Focusing on the Patient Encounter to Improve Adult Immunization Rates

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Abstract

Objective: Healthy People 2010 established target goals for the percentage of adults immunized against Pneumococcus and seasonal influenza. Our objective was to create a vaccine program to allow our family practice clinic to reach these goals.

Methods: Initial chart review (n=50) determined our clinic's baseline percentages for Pneumococcus and billing records identified the number of influenza vaccines administered the previous year. We developed a vaccine program focused on direct intervention and executed it in two six-month phases; the first focused on seasonal influenza, and the second targeted Pneumococcus. We determined program efficacy of phase one (influenza) via shot volume and phase two by measuring post-program vaccine percentages thru a second chart review (n=104).

Results: Pneumococcal coverage for adults age ≥65 dropped from 47 to 39% [95% CI: 23-71% & 22-56%], well short of the *Healthy*

People 2010 target of 90%. We measured a 16% volume increase in the administration of the seasonal influenza vaccine.

Significance: Vaccines have tangible and positive effects on patient health. Direct intervention is an effective method for physicians to improve vaccine percentages, but is costly and time consuming.

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Figures and Tables

Introduction

Vaccinations against seasonal influenza and community-acquired pneumonia exist and have proven benefits[1,2]. Yet, in the United States, 20,000 – 40,000 influenza-associated deaths still occur annually, and community-acquired pneumonia [*S. Pneumoniae*] carries a 15% mortality rate in the elderly[3,4]. Additionally, hospitalizations for these illnesses (which further burden the patient and the health care system) have increased substantially over the last two decades, largely in part to the aging of the population[5,6].

In *Healthy People 2010*, the U.S. Department of Health and Human Services set national targets for the percentage of adults vaccinated against seasonal influenza and pneumococcal disease. These targets are 80% coverage against seasonal influenza for non-institutionalized adults ages 18-64, 90% coverage against seasonal influenza for non-institutionalized adults age ≥65, and 90% coverage against pneumococcal disease for non-institutionalized adults age ≥65[7].

Our objective was to develop a vaccine program that would allow us to reach the *Healthy People 2010* adult immunization target percentages for seasonal influenza and Pneumococcus, be tailored to

include other adult vaccines, and be reproducible in family practice clinics across the country. Our planned timeline was six months.

Research Methods

Vaccine Program and Study Design

Sub-optimal vaccine rates can be partially attributed to barriers (real or perceived) such as cost, fear of needles, adverse effects, or even patient disbelief in vaccine efficacy[8,9,10]; however, we believed the primary reason for low vaccine rates was missed opportunity. In other words, the topic of vaccines simply did not come up enough during office visits. Multiple techniques (i.e. office signs and posters, automated voice messages, postcard mailers) have been employed across the nation to serve as reminders to both the patient and practitioner to minimize these missed opportunities[11,12,13]. Many of these information campaigns improved vaccine rates, but only minimally. We felt we could achieve better results through direct intervention, and therefore designed our vaccine program solely around the patient encounter[14,15,16]. Anything beyond that, we felt, was peripheral to the issue.

We began our study with an initial chart review to determine our clinic's baseline vaccine percentages for Pneumococcus, Zoster, and Tetanus in our adult population. Tetanus and Zoster were included to serve as parallel measures to determine if our vaccine program could

be expanded to include other vaccines outside influenza and Pneumococcus[a]. To determine baseline for seasonal influenza, we utilized shot volume from the previous flu season (2008-09) and electronic billing records were utilized to gather this data. Our rationale for volume over percentage is covered in the discussion section.

Because of the broad differences between influenza and other vaccines (i.e. annual basis, seasonal, all ages), we split our program into two separate six-month studies. Phase one focused on seasonal influenza and coincided with the 2009-10 influenza season; the second phase targeted Pneumococcus, Zoster, and Tetanus. Regardless of phase, the program was defined by two major concepts: priority and efficiency. First, we mandated that during the program, every adult patient appointment – regardless of reason for visit – would include a vaccine discussion. Second, we established standing orders for our Medical Assistants to administer any vaccines that patients were eligible for. Although we focused on the vaccines applicable to the

[a] Tetanus was chosen because of its similarity to influenza with respect to applicability across the entire age spectrum; Zoster because of its focus on a specific age group (≥60), similar to Pneumococcus. Zoster had the additional advantage of becoming a *Healthy People 2020* target vaccine.

specific phase of the program, we did not disallow the discussion or recommendation of other vaccines. Third, we improved our vaccine screening process. Vaccine questionnaires were part of the previous vaccine protocol, but were not filled out until the patient was in the exam room, thereby interrupting the patient interview. Meanwhile, patients in the waiting room had little to occupy their time with. We reversed this procedure. Lastly, we stressed the importance of documentation.

At the conclusion of our program, we conducted a second chart review, identical to the first in regards to vaccines and demographics. We compared pre and post-program vaccine percentages for Pneumococcal, Zoster, and Tetanus to determine program effectiveness of phase one. For phase two, we compared pre and post-program influenza shot volume.

Initial Chart Review

Electronic Medical Records were used to conduct the initial 50 chart review. Utilizing an appointment view mode, we began with the previous calendar day and worked backwards. Select-in criteria were annual appointments within the previous 12 months; no follow-up or

acute visits were selected. Limiting ourselves to annual appointments allowed us to establish consistency for selection criteria between the initial and follow-on chart review and minimize the opportunity for chart duplication. Charts for patients ages 18 or below were disregarded. Qualifying charts were then separated into three age groups (19-59, 60-64, ≥65) and reviewed to determine vaccine status for Pneumococcus, Zoster, and Tetanus[b]. Patient identification numbers in the 50 final charts were cross-checked to ensure there was no chart duplication.

Follow-up Chart Review

The follow-up chart review was conducted identical to the initial review with three exceptions: (1) 104 charts were reviewed; (2) charts were screened to see if a vaccine review was documented during the patient interview; and (3) appointment time frames could not be earlier than the start of the six-month program. Patient identification numbers in the 104 final charts were also cross-checked with each other (but not against the original 50 charts).

[b] Pneumococcal vaccine is Pneumococcal Polysaccharide Vaccine (PPSV23), Zoster

Results

Seasonal Influenza

A total of 939 adult seasonal influenza vaccines were administered during the 2009-10 flu season (phase one of our study), compared to 737 vaccines administered the year prior[c]. When adjusted for patient population growth in our clinic, this resulted in a 16% increase in volume for the administration of the seasonal influenza vaccine[d]. Although not part of our original study design, we itemized adult seasonal influenza vaccinations administered during the 2009-10 flu season according to age and compared against our patient population, partly out of curiosity and partly due to new capabilities of updated billing software. Results showed season-end percentages of 86% for age ≥65, and 59% for ages 19-64[e].

Pneumococcus, Zoster, and Tetanus

Table 1 summarizes our beginning and ending vaccine percentages for Pneumococcal, Zoster, and Tetanus vaccines based on

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vaccine is *Zostavax,* Tetanus vaccines accepted were Td, TdaP, DT, or DTaP.
[c] Billing dates of 01 Aug – 31 Mar were used for both study seasons.
[d] Patient census June 2009: ages 19-59 (*n*=1053), 60-64 (130), ≥65 (167), 19-64 (1183), ≥60 (297), all adults (1350). Patient census Sept 2010: ages 19-59 (*n*=1184), 60-64 (123), ≥65 (191), 19-64 (1307), ≥60 (314), all adults (1498).

our two chart reviews. Our post-program Pneumococcal coverage of 39% was below the national average of 60% and fell well short of the 90% coverage goal for adults age ≥65 established in *Healthy People 2010*[17,18]. We increased our Zoster coverage of adults age ≥60 from 4% to 30%, achieving *Healthy People 2020* target goal of 30% in non-institutionalized adults age ≥60[19]. We raised our Tetanus percentage for adults over age 19 from 16% to 45%, but remained below the 60% national average for Tetanus[20].

During phase two of the program, a total of 752 Pneumococcal, Zoster, and Tetanus vaccines were administered over a six-month period[f], compared to our clinic's baseline six-month vaccine average of 488[g]. On the surface, this 54% increase in vaccine volume reads as program success, however it was short-lived. This is best illustrated in *Figure 1,* which compares bi-weekly vaccines rates during phase two to pre-program extrapolated data. Had we ignored the first three months of our program, we likely would have not seen any measurable differences in vaccine rates compared to the previous year. In other words, the program was not sustainable.

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[e] 165 seasonal influenza vaccines administered to age ≥65, and 774 to ages 19-64.
[f] Phase two vaccine break down: 118 Pneumococcal, 26 Zoster, 608 Tetanus.

We predicted weekly vaccine averages would decrease (largely due to staff fatigue) over the course of the program before leveling off, but we expected that decline to be slow (i.e. over the course of months). We also expected our new baseline rate, once it leveled off, to be higher that pre-program average. The data, unfortunately, shows us wrong on both accounts. We believe staff fatigue is evident between Weeks 2 and 4, indicated by the immediate downward trend in vaccine delivery (*Figure 1*). We also consider Weeks 16 and 18 to be outliers, meaning steady state was reached at Week 14, much sooner than we anticipated and ending with weekly rates no better than before the program.

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[g] Six-month pre-program average was determined by halving the 12 month total of 975 Pneumococcal, Zoster, and Tetanus vaccines, from 01 Aug 2008 – 31 Jul 2009.

Vaccine	Age	Initial Review	Follow-on
Pneumo	≥65	7 of 15 (47%) [95% CI: 23-71%]	11 of 28 (39%) [95% CI: 22-56%]
Zoster	≥60	1 of 26 (4%) [95% CI: 1-11%]	16 of 54 (30%) [95% CI: 19-41%]
Tetanus	≥19	8 of 50 (16%) [95% CI: 6-26%]	47 of 104 (45%) [95% CI: 36-54%]

Table 1: Summary of chart reviews

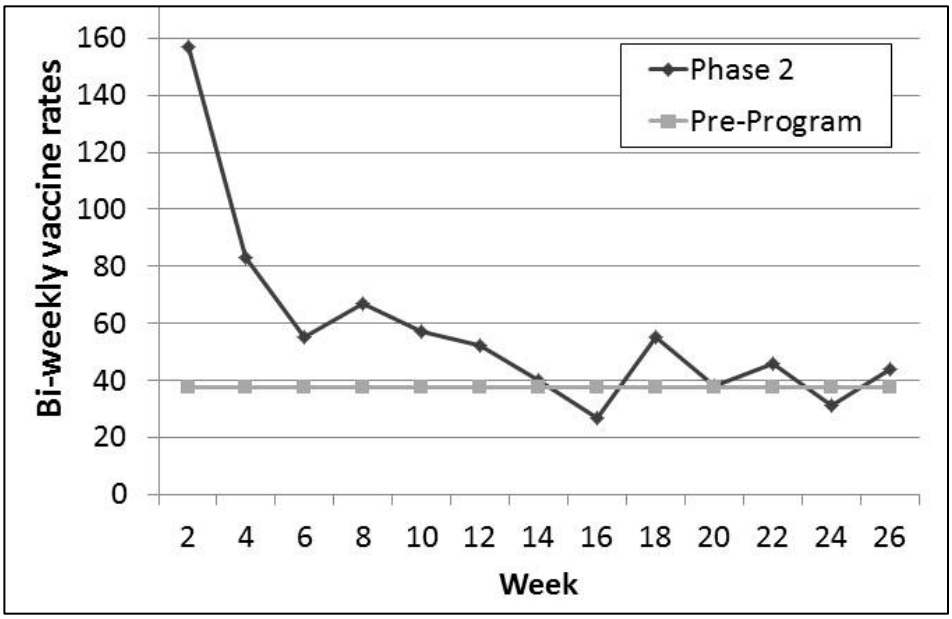

Figure 1: Phase 2 bi-weekly vaccine rates

Discussion

Program Success or Failure – Seasonal Influenza

Our clinic is one of many sources for the seasonal influenza vaccine in the community. Multiple vaccine locations (i.e. pharmacies and grocery stores) are great from a public health standpoint, but present challenges to the health provider in terms of documentation, and subsequently to the researcher in terms of reliable data. Not to mention that exhaustive measures to determine accurate percentages would need to be conducted annually. Based on the above, we decided our best metric for measuring distribution of the seasonal influenza vaccine would be a direct comparison to the previous year's volume.

Although not part of our original study design, upgrades to our billing software allowed us to easily stratify post-program seasonal influenza vaccines according to age. Our season-end vaccine percentages were a minimum of 86% for age ≥65, and 59% for ages 19-64 fell short of *Healthy People 2010* targets of 90% coverage for age ≥65 and 80% coverage for ages 19-64. Despite this shortcoming, we are pleased with the results. Mainly because it is feasible that neighborhood pharmacies and grocery stores contributed the remaining four percent to put our ≥65 patient population at or over the

90% mark. Our younger population, unfortunately, remains at risk with only 59% coverage. This is largely a function of reality as the elderly are more likely to visit their doctor in the course of a year and are typically more vaccine proactive.

Lastly, our influenza study took place during the 2009-10 flu season, which coincided with the swine flu "epidemic". Media coverage and public perception of the swine flu likely encouraged many individuals to get their seasonal influenza vaccines who otherwise might not have been vaccinated; thereby falsely elevating the actual success of our influenza program. On the contrary, the increased demand for the influenza vaccine overwhelmed our resupply capabilities resulting in a three-week vaccine drought in October 2009; thereby negatively impacting our ability to reach target goals. Whether a 16% net increase in vaccine administration qualifies as a success depends on one's interpretation of two these two factors.

Program Success or Failure – Pneumococcus, Zoster, and Tetanus

After mixed results from phase one, we approached phase two of the program with realistic optimism; hopeful that we could raise the vaccine percentages to national goals, but realistic that this was

unlikely to occur in six short months. *Figure 2* shows this dichotomy. We did not crest the 50% mark with a single vaccine, but we did achieve significant immunization improvement with two of the three vaccines (Zoster and Tetanus), not to mention reaching the 30% Zoster target per *Healthy People 2020*. More importantly, we gave a bolus of 752 recommended vaccines to the community. For this last reason alone, we consider our program worthwhile, even if not technically successful.

Our post-program coverage for Pneumococcus was actually a lower percentage than we started with. This decrease was not expected, given that we administered 118 Pneumococcal vaccines over the course of phase two. Although our ≥ 65 patient population is only 191 (giving us the potential to have >62% coverage), we neglected to determine how many of those 118 shots went to patients age ≥65. We are thus put in the classic dilemma of whether to trust the chart reviews or attribute this to small sample sizes. We suspect the latter. In hindsight, a quick review of billing information would have given us the answer, but it was not pursued at the time of the study.

Focusing on the Patient Encounter

With a vaccine program centered on the patient encounter, we felt it necessary to determine just how often our Medical Assistants were discussing vaccines during annual appointments. During the follow-on chart review, all 104 charts were screened to see if a vaccine review was documented; which it was 85% of the time (88 of 104). Although we would have preferred documentation (and the conversation) 100% of the time, we are pleased with the results. Here's why: before the program, vaccine averages were age dependent; with older patients being more likely to be up to date with recommended vaccines. Now, vaccine averages are more equivocal, as shown in *Figure 2*. Our program not only boosted numbers across the board, but created a more equitable vaccine distribution among age groups. To us, this indicates that our staff executed the program as designed and did not key in on one demographic. We did not dig deeper into the charts to determine, for example, if the reason a patient did not receive a vaccine was due to oversight or because he (or she) was already up-to-date.

Handing out vaccine forms in the waiting room was a big component to our program. First, it clued the astute patient into the

fact that our office was making immunizations a priority, and it gave our patients time to make educated vaccine decisions (and fill out the appropriate paperwork) prior to the encounter. Second, it provided the patient with something tangible to carry into the exam room, effectively serving as a visible reminder to both the patient and the provider to discuss vaccines during the visit. Third, it saved time[h]. The unknown question, however, is whether this process actually triggered more patients to either request or consent to vaccinations. Exit interviews, in retrospect, would have been useful.

The unifying concept to our program was *give the patient two opportunities to say 'no'.* The first opportunity occurred in the waiting room as each patient was handed their vaccine forms (each form contained an "opt out" section). The second opportunity took place during the patient encounter when the topic of vaccines surfaced. During the patient interview, we purposefully took advantage of human curiosity and a natural desire for personalized attention in how we introduced our patients to the program, as outlined in *Figure 3*. We used a classic "soft sell" approach to make patients more receptive to immunizations, as opposed to asking outright "do you want a Tetanus

[h] Based on multiple interviews with Medical Assistants during the program.

shot today?" Again, no patient exit interviews were conducted, but based on repeated conversations with medical assistants over the course of the program, this technique was very effective.

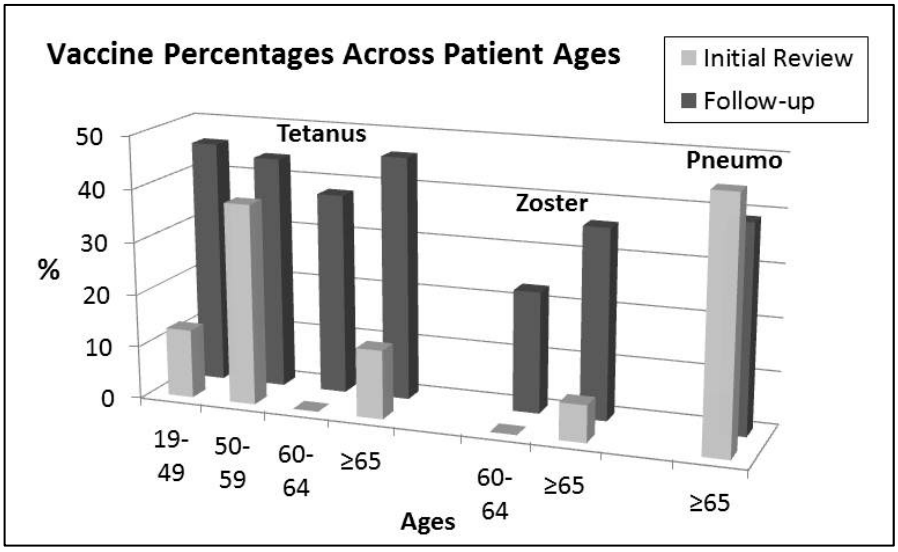

Figure 2: Vaccine percentages, age stratified

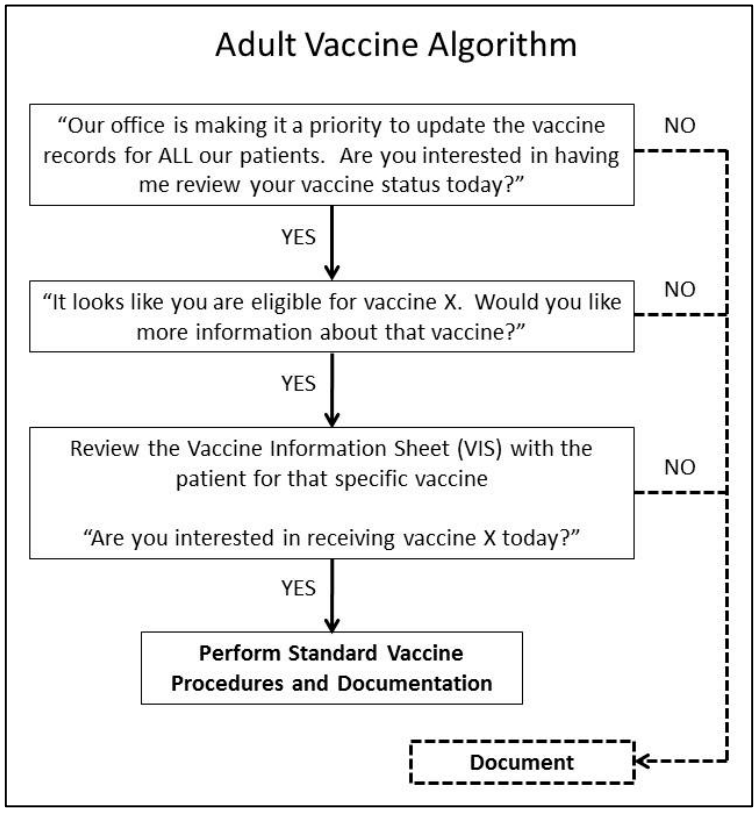

Figure 3: Vaccine algorithm

Reproducibility and Expandability

It seems intuitive to us that timing vaccines to seasons or life events would make patients more receptive to immunization. Influenza in the fall is the classic example of this; another illustration would be HPV and Varicella vaccines during back-to-school season. This selective approach is a proactive way to mitigate community health risks, whether seasonal or behavioral (i.e. STIs). The two to three month life-span of our program makes it ideally suited to accomplish these types of specific and short-term vaccine goals. Short, focused programs can actually be more manageable for staff, particularly in light of the ever-growing number of vaccines, their indications, and contraindications. Therefore, we strongly feel that our vaccine program could be replicated at other family practice clinics across the country.

Our success with Tetanus and Zoster – despite their marked differences – demonstrates that our program is expandable to include other vaccines. Tetanus is applicable to the entire age spectrum and insurance friendly, while Zoster has a narrow age range requires many patients to pay out-of-pocket. Yet, our single vaccine program yielded similar improvements in administration of these two vaccines.

Billing and Reimbursement

We originally intended to repeat our program annually; improving our techniques and making necessary adjustments along the way to ensure vaccine percentages steadily increased. Unfortunately, this was financially untenable and the vaccine program was shelved upon completion. Vaccine reimbursement rates were not covering the purchase cost, much less the in-house costs (notably storage, supplies, and administration). Ironically, the more successful our program became, the more it cost our clinic. Until this negative cash flow aspect of adult vaccines changes, it is unlikely that any program will achieve *Healthy People 2010* targets.

Program Flaws

Low Power: our vaccine study was not designed for publication – it was designed as a quality improvement project. The sample sizes of both chart reviews were based on practicality, rather than to attain statistical significance. Age 60-64 was the least represented age group in our clinic while age 19-49 compromised the bulk of our patients. Therefore, a disproportionate number of charts were reviewed between each age group, resulting in considerable statistical variances. We

recognize that any interpretations or conclusions based off our study data must be made with this point in mind.

Length between chart reviews: because we split our program into two separate vaccine studies, approximately 15 months passed between the two chart reviews. This invited the possibility of patients procuring vaccines (either in house or elsewhere) or having previously current vaccines expire. Additionally, our patient population grew by 11% (148 patients) during this timeframe. The vaccine status of those new patients, and any that might have left, clouds the data.

Anticipation bias: much of the staff was aware that a new vaccine program was being introduced months before actual implementation. During this interim, the possibility exists that the subject of vaccines was either purposefully ignored or intentionally brought up during patient interviews, thereby affecting the value of study data.

Future Directions

Research the true impacts that low reimbursement rates have on vaccine delivery in a primary care setting.

Conclusions

Vaccine programs focused on the patient encounter eliminate the most common reason for low vaccine rates – missed opportunity. By making vaccine reviews a priority during clinical encounters, our family practice office increased the overall percentage of patients vaccinated against Tetanus, Zoster, and seasonal influenza, and likely increased the overall percentage of Pneumococcal coverage. Giving patients "two opportunities to say no" during their clinic visit increases vaccine success. Likewise, using scripted "soft sell" tactics when discussing immunizations during the patient encounter, also works.

Vaccine programs that rely on time-consuming efforts of medical staff (i.e. initiation of vaccine discussion during each patient encounter) are not sustainable in the long term, primarily due to staff fatigue. They are applicable to all vaccines, but work best as short term projects focused on specific immunization deficiencies. These programs will likely require multiple iterations, repeated over the course of several years, to reach national vaccine goals.

References

[1] Jefferson T, Rivetti D, Rivetti A, et al. Efficacy and effectiveness of influenza vaccines in elderly people: a systematic review. *Lancet* 2005; 366:1165.

[2] Johnstone J, Marrie TJ, Eurich DT, et al. Effect of pneumococcal vaccine in hospitalized adults with community acquired pneumonia. *Arch Intern Med* 2007; 167:1938.

[3] Centers for Disease Control and Prevention (CDC). Estimates of deaths associated with seasonal influenza – United States, 1976-2007. MMWR Morb Mortal Wkly Rep 2010; 59:1057.

[4] Marrie TJ, Durant H, Yates L. Community-acquired pneumonia requiring hospitalization: 5-year prospective study. *Rev Infect Dis* 1989; 11:586.

[5] Marrie TJ, Durant H, Yates L. Community-acquired pneumonia requiring hospitalization: 5-year prospective study. *Rev Infect Dis* 1989; 11:586.

[6] Thompson WW, Shay DK, Weintraub E, et al. Influenza-associated hospitalizations in the United States. *JAMA* 2004; 292:1333.

[7] http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=23

[8] Immunization Strategies for Healthcare Practices and Providers: http://www.cdc.gov/vaccines/pubs/pinkbook/downloads/strat.pdf

[9] Johnson DR, Nichol KL, Lipczynski K. Barriers to Adult Immunization. *Am J Med* 2008; 121, S28-35.

[10] Poland GA, Shefer AM, et al. Standards for adult immunization practices. *Am J Prev Med* 2003; 25(2).

[11] Briss PA, Rodewald LE, Hinman AR, et al. Reviews of evidence regarding interventions to improve vaccination coverage in children, adolescents, and adults. *Am J Prev Med* 2000; 18(1S).

[12] Zimmerman RK, Nowalk MP, Bardella IJ, et al. Physician and practice factors related to influenza vaccination among the elderly. *Am J Prev Med* 2004; 26(1).

[13] Jacobson Vann JC, Szilagyi P. Patient reminder and recall systems to improve immunization rates. Cochrane Database of Systematic Reviews 2005, Issue 3, Art No. CD00391.

[14] Key Strategies for Creating an Immunization Friendly Office Environment. This training booklet was produced by The California Health Department and adapted by The Arizona Partnership for Immunization (TAPI) and provided to Arizona health care providers during immunization training on June 10, 2009.

[15] Suggestions to Improve your Immunization Services. Immunization Action Coalition: http://www.immunize.org/catg.d/p2045.pdf

[16] Areas to Consider for a Successful Vaccination Practice. Handout provided by Merck & Co. Inc. which outlines tools and resources available to improve vaccination efforts.
[17] Schiller JS, Euler GL. Vaccination Coverage Estimates from the National Health Interview Survey: United States, 2008. July 2009. http://www.cdc.gov/nchs/data/hestat/vaccine_coverage/vaccine_coverage.pdf
[18]http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=23
[19]
http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=23
[20] Schiller JS, Euler GL. Vaccination Coverage Estimates from the National Health Interview Survey: United States, 2008. July 2009.