) postcard (*n* = 314), (c) telephone (*n* = 307), or (d) postcard and telephone (*n* = 306). To assess whether characteristics of patients differed by study group, the researchers collected information on insurance status and gender for a random sample of one-third of the study population. The age of the children and gender did not differ among the study groups. There was no significant difference in Medicaid coverage across all reminder groups compared with controls (92.5% vs 89.8%, *p* = .25). The proportion of children who were up-to-date prior to the appointment did not differ significantly by study group. The researchers were not able to reach 46.6% of the households assigned to the telephone group, and 53.3% of the households did not receive both the postcard and telephone reminders. Vaccination coverage rates averaged 84.1% and did not differ significantly among the control and reminder groups. But, vaccination coverage differed significantly by appointment-keeping response. Children who kept appointments were 2.3 times more likely to be up-to-date than children who missed appointments, 95% CI [1.7, 3.2]; but, the effectiveness of the reminder intervention was not apparent. Postcard or telephone reminders increased immunization rates in those who were not up-to-date at baseline (26.3% and 22.4% respectively), but the combination of postcard and telephone reminders was less effective than either individual intervention. This

study's limited receipt of interventions and inconsistent findings among treatment arms restricted applicability for the proposed practice change. But, the authors did note that appointment reminders were feasible and affordable in most practice settings. This opinion was consistent with other literature.

Level IV Evidence

Following completion of an RCT documenting 20% improvement in immunization rates, Szilagyi et al. (2002) assessed the effect of a community-wide reminder, recall, and outreach system on immunization rates between inner-city versus suburban populations and among White, Black, and Hispanic children in Monroe County, New York. Lay outreach workers were (a) trained to follow a strict reminder/recall protocol, (b) provided with a list of age-eligible children for whom they were responsible, and (c) provided a system to track and monitor immunization status of their caseload (average of 400 children per outreach worker). Immunization rates were assessed for the entire county and for three geographic regions, representing minority populations, prior to any intervention and at two other times (every 3 years). Statistical adjustments were made using commercial software to account for probability weight of 10% or 25% sampling, clustering, and stratification. Szilagyi et al. (2002) found that immunization rates rose steadily throughout the entire county, from 66% of 2-year-olds being up-to-date in 1993 to 86% in 1999. But, disparities in immunization rates between the inner city and suburbs were reduced from 18-21% in 1993 to 4-5% in 1999. Threats to validity (i.e., assessments were limited to chart review) were addressed by the researchers. Limitations were discussed. The findings of this study provided support for practice change to reduce disparities in immunization rates; however, the study did not provide evidence of the effectiveness of reminder interventions in suburban settings. Therefore, the support for the proposed project was rated as fair.

Esposito et al. (2009) evaluated whether a telephone reminder from a child's primary physician was more effective than a phone call from an alternative physician within the Institute of Pediatrics at the University of Milan, Italy. The study population included all asthmatic children older than 3 years who were regularly cared for at the Institute's asthma clinic (*N* = 315). Children were randomly assigned to one of three groups using a computer-generated randomization list: (1) those whose mothers were to be called by a pediatrician not previously involved caring for their child and would receive influenza vaccine within the immunization clinic, (2) those whose mothers were to be called by their asthma specialist and would receive influenza vaccine within the immunization clinic, and (3) those whose mothers were to be called by their asthma specialist and would receive influenza vaccine within the asthma clinic. Twenty patients were not included in the study group because telephone calls were not answered. The three groups were similar in terms of gender, age distribution, severity of asthma, previous history of allergy, and previous use of influenza vaccine. Data were analyzed using commercially available software. The Kruskal-Wallis test was used when data were not normally distributed or were non-parametric. Categorical data were analyzed using contingency tables and chi-square or Fisher's test. Relative risk and corresponding 95% confidence interval of immunization were computed to compare rates between the groups. Each group had a 10 percentage point increase in immunization rate; children who were followed most closely within the asthma clinic had the most significant increase in immunization rates (38% for the previous year, compared with 58% at study completion; *OR* = 1.26). This study's small sample size limits strength of findings, but the increased immunization rates within the group cared for by their trusted physician supports the proposed practice change.

Level VII Evidence: Expert opinion

The Task Force on Community Preventive Services is an independent, nonfederal, volunteer body of public health and disease prevention experts, whose members are appointed by the Director of CDC. The roles of the task force are to (a) oversee systematic reviews led by CDC scientists, (b) consider and summarize review results, (c) make recommendations for interventions that promote health, and (d) identify areas that need more research. Twelve current members represent diversity within the task force: directors of public health departments, college professors, and researchers/scientists. More than 200 interventions have been reviewed and recommendations issued. The task force has taken part in systematic reviews of recall and reminders to improve vaccination rates. The original review, including the search period from 1980 to 1997 (see Briss et al., 2000), found a median increase in vaccination coverage of 12%. Twenty studies were identified in the search period 1997 to 2007 for the updated review (The Community Guide, 2010). Client remainder and recall alone resulted in a 5.1% increase in immunization coverage. The task force noted that the studies included in the 2007 review documented changes in immunization coverage of a smaller magnitude than observed in the 1997 review, but the findings remained of sufficient magnitude of effect to support a conclusion of effectiveness.
On February 27, 2008, based on these systematic reviews, the Task Force on Community Preventive Services recommended the use of client reminder and recall systems to increase community demand for vaccinations. The task force recommended the use of client reminder and recall interventions based on strong evidence of effectiveness in improving immunization coverage (a) in children and adults, (b) in a variety of settings and populations, (c) from individual practice settings to entire communities, (d) within a range of intervention characteristics (e.g., specific intervention,

method of delivery, and theoretical basis), and (e) when used as a single- or multi-component strategy.

The ACIP (2010) is comprised of 15 experts in fields associated with immunization. The experts have been selected by the Secretary of the USDHHS to provide advice and guidance to the Secretary, the Assistant Secretary for Health, and the CDC on the control of vaccine-preventable diseases. In addition to the 15 experts who serve as voting members, ACIP includes 8 *ex officio* members who represent other federal agencies with responsibility for immunization programs and 26 non-voting representatives of liaison organizations that provide related immunization expertise. The committee develops written recommendations for vaccine administration. The ACIP is the only federal governmental entity to make such recommendations. Based on studies noting the similar effectiveness of mailed and telephone reminders for increasing vaccination rates, the ACIP has recommended strategies for increasing adult vaccination rates. Recommendations noted that the use of reminders (including telephone reminders) is an appropriate strategy for private practice and managed care settings. Advantages, disadvantages, implementation steps, and outcome measurements are available on the webpage. A mailed reminder and telephone script are provided.

Synthesis of Appraised Literature

Studies included in the appraised literature revealed comparable findings and recommendations (see Appendix A). Altogether, the critically appraised literature provided good quality evidence for using reminders to improve immunization coverage across the lifespan. The systematic reviews, meta-analyses, RCTs, and cohort studies contained no major conflict in results. No major methodological concerns were identified. In studies focusing on populations other than older adults (Esposito et al., 2009; Hambidge et al., 2009; Irigoyen et al., 2000; Ndiaye et al., 2005; Szilagyi et al., 2002); there was no compelling reason not to generalize findings to the older adult population.

Two key components were integral for project support: (a) using an easy to implement intervention consistent with the vision and strategy of the office practice and (b) the ability of the selected intervention to produce short-term success that could provide momentum for the healthcare providers and support staff to continue through the change process. Although intense interventions (Hambidge et al., 2009; Szilagyi et al., 2002) have been shown to increase immunization rates by more than 10 percentage points, simpler telephone interventions have been shown to be effective in the older adult population (Hull et al., 2002; Krieger et al., 2000; Szilagyi et al., 2000; Winston et al., 2007). Krieger et al. (2000) found that older adults were 3.33 times more likely to accept an immunization after receiving a reminder phone call from an older adult volunteer. Reminders, by definition alone, have provided a cue to action. Provider recommendations, along with patient education, have often served as an impetus for change. Patient education was commonly included within multi-component interventions (Briss et al., 2000; Ndiaye et al., 2005; Stone et al., 2002). Often, data did not allow attribution to the portion of overall effect of the interventions to individual components, but suggested that combined interventions increased immunization rates (Briss et al., 2000). Increases in immunization rates, as detected within weekly tallies of vaccine intervention worksheets, were anticipated to provide the impetus for continuing progress within the processes of practice change.

Best Practice Model

The practice model recommendation developed for this project was synthesized from the best available evidence integrated from the critically appraised literature. Teamwork and collaboration were noted to be powerful intervention features for introducing practice change (Stone et al., 2002). Within this project, the team used the Iowa model to identify the system-based problem and search for solutions. This process was enmeshed with Kotter's first three steps of change and relied on input from team

members to design or tailor the intervention. The procedure guideline (see Appendix B) was supported by evidence in the literature, but addressed concerns of the healthcare providers (i.e., time and staffing) that allowed opportunities to communicate a common understanding of the goals (Kotter's fourth step) and empowered the healthcare team with an action plan (Kotter's fifth step). This author proposed that implementing the best practice protocol would demonstrate that the use of a telephone reminder, as compared to standard practice of brief education and provider recommendation, increased pneumococcal vaccination coverage for Medicare recipients.

CHAPTER 3

METHOD

Setting and Sample

The EBP project was initiated within the office of Dr. Michael Kovacich in Merrillville, Indiana, a practice consisting of three healthcare providers who have collaborated for more than 11 years. The healthcare providers included a family physician working a 40-hour week and two the nurse practitioners splitting a full-time position. The ANP worked 32 hours per week, while the FNP (project facilitator) was scheduled 8 hours per week. Although the office has been designated as family practice, approximately 90% of the patients seen are adults; more than 30% are Medicare recipients with chronic health conditions. (M. Kovacich, personal communication, February 19, 2010). Medicare recipients have accounted for approximately 60% of daily office visits (M. Kovacich, personal communication, February 19, 2010). The patient mix was noted to be approximately 50% White, 25% Black, and 25% Hispanic (M. Kovacich, personal communication, July 6, 2010). The practice was not accepting new patients; as a result, the practice was reported to have a steady population: the number of older adult patients transitioning to Medicare has been equivalent to the number of older adults leaving the practice due to relocation (including extended care facilities) or death.

The office has been owned and managed by Community Care Network Physicians. As a practice within the Community Care Network, the office was affiliated with St. Mary Medical Center, a 190-bed acute care hospital which offers a wide range of healthcare services to meet the needs of older adults in Lake and Porter counties (M. Kovacich, personal communication, July 6, 2010). St. Mary Medical Center, Inc., a 501 (c) (3) non-for-profit entity within the Community Healthcare System, has grown within

the past ten years to become Northwest Indiana's largest integrated healthcare system (Community Healthcare System chief operating officer, personal communication, February 17, 2010). The parent company, Community Foundation of Northwest Indiana, Inc., has strived to capitalize on opportunities to increase overall growth, improve operative efficiency, and better serve patients, healthcare providers, and employees (Community Health System chief operating officer, personal communication, February 17, 2010). These goals were consistent with the objective of this EBP project: to determine the effectiveness of a telephone reminder system in improving pneumococcal immunization rates of Medicare recipients. The practice setting provided access to the convenience sample targeted for this intervention: Medicare recipients seen within the practice from September 1, 2010 to November 10, 2010 who had not previously received the PPSV or had received the vaccine once, but longer than 5 years ago.

Outcomes

Two major outcomes were evaluated within this EBP project. Consistent with the supporting literature, the primary outcome of interest within this project was a percentage point increase in PPSV immunization rate. Additionally, it was essential to determine the effectiveness of the telephone reminder in increasing PPSV rates, as compared to provider recommendation.

Data

Data collected on site confirmed the healthcare team's identified need for the project. Immunization rates prior to project implementation, as calculated following a chart audit of active patients revealed 487 (33.45%) of the 1456 Medicare recipients were up-to-date on pneumococcal vaccine. Based on the chart audit data, the healthcare team targeted a 20-percentage-point increase in PPSV to approximate Indiana's rates (56.7% of 65 to 74 year olds; ISDH, 2008). Originally, the project was

designed to have the number vaccinated during the project added to the baseline data with the percentage increase calculated. Because of the discovery of inaccuracies in the immunization records, a chart audit was completed at the end of the project to obtain a more accurate reflection of immunization rates. To determine the telephone reminder's effectiveness for increasing PPSV rates, as compared to provider recommendation and brief education, chi-square analyses were undertaken. Chi-square analyses were also used to compare additional variables of interest: gender, ethnicity, length of time within the practice, and healthcare provider seen during the immunization visit. The associations between age and trigger to immunization, as well as additional variables of interest, were analyzed using *t*- tests and ANOVA.

Practice Change Implementation

Preparation for practice change required significant early preparation to ensure protection of human subjects. In the early planning stages, the project facilitator completed training through the National Institutes of Health focusing on the protection of human subjects. The project facilitator was in agreement with the ethical principles regarding all research involving humans as subjects as set forth in the report of the National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research titled, "The Belmont report: Ethical principles and guidelines for the protection of human subjects of research" (1979). The project was approved by Valparaiso University's Institutional Review Board (IRB) and reviewed by the IRB chair for Community Healthcare System. Because the project was based within the facilitator's practice and involved no additional hospital resources, Community Healthcare System's IRB determined approval was not required.

Additional early planning was essential to maximize project success. As noted previously, the healthcare team, consisting of the providers within the office, selected a potential target based on a perceived need. Obtaining support from the

collaborative physician was key. The collaborative physician was involved as a team member identifying the need for the project, reviewing the evidence, and providing final approval for the project. His support streamlined the initial planning phases and helped define the role of support staff.

Maintaining a sense of teamwork, consistent with the Iowa model and Kotter's steps of change, was a key component of project development. It was essential that the project did not require any additional hours by paid staff members, since the practice budget did not allow for additional expenditures. Therefore, the project facilitator initiated a significant portion of the preparatory work through unpaid hours that were included in the requirements of doctoral coursework. Prior to project implementation, the project facilitator held weekly staff meetings, designed and prepared instruments for data collection, and developed a script for the telephone reminder and exit interview/query. The healthcare providers and staff members played an active role in project planning; all participants were afforded ample opportunity to review the procedures and provide feedback, critique, and suggestions for revision prior to project implementation. One specific suggestion involved shortening the project's end from the proposed date of November 15th to November 10th. Limiting the project to a 10-week period was anticipated to facilitate weekly tabulation of data.

Roles of all team members (e.g., the medical assistant's need to maintain vaccine supply) were thoroughly detailed. The project facilitator maintained a dual role throughout the project (as a clinician recommending pneumococcal vaccination when appropriate and as a researcher collecting data), but remained conscious of ethical concerns and potential conflicts between these roles. Vaccine supply orders from the previous year's influenza season were used to estimate the vaccine needed; the initial vaccine ordered for project implementation was twice that of previous years. The

vaccine supplier assured the medical assistant (MA) and project facilitator that replacement supplies would be available for overnight shipment if needed. Once received, the PPSV doses were stored in the refrigerator within the laboratory where the MA performed her daily phlebotomy duties. The MA was responsible for checking supplies daily and reordering additional vaccine once less than 20 doses remained. The project facilitator copied and stored all data collection forms in clearly labeled folders within an easily accessed drawer within the NPs' office; the project facilitator was responsible for ensuring that an adequate supply of worksheets were available for daily use. The standardized script to be used by the radiology technician (RT) when reminder phone calls were made was printed, laminated, and placed in a clearly visible location on the cork board, in close proximity to the telephone, at the RT's desk.

The practice change was implemented in a multi-step format from September 1 to November 10, 2010. During that time, the RT used the following day's patient schedule to identify Medicare recipients; when reminder phone calls were completed prior to the next day's office visits (standard practice), Medicare recipients received an additional standardized script: "Medicare Part B covers the pneumonia vaccine. Be sure to ask your provider about the benefits and to ensure you are up-to-date on your immunization." During the regularly scheduled visit, patients were placed in an examination room by the MA (standard practice). The patients were then seen by the next available healthcare provider, unless the patient requested to be seen by a particular practitioner (standard practice). All eligible patients were offered the pneumococcal vaccine by the provider. Medicare recipients with dementia or severe psychosis, who presented without a healthcare representative, were excluded from participating in the project. Consistent with the established practice standards, those declining immunization had rationale listed within dictated office notes.

Those accepting immunization were queried upon discharge to determine the primary reason for acceptance (previous day's reminder phone call, today's provider recommendation and brief education [standard practice], or other). The nurse practitioners (NPs) discharged their own patients; the MA discharged the physician's patients. The following script was used for all participants: "We are evaluating our office's immunization practices, and it would be helpful know what intervention triggered your acceptance of today's pneumonia vaccine: yesterday's reminder phone call; today's provider recommendation; or something else?" Agreeing to answer the question implied consent. Patients' decisions to answer or not answer would not affect their future care within the practice.

Data Collection

Data collection was initiated following patient discharge from the office. Names were initially recorded on a participant code sheet to facilitate tracking of incomplete data. The NPs recorded the patient's name on the Pneumococcal Vaccine Intervention Participant Code Sheet (see Appendix C) in sequential order using the first available code number. For patients seen by the physician, the MA discharging the patient entered the name on the code sheet. To avoid duplication of code numbers, the NP's sheet used odd numbers; the MA's sheet used even numbers. The assigned code number was then used to ensure anonymity of additional collected data. Following patient discharge, the NP or MA logged demographic data and primary reason for immunization on the Pneumococcal Vaccine Intervention Worksheet (see Appendix D). During the work day, the worksheet and coding sheet were kept separated in a private area within the NPs' office and the MA's work station. At the end of each work day, data were secured within locked drawers within the NPs' office and the MA's work station. At the end of each business week, the project facilitator tallied the Pneumococcal Vaccine Intervention Worksheet information. The tallied sheets were then secured in a locked drawer within

the NPs' office; participant code sheets were secured in a separately locked drawer within the NPs' office.

Consistent with Kotter's steps of change, the healthcare team focused on attaining short-term goals during the data collection process. Weekly meetings were scheduled to discuss progress. The project facilitator reviewed the weekly tally of immunizations at each meeting. The team agreed to focus on "short-term gains"; the project facilitator provided reinforcement (e.g., home baked snacks) after every 20 immunizations. The weekly tally reports had a positive impact on the physician, motivating him to "keep up with the girls".

The weekly meetings and review of data collected identified issues that required revision to the project protocol and addendum to IRB. Initially only two to three patients were immunized each day. The healthcare team explored rationale for limited vaccine acceptance and found that a significant number of patients, who did not have record of receiving the PPSV, actually had received the vaccine outside of the office. Therefore, the accuracy of the initial chart audit was suspect. Furthermore, the healthcare team had not developed a project procedure for tracking the number of those immunized elsewhere. Thus, the healthcare team then determined that immunization records would be updated (standard practice) and an additional chart audit would be undertaken after project completion.

The post-project chart audit was completed on November 12 and November 13, 2010. Findings from the chart audit, along with additional data collected during the project, are detailed in Chapter 4.

CHAPTER 4

FINDINGS

This EBP project was designed to determine a time-efficient approach to improving PPSV rates for Medicare recipients within the Northwest Indiana multi-provider practice. Specifically, the healthcare team developed the project to determine if a telephone reminder, as compared to standard practice of brief education and provider recommendation, would increase PPSV rates within this population. The following data analyses detail project outcomes and compare the effectiveness of the telephone reminder, for vaccine acceptance, to the previous standard practice of provider recommendation.

Sample Characteristics

One hundred thirty-three patients, ranging in age from 65 to 100 years (*M* = 76.65 years) were immunized during the 10-week project. Upon project completion, 1454 Medicare recipients remained within the practice; there was a net loss of two patients due to death or relocation during the 10-week period. Overall vaccine acceptance was similar in men (*n* = 68) and women (*n* = 65). The vast majority of patients who accepted the vaccine (96.24%) had been in the practice for more than 5 years. Although the practice population was reported as 50% White, 25% Black, and 25% Hispanic, a higher proportion of patients vaccinated were White (64.66%), as compared to Black (18.8%), or Hispanic (16.54%). Forty patients were immunized during a physician visit, and 93 patients were immunized during a nurse practitioner visit: 54 during a visit with the ANP and 39 during a visit with the FNP. Demographic characteristics of those accepting the PPSV, by provider, are shown in Table 4.1. There was no significant difference in gender, years in the practice, ethnicity, or mean age among providers.

Changes in Outcomes

The one hundred thirty-three patients immunized represented a 6-fold increase in PPSV, as compared to the 22 patients receiving PPSV during the 2009 influenza season. When the 133 immunized patients were added to baseline chart audit data, the PPSV rate increased only a modest 9.13 percentage points (from 33.45% to 42.58%). But, additional changes in outcome reflected not only an increase in the number immunized, but also an increased accuracy in immunization records. The final chart audit, which included those immunized during the project plus those whose immunization records were updated during the project, revealed that 898 of the 1454 Medicare recipients (61.76%) were up-to-date on the PPSV. Although this percentage does not approximate Healthy People 2010's goal of 90% immunized, the figure is more congruent with Indiana data: 56.7% of Hoosiers 65 to 74 years of age and 75.9% of those 75 and older (ISDH, 2008).

Table 4.1

Demographic Characteristics of Those Accepting PPSV by Provider

	Total	MD	ANP	FNP	Significance (*p* value)
Gender					
Female	65 (48.87%)	21 (52.5%)	25 (46.3%)	19 (48.72%)	.650
Male	68 (51.13%)	19 (47.5%)	29 (53.7%)	20 (51.28%)	.262
Years in Practice					
< 1	1 (0.75%)	1 (2.50%)	0 -----	0 -----	-----
1-5	4 (3.00%)	3 (7.50%)	1 (1.85%)	0 -----	-----
> 5	128 (99.96%)	36 (90.00%)	53 (98.15%)	39 (100%)	.254
Race					
Black	25 (18.8%)	9 (22.5%)	12 (22.22%)	4 (10.25%)	.141
Hispanic	22 (16.54%)	9 (22.5%)	8 (14.81%)	5 (12.82%)	.554
White	86 (64.66)	22 (55.5%)	34 (62.97%)	30 (76.92%)	.272
Mean Age	76.65	76.48	76.42	77.24	.744

Statistical testing and significance

To determine the effectiveness of the telephone reminder, chi-square analyses were conducted using commercially available software (PASW [Predictive Analytics SoftWare] Statistics 18). Chi-square analyses were also used to compare the relationship between providers and trigger, as well as to evaluate variables of interest: race/ethnicity, gender, and length of time within the practice. Mean ages of participants were compared using *t*-tests for means. Statistical significance for all analyses was established as $p < .05$.

Findings

Overall, the telephone reminder was no more effective than provider recommendation as a trigger for immunization. Although a higher percentage of patients immunized during the project reported the telephone reminder as the intervention triggering vaccine acceptance, there was no statistically significant difference between interventions (54.89% of patients reported telephone reminder; 45.11% reported provider recommendation, $X^2 = 1.271$, $p = .260$). Furthermore, the telephone reminder was no more effective than provider recommendation for any race, gender, age, or number of years in practice (see Table 4.2). But, a difference between providers was noted. Significantly more patients immunized during a physician visit reported the telephone reminder as the main trigger for vaccine acceptance (80%, compared to 20% reporting the provider recommendation, $X^2 = 14.400$, $p = .000$). In contrast, patients seen by the ANP, working 32 hours per week, were more likely to report the provider recommendation as their trigger for vaccine acceptance (66.67%, compared to 33.33% reporting telephone reminder, $X^2 = 6.00$, $p = .014$). Those seen by the FNP (project facilitator), working 8 hours per week, were nearly as likely to report the telephone reminder as the provider recommendation (58.97% reporting telephone reminder, as compared to 41.03% reporting the provider recommendation, $p = .262$). Regardless of

provider, patient age, and patient gender, those accepting the vaccine were more likely to have been a patient within the practice for more than five years (p = .000) and were more likely to be White than Black or Hispanic (p = .000). Males were equally divided on the trigger for vaccination: 34 reported the telephone reminder; 34 identified the provider recommendation (see Table 4.2). Although more women reported the telephone reminder as the trigger for PPSV (60% reporting telephone reminder vs. 40% reporting provider recommendation), the difference did not reach statistical significance (X^2 = 2.6, p = .107). Secondary analyses were completed to evaluate for differences within the provider groups; results have been incorporated into Table 4.1. ANOVA was used to compare age. There was no difference in age of patients among providers or between races, gender, or years within the practice. But, throughout all evaluation, the number of patients immunized during the project who were in the practice less than 1 year (n = 1) or from 1-5 years (n = 4) limited the ability to perform additional data analyses.

Table 4.2

Comparison of Telephone Reminder and Provider Recommendation

	Telephone Reminder	Provider Recommendation	Significance (*p* value)
Total	73	60	.260
Provider			
MD	32	8	.000
ANP	18	36	.014
FNP	23	16	.262
Years within Practice			
< 1	1	0	----
1-5	2	2	----
> 5	70	58	.242
Race			
Black	15	10	.317
Hispanic	10	12	.670
White	48	38	.281
Gender			
Female	39	26	.107
Male	34	34	1.00
Mean Age	75.38	78.20	.355

CHAPTER 5

DISCUSSION

This EBP was designed to answer the PICO question: Does the addition of a telephone reminder, as compared to the standard practice of brief education and provider recommendation, increase pneumococcal vaccination rates? Although a marked increase in immunization rates occurred as a result of project implementation, an examination of key factors playing a role in successful implementation was warranted. Essential elements of the Promoting Action on Research Implementation in Health Services (PARIHS) framework (McCormack et al., 2002) were used to guide a thorough evaluation of the project. In this chapter, the elements of the PARIHS framework (evidence, context, and facilitation) were explored in the perspective of integrating an evidence-based strategy to increase PPSV rates in older adults.

Explanation of Findings

Evidence.

A decade of research focusing on barriers to immunization and specific strategies to increase vaccination rates has yielded a high-quality evidence base. As a result, the healthcare team taking part in this EBP project had access to systematic reviews and meta analyses (Briss et al., 2000; Jacobson Vann and Szilagyi, 2005; Ndiaye et al., 2005; Stone et al., 2002; Szilagyi et al., 2000) as well as primary research (Esposito et al., 2009; Hambidge et al., 2009; Irigoyen et al., 2000; Szilagyi et al., 2002; Winston et al., 2007) focusing on the effectiveness of specific patient and provider reminders. Using the Iowa Model of Evidence-Based Practice to Promote Quality Care, the healthcare team reviewed literature critically appraised and summarized by the project facilitator. The literature revealed comparable findings and recommendations,

and provided a high level of quality evidence demonstrating the effectiveness of simple telephone interventions in older adults.

Although the supportive research evidence assisted the team in the decision making process, the clinical experience of the healthcare providers played a significant role in project selection and development. Given their clinical experience with this patient population, the team members determined that the research provided was consistent with the needs of the practice. Additionally, patient preferences were judiciously weighed within the early planning stages. In addition to research on patient beliefs and preferences (Holmboe et al., 2001; Mieczkowski & Wilson, 2002; Santibanez et al., 2002), the healthcare providers, based upon their close relationship with many of the older adults in the practice, were able to consider patient preferences during project development. The team determined that this EBP project was appropriate for the clinical setting based on the targeted patient population.

Context and Facilitation.

According to McCormack et al. (2002), healthcare is provided in a variety of contexts that are influenced by individual economic, social, and political factors. Furthermore, McCormack et al. noted that organizational culture, leadership, and evaluation characterize the concept of context.

Within this EBP project, economic, social, and political factors impacted the organizational culture. From the start, the project facilitator was given support from the parent organization, but was advised that the project needed to be completed at no additional cost to the practice. Therefore, budgetary concerns were paramount. Vaccine supply costs were offset by Medicare reimbursement, but profit margins on vaccines were minimal; therefore, the project did not generate any significant additional revenue for the practice. Yet, upon project completion, although no analysis of cost-effectiveness analysis was conducted, the healthcare team determined the telephone reminder was an

inexpensive and time-efficient strategy to increase PPSV rates within this practice. As a result of budgetary constraints, the project facilitator spent a significant amount of "volunteer" time within the office. The extra time may have impacted the number of patients seen by the FNP, but also appeared to alter the social culture of the practice. Initially, the culture was somewhat divided or tiered. The NPs readily accepted the need to vaccinate older adults, while the actions of the physician were discordant with his previously vocalized commitment to the EBP project. Early in the project, the only patients immunized during a physician visit were vaccinated on days when the FNP project facilitator was working in the office. This trend did change over time; but early on, the NPs readily began vaccinating patients, incorporating PPSV education into the education routinely provided for influenza vaccination during the same period of time. Within this practice, the NPs have been known to spend more time in health promotion activities and patient education. The MD, who must focus on productivity demonstrated by patient volume to maintain his income, spends much less face-to-face time with patients; thus, less time has been allotted for health promotion and patient education. The length of time within the examination may indeed have been a major reason why the telephone reminder was more efficient for patients seen by the physician. In contrast, organizational politics may have played a role in limiting the patients immunized during a physician visit. It was questioned if the physician saw more complex patients who had recently been hospitalized, since the NPs were not allowed to admit and did not make hospital rounds. Therefore, patients seen by the physician may have been vaccinated during a recent hospitalization stay and would not be eligible to accept vaccination during the project. Unfortunately, the project was not designed to track these data.

Leadership within this organization was guided by the Iowa model. Because the Iowa model relies on a healthcare team, leadership was initially designated as the triad of healthcare providers. Because the team members had worked together for more than

10 years, each individual was well aware of the strengths of each member. In general, roles of the office staff were clear at the time of project initiation. Although the ultimate approval came from the collaborative physician, initial decision-making was democratic and inclusive. After the project was decided upon, the physician deferred many decisions to the facilitator, blurring the leadership role. As a result, the FNP took on a dual role: as leader and project facilitator.

Rycroft-Malone et al. (2002) noted that successful facilitation of evidence into practice requires that the purpose and role of the facilitator be clear. Although this project facilitator held a dual role, the facilitator's experience within the office setting provided a seamless transition between roles. As a leader, the facilitator focused on developing a team, noting that participation of the entire staff was necessary for project success: from scheduling patients, billing for services, and maintaining adequate vaccine supply to documenting the demographics and trigger for vaccine acceptance. Throughout planning and implementation, each office member was encouraged to provide input, and all feedback was positively acknowledged; several suggestions were incorporated into the EBP project procedure. This empowering approach to project management was well received by participants.

Undoubtedly, the role transition was facilitated by the facilitator's subject knowledge. As a clinical doctorate student completing her final coursework, the facilitator systematically gathered and critiqued evidence. Furthermore, the FNP's experience with the patient population, as well as knowledge and perception of the "inner workings" or politics of the office setting facilitated the FNP's role as a change agent and were vital to project success. Drawing on the strengths and personalities of each individual, the facilitator adopted a multifaceted approach, tailoring and combining techniques to promote team cohesiveness.

Although many positive influences were noted, facilitation was not without its limitations. The team, under the guidance of the facilitator, determined a chart audit was the appropriate method for obtaining baseline data. Based on the chart audit, the team targeted the 20 percentage point increase in immunizations as a measure of project success. But, early within the implementation phase, the healthcare team became very aware of gross deficiencies in medical records. More patients seen were actually having their immunization records updated, because they had received the vaccination outside the practice, as compared to those who were accepting the vaccine. The project was not designed to monitor needed updates to immunization records. When this oversight was found, the facilitator initially suspected an unrealistic goal was set for project success. But, the FNP project facilitator also questioned whether the designed project was necessary: Would a more appropriate project have focused solely on improving medical record documentation?

Implications for Theory

The Iowa Model of Evidence-Based Practice to Promote Quality Care, with its focused triggers, team formation, and critique and synthesis of research, served as an appropriate guide to project selection. The incorporation of a healthcare “team” fit well within this practice of three healthcare providers. The model was also appropriate for monitoring and analyzing the structure, process, and outcome data in the terms of environment, staff, cost, and patients. But the Iowa model had its limitations for use within this EBP. Unfortunately, the Iowa model provided little guidance to proceed through the implementation process. The lack of guidance was particularly important in this organization that was not previously ingrained within a culture of change. Because of this limitation, Kotter’s eight steps of change (Kotter, 1996) were more essential to sustaining the processes necessary for project success.

Using Kotter's sixth change step, the project facilitator was able to provide feedback on the team's performance during weekly meetings. The data revealed within the meetings served as a form of audit and feedback. The meetings had positive outcomes, inspiring the project to succeed and providing insight into unanticipated outcomes. For example, as noted previously, the MA discharges all the patients seen by the MD, but the NPs discharge their own patients. At one luncheon meeting, the ANP questioned whether her own patients would feel comfortable discounting today's education in favor of yesterday's reminder for fear of "getting her in trouble" or seeming less than appreciative of the time spent in education. Additionally, during a weekly luncheon meeting in early October, the physician became aware that he was being "soundly beaten" by "the girls". This information served as an additional incentive, becoming a driving force for the physician's increased participation and resulting in an increase in the number of individuals vaccinated during a physician visit.

Implications for Research and Education

Despite the success of this EBP, ethnic disparities remain a concern. This EBP project, as designed and implemented, did not track those who declined immunization. Although the rationale for decline was dictated with the day's office note (standard procedure), the data collection worksheets did not include patients who declined immunization; thus, the project facilitator was unable to evaluate the reason for vaccine non-acceptance. This has significant importance because evaluation of this EBP revealed that the majority of patients accepting vaccination were White. Blacks and Hispanics were immunized to a lesser extent than anticipated given the typical patient mix. Although these data were consistent with previous literature (CDC, 2010; Hebert et al., 2005; O'Malley & Forrest, 2006; Szilagyi et al., 2002; Winston et al., 2006), one could question if fewer minority patients were actually seen during the project or if the initial demographic data provided by the collaborative physician were accurate.

Nonetheless, additional research is needed to determine why ethnic populations decline immunizations when recommended by the provider and/or when patient reminders are used. Further research should then focus on overcoming the identified barriers so that ethnic minorities receive the same benefits of disease prevention strategies as their White counterparts.

The limitation of not tracking data on those who declined immunization also raised another questioned that could be answered by additional research. Nearly all those who accepted the PPSV during the project were in the practice for more than 5 years. The team questioned if the statistic obtained during data analysis was a true indication of the majority of Medicare recipients seen during the period of project implementation. But, the healthcare team also had to consider if those who declined immunization differed in length of time within the practice from those accepting vaccination. Previous research has shown the main reason for vaccine acceptance is provider recommendation (Ehresmann et al., 2001; Nowalk, Zimmerman, & Feghali, 2004; Santibanez et al., 2002), but will research show that the length of the provider-patient relationship impacts the likelihood of accepting a vaccine based on provider recommendation?

Also, when final data for this EBP were presented, the healthcare team noted that, although not statistically significant, more women than men reported the telephone reminder as the trigger for immunization. This led the team to explore whether women in the household were more likely to answer the phone and receive the reminder. The team also questioned how many reminders were not relayed to the intended patient, left on answering machines, or missed altogether. Because the project was not designed to determine if the patient was the individual who actually received the reminder, the impact on results cannot be determined. Furthermore, within the literature reviewed by the project facilitator, no study evaluated accurate receipt of the reminder. Therefore, these

questions cannot be answered, and their impact on data interpretation cannot be determined.

Conclusion

Overall, the project was considered a significant success. But, the ability to measure the ultimate outcome was limited, because providers will need to wait a prolonged period of time to evaluate a decrease in the morbidity and mortality related to invasive pneumococcal disease. The relatively small number of patients within the practice further complicates the ability to track reduction in morbidity and mortality. Nonetheless, the doctorally-prepared FNP was the ideal candidate to lead this EBP. Additional education provided the APN with the knowledge and tools to become a transformational leader: inspiring, challenging, and enabling others throughout the change process. Within this project, the change began as a vision for improving health care for older adults, continued as the FNP perused through a wealth of information, and ultimately manifested in project completion. The Iowa model was an appropriate guide to project selection, but provided less guidance for sustaining implementation process. Instead, Kotter's steps of change proved to be essential to ensuring the continued participation of healthcare providers. Team members developed a common understanding of goals and direction; focusing on short-term successes provided momentum to overcome complacency and achieve the overall goal. Participation in this EBP has now launched an organizational change, albeit with some initial reluctance from the physician, which is anticipated to be applied to other health promotion activities. The small number of patients included within this project involving three healthcare providers and their support staff may limit its applicability to organizational change within larger facilities. But, there are now 133 older adults who are at decreased risk for morbidity and mortality related to invasive pneumococcal disease.

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BIOGRAPHICAL MATERIAL

Julie A. Koch

Ms. Koch received her BS with a Family Nurse Practitioner (FNP) Certificate from Purdue University Calumet in 1989. She worked as a nurse practitioner making hospital rounds with a thoracic, vascular, and general surgeon until taking a position with a Merrillville-based family practitioner in 1993. As a Board Certified FNP, Ms. Koch has precepted a number of advanced practice nursing (APN) students from northwest Indiana. The preceptorship experiences heightened her desire to further her education. Ms. Koch completed her MSN with an Adult Health Clinical Nurse Specialist focus at Valparaiso University in 1998 and joined the faculty shortly thereafter. She is currently teaching in the college's graduate nursing program, focusing on clinical application of the APN role, and continuing to mentor FNP students. Ms. Koch is an active member of the American College of Nurse Practitioners, the American Academy of Nurse Practitioners, the Coalition of Advance Practice Nurses in Indiana, and the Society of Nurses in Advanced Practice. She was inducted into the Zeta Epsilon Chapter of Sigma Theta Tau International Honor Society of Nursing in 1998 and has held multiple officers' positions, most recently serving as Chapter President from 2008 to 2010. Focusing on clinical case studies and chronic disease management, Ms. Koch has published a number of articles within APN journals and has presented at several national conferences, while continuing to maintain an active family practice with her collaborative physician of more than 15 years. Her clinical practice focuses on the care of older adults with chronic disease processes. Ms. Koch's expertise and her interest in maintaining health and promoting wellness in this population led to the exploration of evidence-based practice projects to improve pneumococcal vaccination rates for Medicare recipients.

ACRONYM LIST

ACIP: Advisory Committee on Immunization Practices

AHRQ: Agency for Healthcare Research and Quality

ANP: adult nurse practitioner

APN: advanced practice nurse

CDC: Centers for Disease Control and Prevention

CMS: Centers for Medicare and Medicaid Services

CPT: current procedural terminology

EBP: evidence-based practice

FNP: family nurse practitioner

HCFA: Health Care Financing Administration

IAC: Immunization Action Coalition

IRB: Institutional Review Board

ISDH: Indiana State Department of Health

MA: medical assistant

MeSH: medical subject heading

NP: nurse practitioner

PARIHS: Promoting Action of Research Implementation in Health Services

PASW: Predictive Analytic Software Statistics

PICO(S): patient population, intervention or interest, comparison intervention or status, and outcome (study design)

PPSV: pneumococcal polysaccharide vaccine

RCT: randomized controlled trials

RT: radiology technician

USDHHS: U.S. Department of Health and Human Services

APPENDIX A

Evidence Data Table

Author(s), Publication, Level of Evidence	Population, Setting	Design, Intervention(s), Comparisons	Outcomes and Effect Measures
Briss et al. (2000) *American Journal of Preventive Medicine* Reviews of evidence to improve vaccination coverage in children, adolescents, and adults *Level I*	• Across the lifespan • Inpatient and outpatient settings • Industrialized nations	• Systematic review of 42 studies from 1980-1997 • 34 intervention arms evaluated reminders or recalls used alone; 25 arms evaluated multi-component interventions	• Overall, median percentage point increase of 12% (range, -8% to 47%) • Single-component studies revealed a median percentage point increase of 8% (range, -7% to 31%); studies evaluating reminders or recalls as part of a multi-component intervention documented a median percentage point increase of 16% (range, -8% to 47%)
Esposito et al. (2009) *Vaccine* Factors conditioning effectiveness of a reminder/recall system to improve influenza vaccination in asthmatic children *Level IV*	• 285 asthmatic children < age 3 cared for within clinics associated with the Institute of Pediatrics at the University of Milan	• Cohort study; children randomly assigned to receive 1 of 3 phone-based interventions: 1) called by pediatrician not previously involved with child; receiving vaccine at immunization clinic (n = 93); 2) called by their asthma specialist; receiving vaccine at immunization clinic (n = 97); or 3) called by their asthma specialist; receiving vaccine within the asthma clinic (n = 95)	• Measured increase in influenza rates during season with intervention as compared to previous season (without intervention) ○ Arm 1 increased from 33% to 46% (p = .004) ○ Arm 2 increased from 37% to 48% (p = .014) ○ Arm 3 increased from 38% to 58% (p < .001)

Author(s), Publication, Level of Evidence	Population, Setting	Design, Intervention(s), Comparisons	Outcomes and Effect Measures
Hambidge et al. (2009) *Pediatrics* A stepped intervention increases well-child care and immunization rates in a disadvantaged population *Level II*	• 811 infants born at Denver Health Medical Center and 3 of its affiliated community health centers	• RCT (*n* = 399 control; *n* = 408 intervention) • Intervention in three steps: 1) postcard reminder for WCC; 2) a telephone reminder and postcard if WCC or immunization missed; and 3) case management and home visit	• 30 children required only step 1, 228 children required only steps 1 and 2, 150 children required steps 1, 2, and 3 • The proportion of infants who received the recommended 2 influenza vaccines increased from 31% to 43% ($p < .01$)
Irigoyen et al. (2000) *Pediatrics* Impact of appointment reminders on vaccination coverage at an urban clinic *Level III*	• 1273 children ages 4 through 18 months seen at a pediatric clinic serving low-income community in New York City	• Controlled trial without randomization • Each child was systematically assigned to one of four study groups: 1) control (*n* = 346); 2) postcard (*n* = 314); 3) telephone (*n* = 307); or 4) postcard and telephone (*n* = 306) • Researchers were not able to reach 46.6% of households assigned to telephone reminder, and 53.3% of the households assigned to group 4 did not receive both the postcard and telephone reminders	• Vaccination coverage rates averaged 84.1% and did not differ significantly among the control and reminder groups • Vaccination coverage differed significantly by appointment-keeping response; children who kept appointments were 2.3 times more likely to be up-to-date than children who missed appointments, 95% CI [1.7, 3.2] • Postcard or telephone reminders increased vaccination rates (26.3% and 22.4% respectively), but the combination of postcard and telephone reminders resulted in only a 6.8% increase compared with 9.1% in the control group

Author(s), Publication, Level of Evidence	Population, Setting	Design, Intervention(s), Comparisons	Outcomes and Effect Measures
Jacobson Vann & Szilagyi (2005) *Cochrane Collaboration* Patient reminder and recall systems to improve immunization rates *Level I*	• Across the lifespan • Inpatient and outpatient settings • Industrialized nations	• Update of 2000 systematic review • Subgroup analyses were performed by major immunization category: childhood, preschool, adult influenza, and other adult immunizations (hepatitis B, (pneumococcal, and tetanus)	• For other adult vaccines, all 6 studies demonstrated higher immunization rates in patient reminder or recall intervention groups; pooled random effect summary without unit of analysis errors was 2.19, 95% CI [1.21, 3.99]
Ndiaye et al. (2005) *American Journal of Preventive Medicine* Interventions to improve influenza, pneumococcal polysaccharide, and hepatitis B vaccination coverage among high-risk adults *Level I*	• Adults and practices managing care of adults with risk factors making them susceptible to a disease • Inpatient and outpatient settings • Industrialized nations	• Systematic review of 35 primary research studies published from 1980-2001 • 23 studies evaluated multi-component interventions; 16 included client reminders plus other interventions • 1 study evaluated effectiveness of reminder systems when used alone	• Median difference in vaccination coverage among the 16 studies evaluating client reminder plus other interventions was 14% (range, -2 to 28.9%) • One included study, Brimberry (1988), noted a 9.3% increase when telephone reminders were combined with expanded office hours for vaccination
Stone et al. (2002) *Annals of Internal Medicine* Interventions that increase use of adult immunization and cancer screening services: a meta-analysis *Level I*	• Adults and older adults • Outpatient focus • Industrialized nations	• A review of 95 RCTs and 13 controlled clinical trials; meta-analysis of 81 of these studies that compared intervention to usual care • 29 studies in the meta-analysis focused on adult immunizations	• Adjusted *OR* for patient reminders to increase immunization rates was 2.52, 95% CI [2.24-2.82] • Patient reminders did include telephone interventions

Author(s), Publication, Level of Evidence	Population, Setting	Design, Intervention(s), Comparisons	Outcomes and Effect Measures
Szilagyi et al. (2000) *JAMA* Effect of patient reminder/recall interventions on immunization rates: A review *Level I*	• Across the lifespan • Inpatient and outpatient settings • Industrialized nations	• Systematic review of 41 studies published through 1998 evaluating effectiveness of reminder/recall systems • 7 studies evaluated use of telephone reminders in adults: 5 influenza vaccine and 2 "other" vaccines (pneumococcal and tetanus)	• In the 2 studies focusing on "other" vaccines in all populations, telephone reminders increased vaccine rates 24.1% (range, 20.8-27.4%), *OR* = 9.61 • Reminder interventions in 2 studies of adults ≥ 65 years increased pneumococcal immunization rates 10.0%
Szilagyi et al. (2002) *Pediatrics* Reducing geographic, racial, and ethnic disparities in childhood immunization rates by using reminder/recall interventions in urban primary care practices *Level IV*	• Newborn to 2- year-olds (White, Black, and Hispanic) • Primary care practices within inner-city Rochester, NY and Monroe Co.	• Cohort study assessing the effect of a community-wide reminder, recall, and outreach system in immunization • Lay outreach workers were trained to follow a strict reminder/recall protocol and tracked immunization status of their caseload	• Immunization rates rose steadily throughout the entire county, from 66% of 2-year-olds being up-to-date in 1993 to 86% in 1999 • Disparities in immunization rates between inner city and suburbs were reduced from 18-21% in 1993 to 4-5% in 1999
Thomas et al. (2009) *Vaccine* Systematic review of interventions to increase influenza vaccination rates of those 60 years and older *Level I*	• Adults age 60 and older • Inpatient and outpatient settings • Industrialized nations	• Systematic review of 44 primary research articles grouped studies by type of intervention using the PICOS format • 8 studies were included in meta-analyses	• 3 of the 8 studies used telephone reminders in combination with other interventions; *OR* = 0.94 to 1.27 • Krieger (2000) reported increased immunization rate when older adult volunteers called participants (*OR* = 3.33, *p* = .0002)

Author(s) Publication, Level of Evidence	Population, Setting	Design, Intervention(s), Comparisons	Outcomes and Effect Measures
Winston et al. (2007) *American Journal of Managed Care* Increasing pneumococcal vaccination in managed care through telephone outreach *Level II*	• Patients at 5 managed care general medicine clinics in Atlanta, GA who were 65 years or older without a chronic medical condition or 18 years or older with a chronic medical condition	• RCT of 2395 healthy older adults (*n* = 1197 control; *n* = 1198 intervention) and 3711 adults with a chronic medical condition (n = 1866 control; n = 1845 intervention) • Trained nurses called patients, explained recommendations for immunization, and detailed that the vaccine was a covered benefit with no required copayment	• In the chronic disease group, 16% of intervention patients were vaccinated compared with 6% of controls ($p < .001$) • Of the older adults, 17% of intervention patients were vaccinated compared with 8% of controls ($p < .001$) • Among the chronic disease and older adults groups combined, patients in the intervention arm were 2.3 times as likely, 95% CI [2.0-2.7], to obtain immunization than controls ($p < .001$)

APPENDIX B

Pneumococcal Vaccination Telephone Reminder Procedure

PROCEDURE TITLE:		Telephone Reminders to Improve Pneumococcal Vaccines for Medicare Recipients	
AUTHOR:	Julie A. Koch, MSN, RN, FNP-BC	APPLICABLE TO:	Healthcare Providers and Support Staff within the office of Dr. Michael Kovacich
DATE ORIGINATED:	7/10	DATE EFFECTIVE:	9/10
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GENERAL INFORMATION:

Streptococcus pneumoniae-associated infections are a significant cause of morbidity and mortality in older adults; still, only slightly more than one-half of Hoosiers 65 to 75 of age report ever having received a pneumococcal vaccine. Not surprisingly, pneumococcal disease represents a substantial target for vaccine-preventable, bacterial death in those $\geq$ 65 years. Recent studies have shown that immunization prevents invasive infection and reduces disease severity in vaccinated older adults.

As recommended by the Centers for Medicare and Medicare Services, healthcare professionals ordering the administration of the vaccine should not require the patient to present an immunization record prior to administering the pneumococcal vaccine, nor should they feel compelled to review the patient's complete medical record if it is not available. Instead, provided that the patient is competent, health professionals may rely on the patient's verbal history to determine prior vaccination status.

This evidence-based practice project will be implemented with the objective of determining the effectiveness of a telephone reminder system in improving pneumococcal immunization rates of Medicare recipients within the office practice of Michael Kovacich, MD, Connie J. Ramirez, BSN, RN, ANP-BC, and Julie A. Koch, MSN, RN, FNP-BC (project facilitator). The procedure was developed with input from a multi-disciplinary team consisting of healthcare providers and support staff.

TITLE:	Telephone Reminders to Improve Pneumococcal Vaccines for Medicare Recipients	
DEPARTMENTS:	Healthcare Providers, Support Staff	Page 2 of 3

PROCEDURES:

1.0 From September 1 to November 10, 2010, office staff members will use the following day's patient schedule to identify Medicare recipients

1.1 When reminder phone calls are completed prior to the next day's visits, Medicare recipients will receive an additional standardized script: "Medicare Part B covers the pneumonia vaccine. Be sure to ask your provider about the benefits and to ensure you are up-to-date on your immunization."

2.0 During the regularly scheduled visit, eligible patients (those age 65 and older who have not previously received the vaccine or have received the vaccine previously, but longer than five years prior) will be offered the pneumococcal vaccine. Medicare recipients with dementia or severe psychosis, who present without a healthcare representative, will be excluded from the project.

2.1 Those declining immunization will have rationale listed within dictated office notes (standard practice).

2.2 Those accepting immunization will be queried by the nurse practitioner or medical assistant upon discharge to determine the primary reason for acceptance: "We are evaluating our office's immunization practices, and it would be helpful know what intervention triggered your acceptance of today's pneumonia vaccine: yesterday's reminder phone call; today's provider recommendation; or something else?"

2.2.1 Agreeing to answer the question implies consent

2.2.2 Patients' decision to answer or not answer will not affect their future care within the practice.

TITLE:	Telephone Reminders to Improve Pneumococcal Vaccines for Medicare Recipients	
DEPARTMENTS:	Healthcare Providers, Support Staff	Page 3 of 3

3.0 The NPs, who discharge their own patients, will log demographic data and primary reason for immunization on the Pneumococcal Vaccine Intervention Worksheet. For patients seen by the physician, the MA discharging the patient will record data.

3.1 Names will initially be recorded to facilitate tracking of incomplete data.

3.2 A code number will be assigned to ensure anonymity of collected data: odd numbers for patients seen by the MD and even numbers for patients seen by a NP.

4.0 During the work day, the worksheet will be kept in a private area within the NPs' office and the MA's work station. At the end of each work day, data will be secured within a locked drawer within the NPs' office and the MA's work station.

5.0 At the end of each business week, the project facilitator will tally the Pneumococcal Vaccine Intervention Worksheet information.

5.1 The tallied sheets will then be secured in a locked drawer within the NPs' office.

6.0 The project facilitator will code all identifying information and report findings to healthcare providers and support staff. Demographic data will be used in aggregate format. Patient names or other identifying information will not be associated in any dissemination of project findings.

APPENDIX C

Pneumococcal Vaccine Intervention Participant Code Sheet

Code Number	Patient Name
001	
003	
005	
007	
009	
011	
013	
015	
017	
019	
021	
023	
025	

APPENDIX D

Pneumococcal Vaccine Intervention Worksheet

Appt Date	Patient Code Number	Date of Birth	Gender	Race/ Ethnicity	Years within the Practice: <1, 1-5, >5	Provider Initials	Intervention Triggering Vaccination Acceptance			
XX	XX	XX	XX	XX	XX	XX	Elected not to Answer	Phone Call Reminder	Today's Provider Recommendation	Other: Briefly Describe