Utilizing Population Health Outcomes Data to Increase Adult Pneumococcal Immunization Rates

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Structured Abstract

Purpose: To improve the rates of pneumococcal vaccination among eligible elderly and high risk patients.

Scope: This project was a performance improvement CME initiative designed to address and improve the quality of care and health outcomes for people at risk for pneumococcal infection. The University of Cincinnati, in partnership with Direct One Communications, Confluent Healthcare Solutions, Humedica, Inc., the American Medical Group Association (AMGA), and representatives from three healthcare systems designed a program that linked full denominator clinical performance patient data from individual providers to a fully integrated learning management system supported by educational interventions.

Methods: Phase 1 of the project helped clinicians better understand their own performance by displaying their pneumococcal immunization rates for eligible patient populations via an individualized clinical performance dashboard. Phase 2 linked this population health data for each participating clinician to a learning management system featuring two case-based educational activities and a slide library each capturing the most recent clinical research data, advances in vaccines, and evidence-based improvement strategies to increase immunization rates. The focus of the educational interventions was to raise awareness of current pneumococcal immunization guidelines and to provide strategies for providers in communicating with patients about vaccination and in changing systems of care to improve immunization rates. Semi-annual reports were provided comparing provider-specific pneumococcal immunization rates with practice-wide (ie health system-wide) and national rates.

Results: The final outcome of the project showed that delivery of periodic provider, system and national data on immunization rates, paired with educational interventions resulted in pneumococcal vaccination rate increases for the population of patients ≥ 65 years, and for the population of high risk patients aged 18-64. In addition, this initiative showed that data-driven CME worked by comparing pneumococcal immunization rate improvements of physicians who participated in the PICME program and reviewed their vaccination rate data periodically with those who did not participate in the PICME but did review their vaccination rate data periodically.

Keywords: Pneumococcal, Immunization Rates, PICME, performance improvement, quality improvement

Purpose

The goal of this performance improvement activity was to improve the rates of pneumococcal vaccination among eligible patients. This project was designed as a performance improvement CME initiative to address and improve the quality of care and health outcomes for people at risk for pneumococcal infection. The University of Cincinnati, in partnership with Direct One Communications, Confluent Healthcare Solutions, Humedica, Inc., the American Medical Group Association (AMGA), and representatives from the three participating healthcare systems designed a program that linked full denominator clinical performance patient data from individual providers to a fully integrated learning management system supported by educational interventions developed by national experts in infectious disease and vaccines.

During the timeframe of this initiative, the recommendation for pneumococcal vaccination for adults ≥ 65 years of age was for PPSV23 vaccine. Toward the end of the initiative, in August 2014, new guidelines from the Advisory Committee on Immunization Practices (ACIP) added the recommendation that adults ≥ 65 should receive both PVC13 and PPSV23 routinely. The recommendations for routine use of PVC13 in adults aged ≥ 19 years with immunocompromising conditions remained unchanged. This project focused on the prevention of pneumococcal disease through vaccination with PPSV23 which is referred to as "pneumococcal vaccination" in this report.

The expectation was that at the end of this initiative, participants would be able to:

- Understand their own rate of pneumococcal immunization and how it compared to those of colleagues within their health system and nationally
- Implement data-informed quality improvement strategies (ex. patient reminder systems) to increase vaccination rates amongst eligible people in their patient panel
- Utilize team members to case manage, care coordinate, educate and modify patient behaviors and perceptions related to vaccination in order to increase acceptance of immunization among eligible patients
- Understand the rationale and protocols for pneumococcal vaccination and the health outcomes consequences that may result from the lack of patient adherence
- Describe the need for early vaccination for the at-risk population and the related health outcomes particularly for those populations that are underserved
- Identify approaches to reduce the risk of pneumococcal infection including lifestyle modification,

Scope

Background

Although the availability of pneumococcal conjugate vaccine in childhood vaccination programs has significantly reduced both invasive pneumococcal (eg, bacteremia, meningitis) and mucosal disease (eg, community-acquired pneumonia [CAP] and otitis media) with indirect benefits to the adult population[1] the burden of pneumococcal disease remains high in adults ≥50 years of age.[2] Indeed, US data suggest 30,000 cases of invasive pneumococcal disease, 500,000 cases of CAP and 25,000 deaths occur annually.[3] Half of all mortality associated with invasive pneumococcal disease is in patients ≥65 years of age.[4] More specifically, the overall fatality rate for meningitis, bacteremia, and pneumonia are 30%, 20%, and 5%-7%, respectively, increasing to 80%, 60%, and 10.6% for patients ≥65 years of age.[5] Patients hospitalized with pneumococcal pneumonia are at increased risk for myocardial infarction, arrhythmia, or congestive heart failure.[6]

Pneumococcal disease accounts for $3.5 billion in direct medical costs, with the majority of costs and most severe cases in patients ≥65 years of age and contributing to nearly 2 million hospital days each year.[7] When work loss and lost productivity are considered, the cost of pneumococcal disease among younger working adults (18 to <50 years of age) nearly equals those ≥65 years of age and diminished quality of life affects patients of all ages. Thus the prevention of pneumococcal infection is critical, particularly in the context of increasing resistance of *S. pneumonia* to antibiotic therapy.[8]

While a pneumococcal polysaccharide vaccine (PPSV23) has been recommended over the last decade for all adults ≥65 years of age, the vaccination rate has been approximately 60% to 64%.[9,10] Vaccination rates are lower among older African-Americans (53%), Hispanics (45%) and Asians (48%).[10,11] The disparities in pneumococcal vaccination exist even for minority residents of US nursing homes.[12] An estimated 73 million adults have an indication for pneumococcal vaccination and have not received it.[13]
Current recommendations for pneumococcal vaccination include all adults ≥65 years of age and adults age 19 through 64 years who would be considered at higher risk for pneumococcal disease due to chronic medical comorbidities (cardiovascular disease, stroke; liver, kidney or lung disease [eg, chronic kidney disease, asthma, diabetes]); immunocompromising diseases (eg, lymphoma, leukemia) or treatments (eg, corticosteroids, radiotherapy); HIV/AIDS; environmental risk (eg, skilled nursing facility); Cochlear implant or leaks of cerebrospinal fluid, and those smoking cigarettes.**Error! Bookmark not defined.** Vaccination rates are suboptimal in all these groups.[14] While these recommendations are well established, a recent survey showed that 13% of physicians did not know all patients over 65 years of age need pneumococcal vaccination and more than 40% did not know smokers and alcoholics should be vaccinated.[15]

Context

The primary objective of this activity was to provide educational interventions through a learner-centered e-portfolio to help close the health care quality gaps identified through the development of provider and system level performance reports capturing the full denominator of patients eligible to receive pneumococcal immunization. The University of Cincinnati's Office of Continuing Medical Education and its educational partners developed a flexible, easy-to-implement technical infrastructure to review existing clinical practice data and access targeted interventions from within a learning management system. The effort was directed toward improving knowledge and the clinical performance for community-based primary care providers, nurse practitioners, and physician assistants. The patient health outcomes data (eg, vaccination rates) that were collected were used to provide each individual provider and the entire health system with a view of the immunization status of targeted patient populations. The participating health systems were given access to their quality and performance data on a semi-annual basis to provide a reflection of the individual physicians' performance against the nationally accepted standards for pneumococcal vaccination. These performance data were transferred into the learning management system in order to provide each participant with a learning environment in which they could view their data and participate in educational interventions designed to improve quality through the application of knowledge, the development of competencies, or improvements in system processes.

Settings

The activity took place in three hospital systems: Community Physicians of Indiana (Indianapolis, Indiana), Holston Medical Group (Kingsport, Tennessee), and Sentara Medical Group (Norfolk, Virginia).

Participants

Participants in the study were from American Medical Group Association (AMGA) member health systems, consisting of both integrated delivery networks (IDNs) and multi---specialty group practices, whose electronic health record data is part of Humedica's patient population database (the "Humedica network"). The Humedica network includes over 100 hospitals and 1,400+ outpatient clinics, representing over 16,000 US-based primary care clinicians and supporting healthcare team members actively seeing nearly 800,000 patients ≥65 years of age. Three health systems opted to participate in the project. Within the three systems, there were 105,482 eligible patients in the age 65 and older category and 162,675 patients in the age 18-64 at high risk of pneumococcal infection category.

Representatives from each of the health systems' administrative units and their directors of quality improvement participated as a part of the quality improvement and educational steering committee, along with the Principal Investigator from the University of Cincinnati, Tiffiny Diers, MD, and the CME Director, and educational partners from Direct One Communications, Confluent Healthcare Solutions, Humedica, and the AMGA.

Incidence/Prevalence

Annually, pneumococcal disease accounts for a substantial number of cases of invasive and non-invasive disease including meningitis, bacteremia, pneumonia, and acute otitis media.

A recent analysis from the Centers for Disease Control estimated that pneumococcal disease was responsible for 4 million illness episodes, 445,000 hospitalizations, and 22,000 deaths annually. Incidence of pneumococcal infections in the U.S. for patients greater than 65 years of age are 37.0 per 100,000 cases, with a death rate of 5.61 deaths per 100,000. Approximately 10% of all patients with invasive pneumococcal disease die of their illness, but case-fatality rates are higher for the elderly and patients who are at-risk due to chronic or serious illness.

Methods

Study Design

This project linked full-denominator clinical performance patient data from individual healthcare providers to a fully integrated learning management system supported by educational interventions developed by national experts in infectious disease prevention. Physicians were able to review their own performance compared with that of their colleagues in vaccinating elderly patients and those at high risk of pneumococcal infection using an individualized clinical performance dashboard.

The design of this activity followed that outline by the AMA for designation of PI CME credit:

Stage A: Assess current practice using the identified performance measures, either through chart reviews or some other appropriate mechanism. Participating physicians must be actively involved in the analysis of the collected data to determine the causes of variations from any desired performance and identify appropriate interventions to address these.
Stage B: Implement educational interventions based on the results of the analysis in Stage A, using suitable tracking tools. Participating physicians should receive guidance on appropriate parameters for applying the interventions.
Stage C: Reassess and reflect on performance in practice measured after the implementation of the interventions in Stage B, by comparing to the assessment done in Stage A and using the same performance measures. Summarize any practice, process and/or outcome changes that result from participating in the PI CME activity.

The methodology described by the AMA during Stages A and C requires a clinician to perform a review of their patient populations typically based on a chart audit of a small sample of eligible patients from their practice and to document their performance on established measures for quality. While this approach for the identification and analysis of real patient data in order to provide an individual's performance assessment is a step in the right direction, there are also many shortcomings. Specifically, only a limited number of patients are assessed during this process and used to extrapolate as being representative of clinician's entire patient panel, and

overall participation in these programs is very low in most part due to the burdensome time commitment to complete all three steps in the process.
The model described in this activity design corrects for these shortcomings by incorporating (1) automated and electronic capture of patient outcomes data, (2) the entire population of patients eligible for pneumococcal vaccination for all providers with no limitation except for pre---determined and validated exclusion criteria, and (3) much less effort on the part of the provider or office staff for the collection of data.
The overarching purpose of this exercise is for the participant to be able to reflect on their own practice using their own patient data, while simultaneously being provided with targeted education on evidence-based strategies to improve immunization rates.

Provider performance can be described, mathematically, as follows:

$$\text{Performance} = \frac{\text{Number of eligible patients receiving pneumococcal vaccine}}{\text{Number of patients who were eligible}}$$

Participants were encouraged to review their baseline data, which was loaded automatically onto their individualized dashboard. They were offered the educational intervention, also accessible through the dashboard, and encouraged to test and implement improvement strategies discussed in the educational modules. Participants were notified when their updated pneumococcal vaccination rates were loaded into their personalized dashboard over the course of the two-year project.

Data Sources/Collection

The three participating health systems were a part of the American Medical Group Association (AMGA), whose electronic health record data is managed as a part of Humedica's patient population database. Patient data for the individual physicians in the three participating health systems as well as system-wide data were drawn from this database..

Educational Interventions

The educational interventions consisted of two modules authored by infectious disease expert Kristin L. Nichol, MD, MPH, MBA, and reviewed by Tiffiny Diers, MD, the PI for this project – one focused on adults>65 years of age and one on adults 18-64 at high risk for pneumococcal infection.

Measures

The importance of pneumococcal vaccination and prevention has been recognized and incorporated into performance measures and quality indicators. For example, Healthy People 2020 has objectives for increasing the percentage of adults vaccinated against pneumococcal

disease (including institutionalized adults) as well as reducing new cases of invasive pneumococcal infections in patients aged 65 and older.[xxviii]

The National Quality Forum has a number of measures related to pneumococcal vaccination in tandem with the National Quality Measures Clearinghouse. For the purpose of this educational initiative, the primary focus was on improving pneumococcal vaccination in older adults and high-risk populations including those ≥ 65 years of age and older, and patients who were 18 to 64 years of age with medical comorbidities (NQF measures #0043, #0617).[xxix]

Listed below are the specific measure descriptions for this project:

***Measure 1*:** Percent of patients age 65+ who received pneumococcal vaccine, ever
Denominator: All patients age 65+ attributed to a given provider
Numerator: All patients in the denominator with evidence of pneumococcal vaccine

***Measure 2*:** Percent of patients age 18-64 who received pneumococcal vaccine, ever
Denominator: All patients age 18-64 who meet one or more high risk criteria*, attributed to a given provider
Numerator: All patients in the denominator with evidence of pneumococcal vaccine
High Risk Criteria: "High Risk" is defined as patients ages 18-64 with coded evidence for one more of the following conditions: 1) Cerebrospinal fluid (CSF) leaks, 2) Cochlear implant(s), 3) Sickle cell disease and other hemaglobinopathies, 4) Functional or anatomic asplenia, 5) congenital or acquired immunodeficiencies, 6) HIV infection, 7) Chronic renal failure, 8) Nephrotic syndrome, 9) Leukemia, 10) Hodgkin disease, 11) Generalized malignancy, 12) Long-term immunosuppressive therapy, 13) Solid organ transplant, 14) Multiple myeloma.

For both measures:
Patient inclusion criteria are as follows: 1) patient has seen a primary-care or mid-level provider in the last 24 months AND 2) patient is age 65+ or meets one or more "High Risk" criteria, as defined by the CDC.

Results reflect data as extracted from the participating health system's Electronic Health Record (EHR) and clinical billing data and aggregated by Humedica, a healthcare analytics partner. Humedica provides clinical data analytics services for the participating health systems and extracts data from these on a continuous basis to support these services. This is the data that was used to support this educational initiative. A patient is defined is "vaccinated" if the EHR indicates a prescription or Rx for a vaccine, a 90669, 90670, 90732, G0009, or a 4040F CPT code, or a V03.82 or V06.6 ICD-9 DX. In addition, evidence of vaccines documented in an immunizations table and/or health maintenance table is included.

Measures reflect full eligible patient panels for a given provider.

Limitations

There were several limitations to our methods. First, although the health system administration at each of the three participating systems agreed to take part in this initiative, participation on the part of individual physicians was optional. All physicians in each of the three healthcare systems were registered automatically to receive data related to their patients' pneumococcal vaccination rates and an individualized provider Clinical Performance Dashboard was set up for each physician. The periodic updates related to their pneumococcal vaccination rates were uploaded onto the dashboards automatically at each reporting period. It was up to each physician to review their own data and the comparison data from their system and nationally, to decide whether to make efforts to improve their rates, and to decide whether to participate in the educational modules and the PICME activity. Second, while we monitored immunization rates across the three systems for the two eligible patient populations periodically over the intervention period, we did not assess improvements during the same time period in a control group of providers working within the same system to assess for possible secular effects that could have contributed to an improvement in immunization rates over the intervention period. Third, while we assessed improvement in immunization rates by provider and by system, we do not know what strategies were used by providers to make these improvements (ie level of awareness, increased knowledge of immunization guidelines or system changes) and whether the improvements will be sustained past the intervention period.

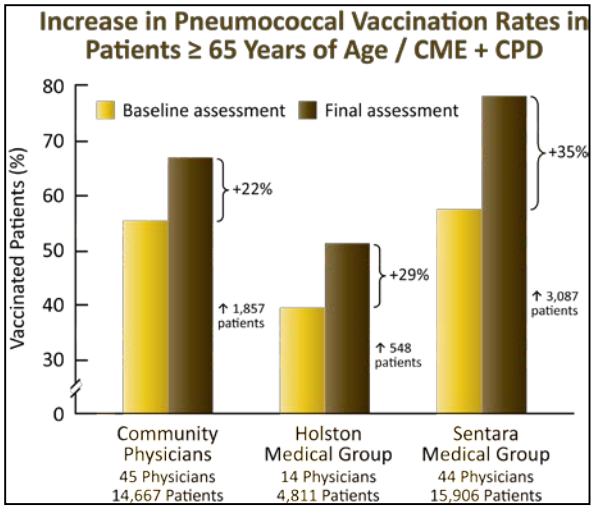
Results

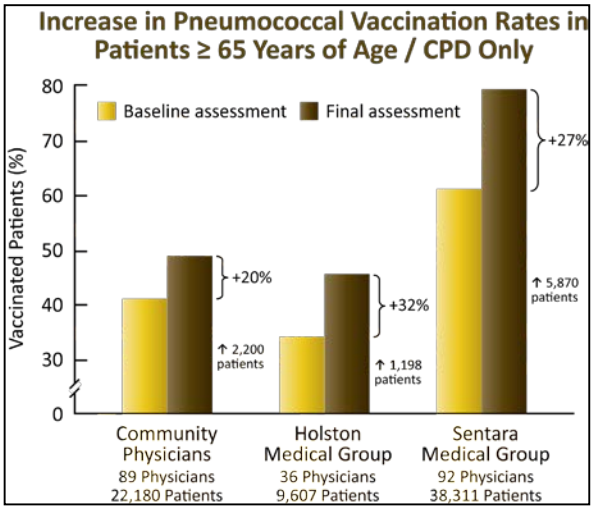
Principal Findings

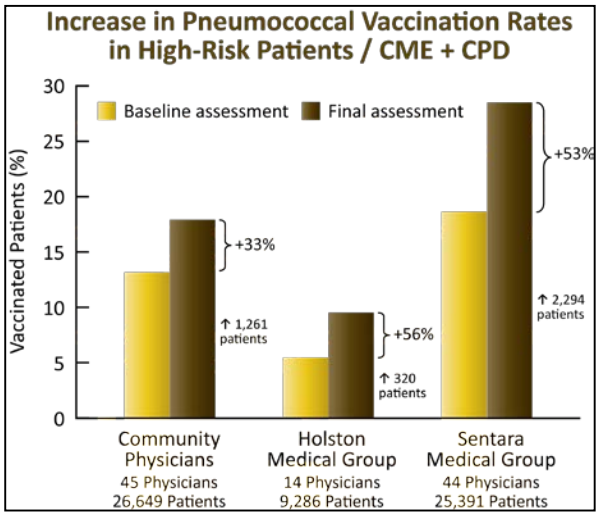
Three health systems participated in this initiative, Community Physicians of Indiana (Indianapolis, IN), Holston Medical Group (Kingsport, TN), and Sentara Medical Group (Norfolk, VA). The total number of participating providers was 316. The project involved 105,482 eligible patients age 65 and older, and 165,675 patients age 18 to 64 determined to be at high risk for pneumococcal infection.

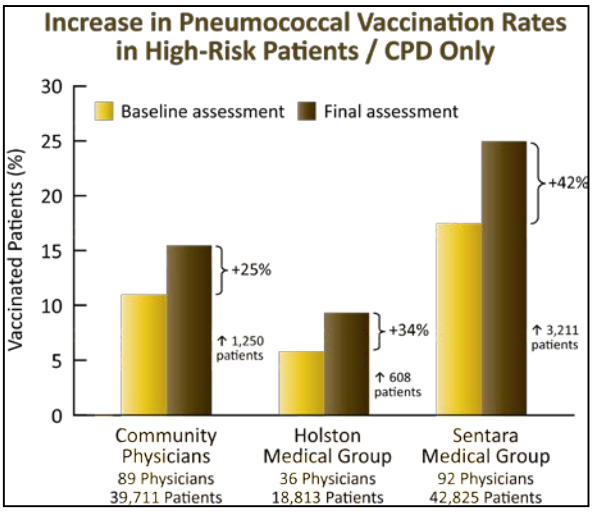
Outcomes

We are reporting outcomes graphically in two ways. First, we review the outcomes among clinicians who completed the PICME project, received 20 AMA PRA Category 1 Credits™, and monitored their clinical improvement as a part of continuing professional development (CPD) via their individual Clinical Performance Dashboard. Second, we provide the outcomes among clinicians who monitored the improvement in pneumococcal rates in their own and their colleagues' patients via their individual Clinical Performance Dashboard as CPD, but did not complete the CME activity. This is reported for both patient populations, those 65 and older, and those 18-64 who are at risk.









In addition, the two CME learning modules designed for this project were also utilized as training curricula for the University of Cincinnati's Open School students (312 student leaders, student volunteers, and pharmacy students) who were participating in another Pfizer-funded project entitled *Community-Academic Partnership to Improve Immunization Rates in an Underserved Population*.

Discussion

Despite ongoing efforts to improve immunization rates in the U.S., a 2012 survey from the National Foundation of Infectious Diseases showed that 13% of physicians did not know all patients ≥ 65 years of age and older need pneumococcal vaccination and more than 40% did not know smokers and alcoholics should be vaccinated. [xxi] This continuing professional

development/PICME project provided the opportunity to demonstrate that periodic updates to individual physicians of their immunization data for their own patients, with opportunity to compare the data with that of colleagues in the same system and with national data, coupled with educational interventions, provide an effective method to support physicians' continuous improved performance.

Conclusions

This initiative was successful in driving up pneumococcal vaccination rates. 14,769 elderly patients and 8,944 patients at high risk of pneumococcal infection in just three medical systems were vaccinated post-baseline assessment over the two years. Nearly one third (103/316) of the physicians who participated in this initiative completed the PICME process, including the educational activities, and received 20 *AMA PRA Category 1 credits* ™. The initiative demonstrated that data-driven CME worked. In both the elderly and high-risk patient populations, the percentage of improvement in the rate of pneumococcal vaccination increased by 22% to 56% among physicians who completed the PICME activity, compared with a 20% to 42% improvement among those who did not take part in the educational activity. Both Moore's Level 5 (Performance) and Level 6 (Patient Health Status) were achieved through this initiative.

Significance

This initiative demonstrated that performance improvement can be achieved utilizing methods for assessing electronic health record data and providing baseline and periodic progress reports through an online performance dashboard with a process that is intended to ease the burden of traditional PICME project work involving physician review of individual patient records. Further, this project supports health system action to provide clear, easy-to-understand performance data to busy clinicians in order to encourage continuous quality improvement.

Implications

This success of the project has implications in several areas. First, in the field of CPD, it demonstrates the potential for successful collaborations in PICME among medical education and data analytic companies and community health systems working in partnership with an academically-based CPD team. Second, it offers an effective and efficient alternative in PICME format for maintenance of board certification for physicians, while also being relevant to other health professionals. Third, the ability to translate improved immunization rates into cost savings using national data increases the likelihood that programs such as this will be sustained once constructed.

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Incidence/prevalence data: http://www.cdc.gov/vaccines/pubs/surv-manual/chpt11-pneumo.html#t1

APPENDICES

Appendix A-Brief Bio of Activity Leader

Tiffiny Diers, MD, Program Director: Dr. Diers is board-certified in Internal Medicine and Pediatrics and is a faculty physician in the University of Cincinnati Internal Medicine and Pediatrics practice, a combined faculty-resident practice that recently achieved designation as a Level 3 Patient Centered Medical Home from the National Center for Quality Assurance. Her academic area of interest is using improvement science to improve the health of vulnerable populations. She has received specialized training in healthcare improvement through Cincinnati Children's Hospital Medical Center's Intermediate Improvement Science Series and directs a HRSA-funded Sickle Cell Treatment Demonstration Project, the Ohio Valley Sickle Cell Network. She is the director of the HPEC Team.

Dr. Diers is also the Co-Director of the Initiative on Poverty, Justice and Health at the University of Cincinnati College of Medicine, and the Director of the Latino Health Collaborative of Greater Cincinnati. Additional areas of academic interest include interprofessional education and she directs the UC Health Professions Collaborative, a team that also provides faculty supervision for the UC Chapter of the IHI Open School.

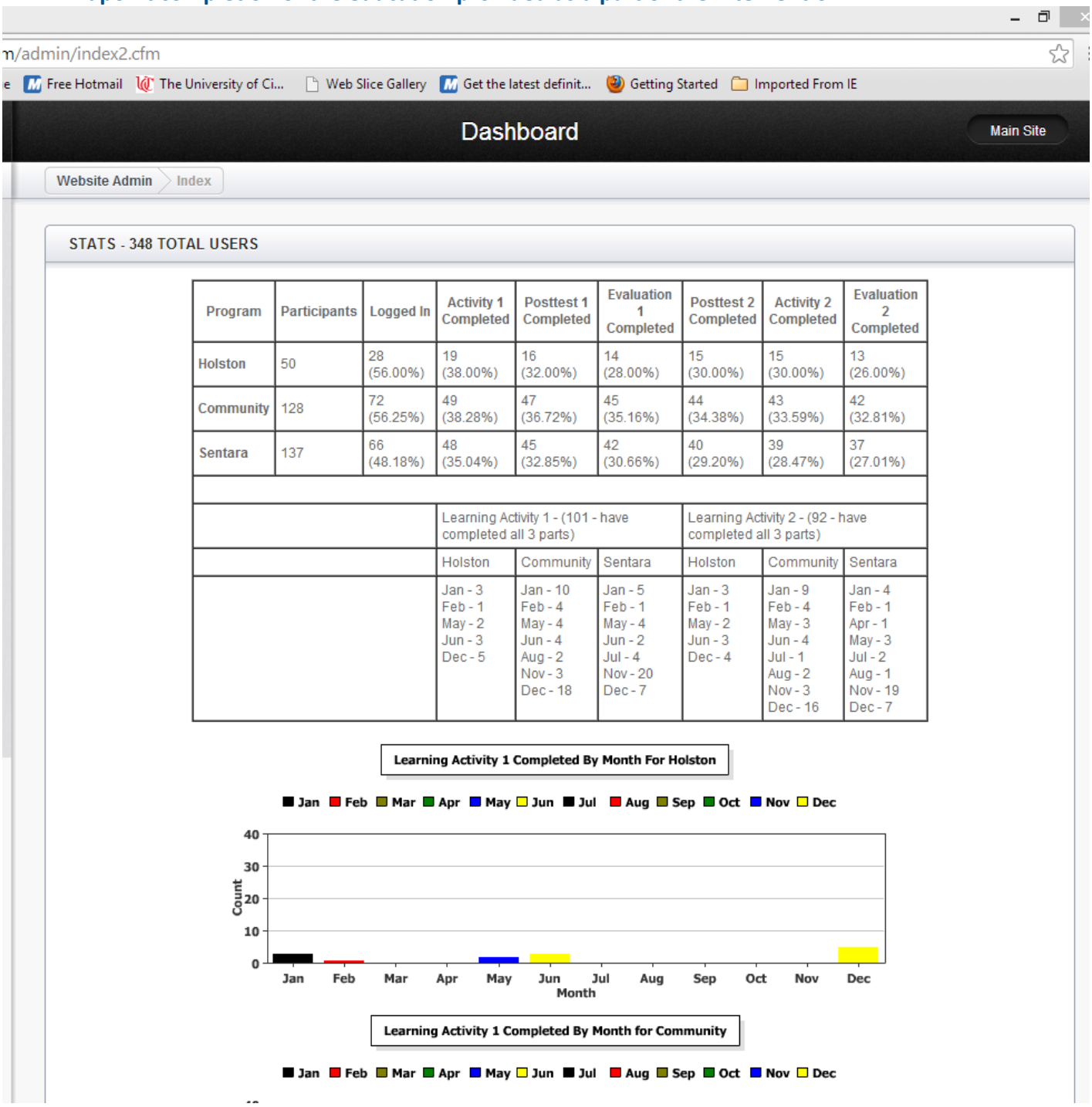
Dr. Diers has been involved in the following quality improvement/performance improvement in practice (PICME) activities:

1. Improving Chronic Pain Care in Primary Care – Provider Champion in the Med-Peds practice for ensuring improvement in the opioid refill process and the use of the PEG to assess pain severity; committed to sustaining the improvement. Partnered with the Improvement Leader (Amy Short) to develop Key Drivers, PDSAs etc. Ends 3/31/2015.
2. Partnering with Patients to Improve Management of Chronic Nonmalignant Pain in Primary Care Using a Longitudinal Group Visit Model – Co-Principal Investigator and Provider Champion in the Med-Peds practice. Group visits scheduled to begin after January 1. Prep work going on now. Awaiting IRB approval/exemption.
3. Increasing Vaccination Rates with an Appointment-Based Pharmacy Model – Co-Principal Investigator. Worked with faculty in the Health Professions Education Collaborative and interprofessional students in the UC Open School. Part I was qualitative research to establish trusted partner organizations in the Cincinnati West End community. Part II was partnering with these organizations to disseminate information about pneumococcal disease and availability of immunizations at St. Vincent de Paul. Also went to several community outreach venues to offer vaccinations. Ends 9/30/2014.

Utilizing Population Health Outcomes Data to Increase Adult Pneumococcal Immunization Rates—QI Project Leader for activity involving three health systems (the project described in this application). Ends 9/2/2015.

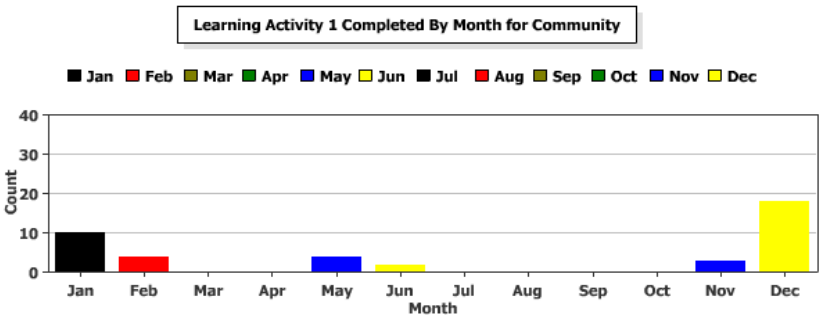
Appendix B: Aggregate Performance Data at Midpoint of Project

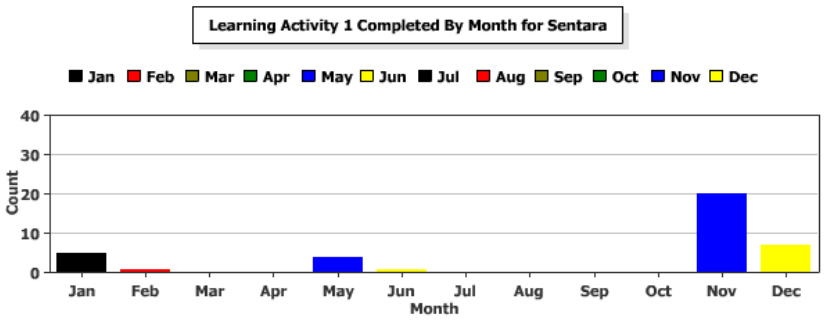
B. 1. Midpoint completion of the education provided as a part of the intervention.

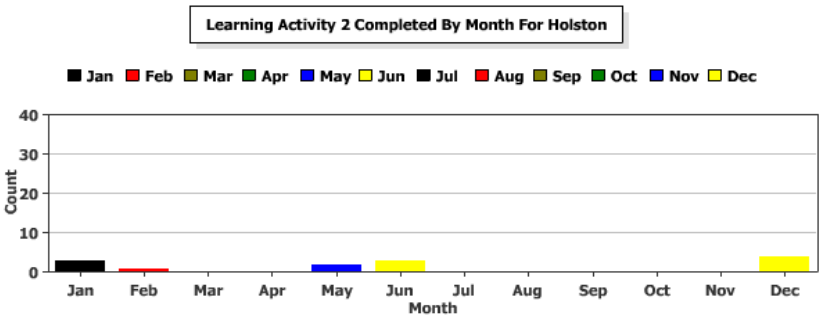


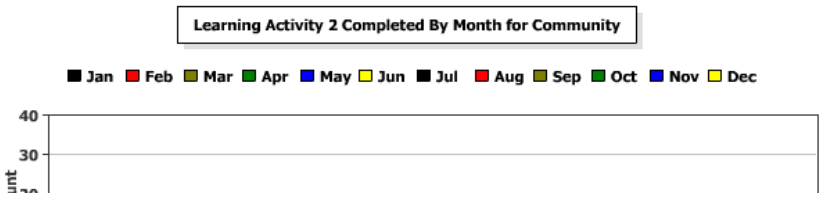
Program	Participants	Logged In	Activity 1 Completed	Posttest 1 Completed	Evaluation 1 Completed	Posttest 2 Completed	Activity 2 Completed	Evaluation 2 Completed
Holston	50	28 (56.00%)	19 (38.00%)	16 (32.00%)	14 (28.00%)	15 (30.00%)	15 (30.00%)	13 (26.00%)
Community	128	72 (56.25%)	49 (38.28%)	47 (36.72%)	45 (35.16%)	44 (34.38%)	43 (33.59%)	42 (32.81%)
Sentara	137	66 (48.18%)	48 (35.04%)	45 (32.85%)	42 (30.66%)	40 (29.20%)	39 (28.47%)	37 (27.01%)

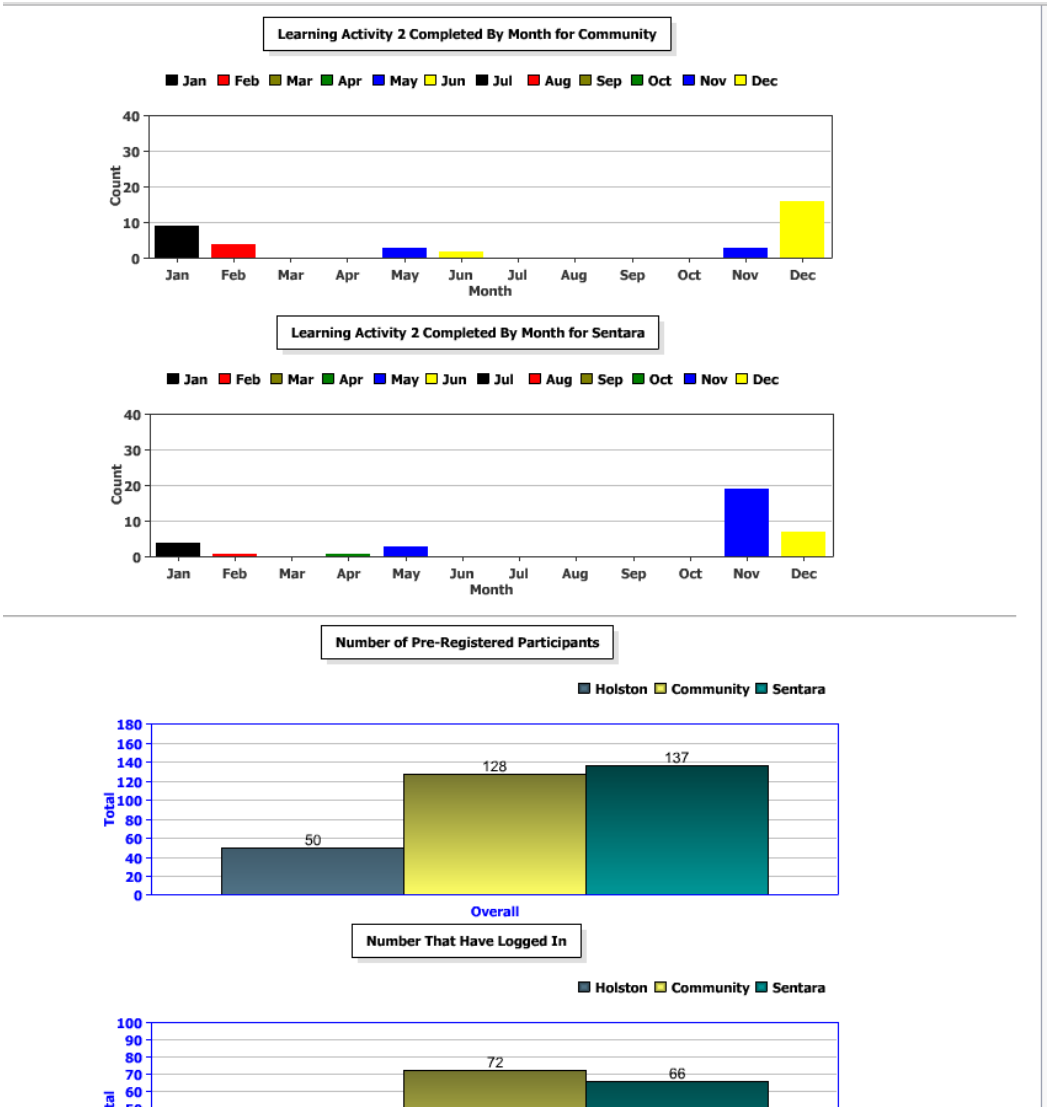
	Learning Activity 1 - (101 - have completed all 3 parts)			Learning Activity 2 - (92 - have completed all 3 parts)		
	Holston	Community	Sentara	Holston	Community	Sentara
	Jan - 3 Feb - 1 May - 2 Jun - 3 Dec - 5	Jan - 10 Feb - 4 May - 4 Jun - 4 Aug - 2 Nov - 3 Dec - 18	Jan - 5 Feb - 1 May - 4 Jun - 2 Jul - 4 Nov - 20 Dec - 7	Jan - 3 Feb - 1 May - 2 Jun - 3 Dec - 4	Jan - 9 Feb - 4 May - 3 Jun - 4 Jul - 1 Aug - 2 Nov - 3 Dec - 16	Jan - 4 Feb - 1 Apr - 1 May - 3 Jul - 2 Aug - 1 Nov - 19 Dec - 7

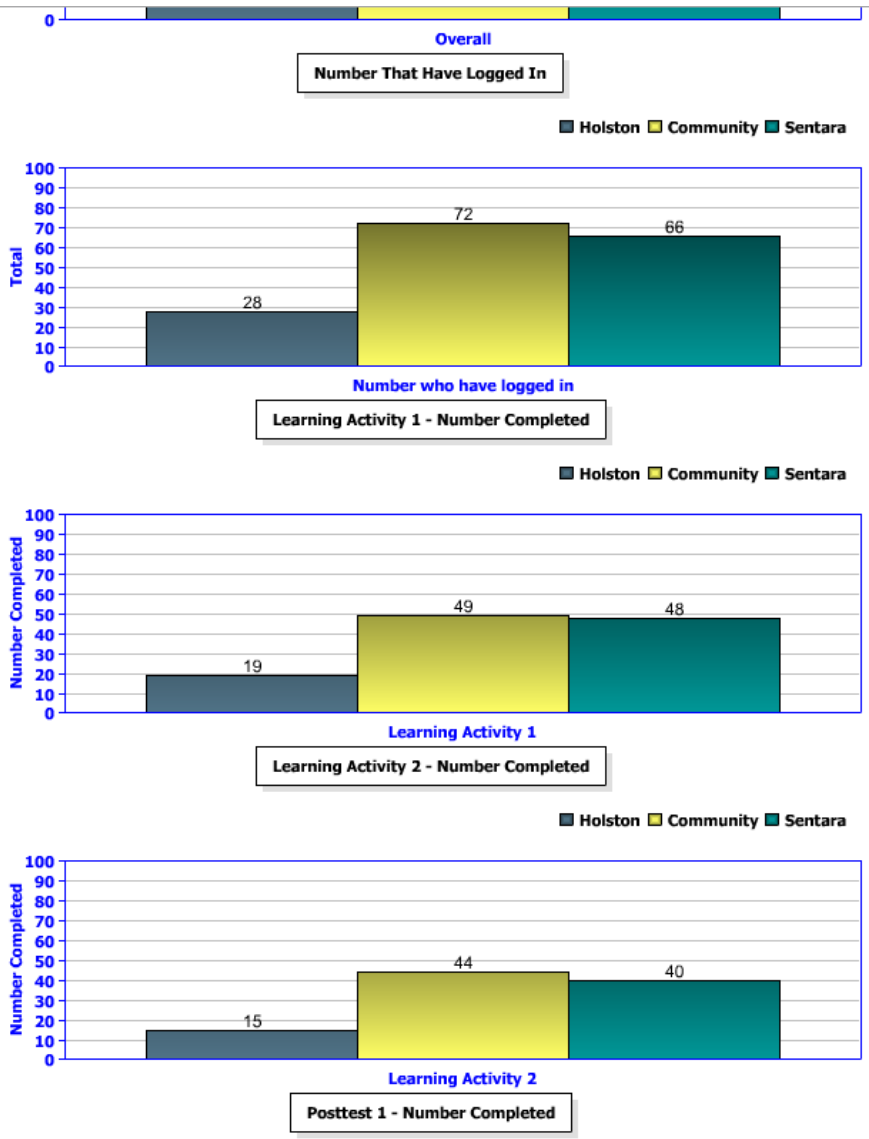

Learning Activity 1 Completed By Month for Community
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Count
40
30
20
10
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month

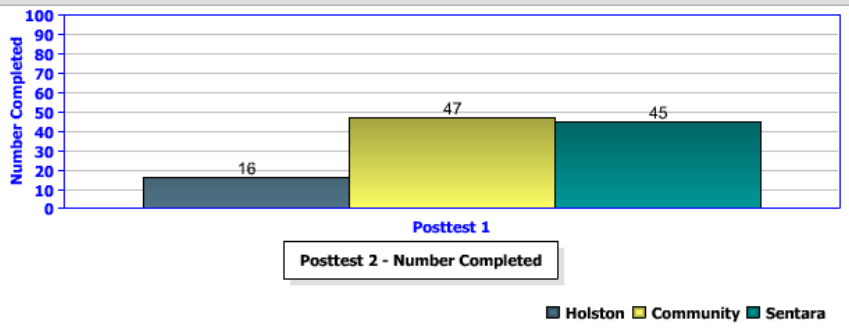

Learning Activity 1 Completed By Month for Sentara
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Count
40
30
20
10
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month

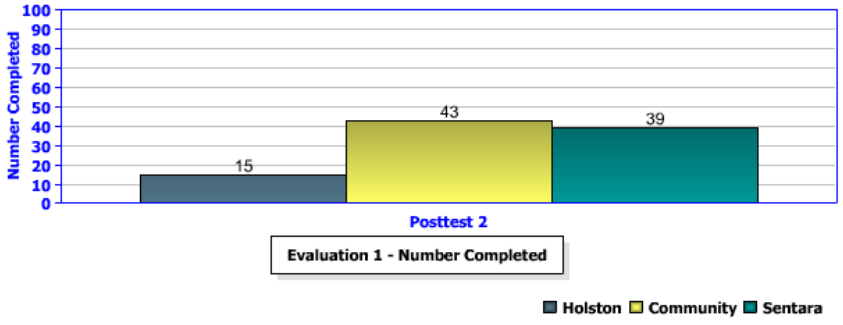

Learning Activity 2 Completed By Month For Holston
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Count
40
30
20
10
0
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Month

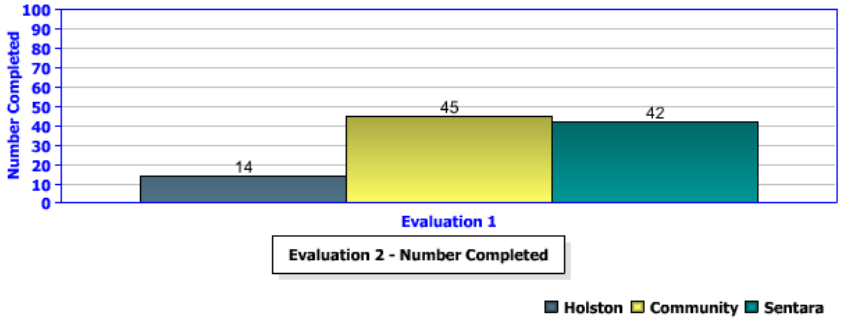

Learning Activity 2 Completed By Month for Community
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
40
30

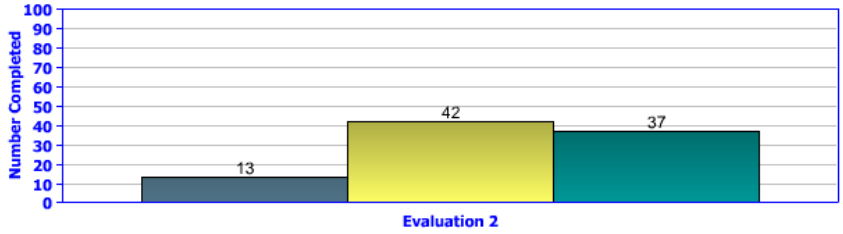

Learning Activity 2 Completed By Month for Community
Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec
Count
Month
Learning Activity 2 Completed By Month for Sentara
Number of Pre-Registered Participants
Holston Community Sentara
Total
50
128
137
Overall
Number That Have Logged In
72
66


0
Overall
Number That Have Logged In
Holston Community Sentara
100
90
80
70
60
50
40
30
20
10
0
Total
72
66
28
Number who have logged in
Learning Activity 1 - Number Completed
Holston Community Sentara
Number Completed
49
48
19
Learning Activity 1
Learning Activity 2 - Number Completed
Holston Community Sentara
Number Completed
44
40
15
Learning Activity 2
Posttest 1 - Number Completed









B. 2. 1. These charts show the midpoint aggregated performance data.

For Patients age 65+ who have received pneumococcal vaccine at baseline, time 1 and time 2

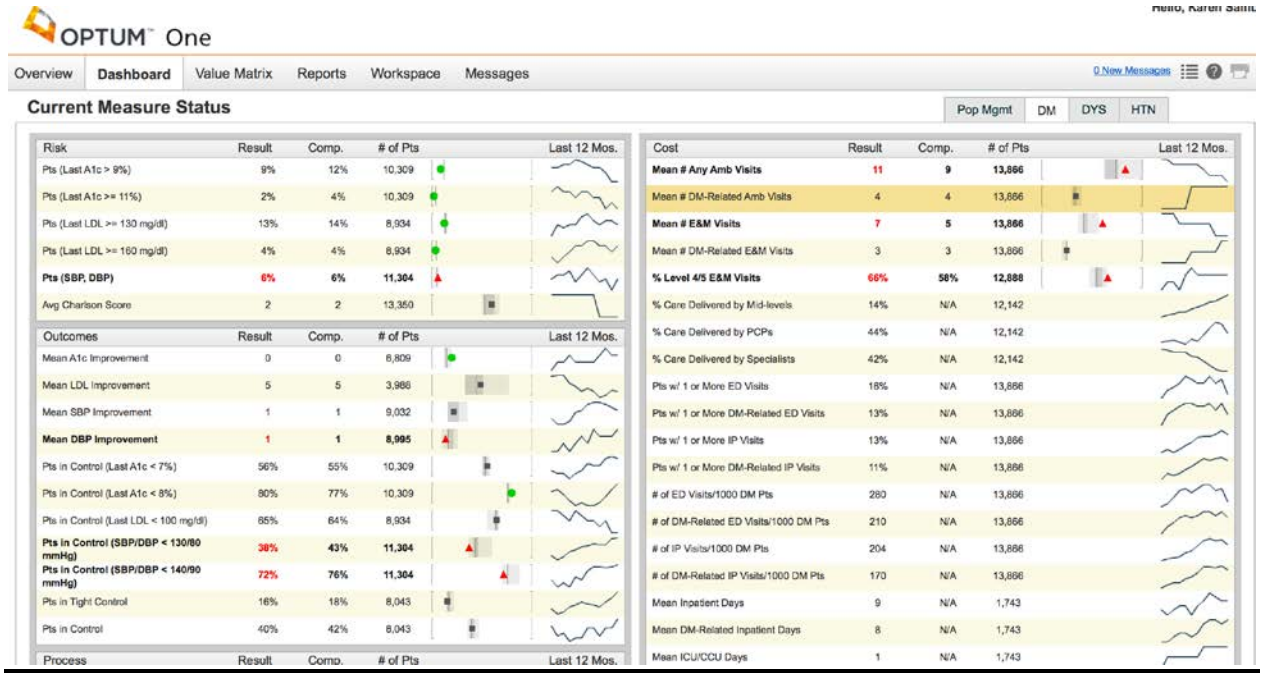
Group	Values					
	Baseline: Group Average % 65+Pts with Pneumo Vaccine	Refresh #1: Group Average % 65+Pts with Pneumo Vaccine	Refresh #2: Group Average % 65+Pts with Pneumo Vaccine	Baseline: National Average % 65+Pts with Pneumo Vaccine	Refresh #1: National Average % 65+Pts with Pneumo Vaccine	Refresh #2: National Average % 65+Pts with Pneumo Vaccine
Community Phys of Indiana	60.20	67.80	69.40	54.20	62.30	63.80
Holston	51.20	56.60	58.50	54.20	62.30	63.80
Sentara	69.90	79.90	82.30	54.20	62.30	63.80
Grand Total	**62.92**	**71.19**	**73.18**	**54.20**	**62.30**	**63.80**

B.2.2 For patients at high risk who have received pneumococcal vaccine at baseline, time 1 and time 2

Group	Values					
	Baseline: Group Average % HR Pts with Pneumo Vaccine	Refresh #1: Group Average % HR Pts with Pneumo Vaccine	Refresh #2: Group Average % HR Pts with Pneumo Vaccine	Baseline: National Average % HR Pts with Pneumo Vaccine	Refresh #1: National Average % HR Pts with Pneumo Vaccine	Refresh #2: National Average % HR Pts with Pneumo Vaccine
Community Phys of Indiana	16.90	23.30	23.90	15.70	18.50	19.20
Holston	8.60	10.30	10.80	15.70	18.50	19.20
Sentara	22.90	28.20	30.30	15.70	18.50	19.20
Grand Total	**18.15**	**23.35**	**24.57**	**15.70**	**18.50**	**19.20**

Appendix C: Data Collection Tool(s)

Data is extracted by Humedica from provider health systems for use in the Humedica patient population health management software tool, formerly called Humedica MinedShare, now call OptumOne. A screenshot from this reporting tool is below:

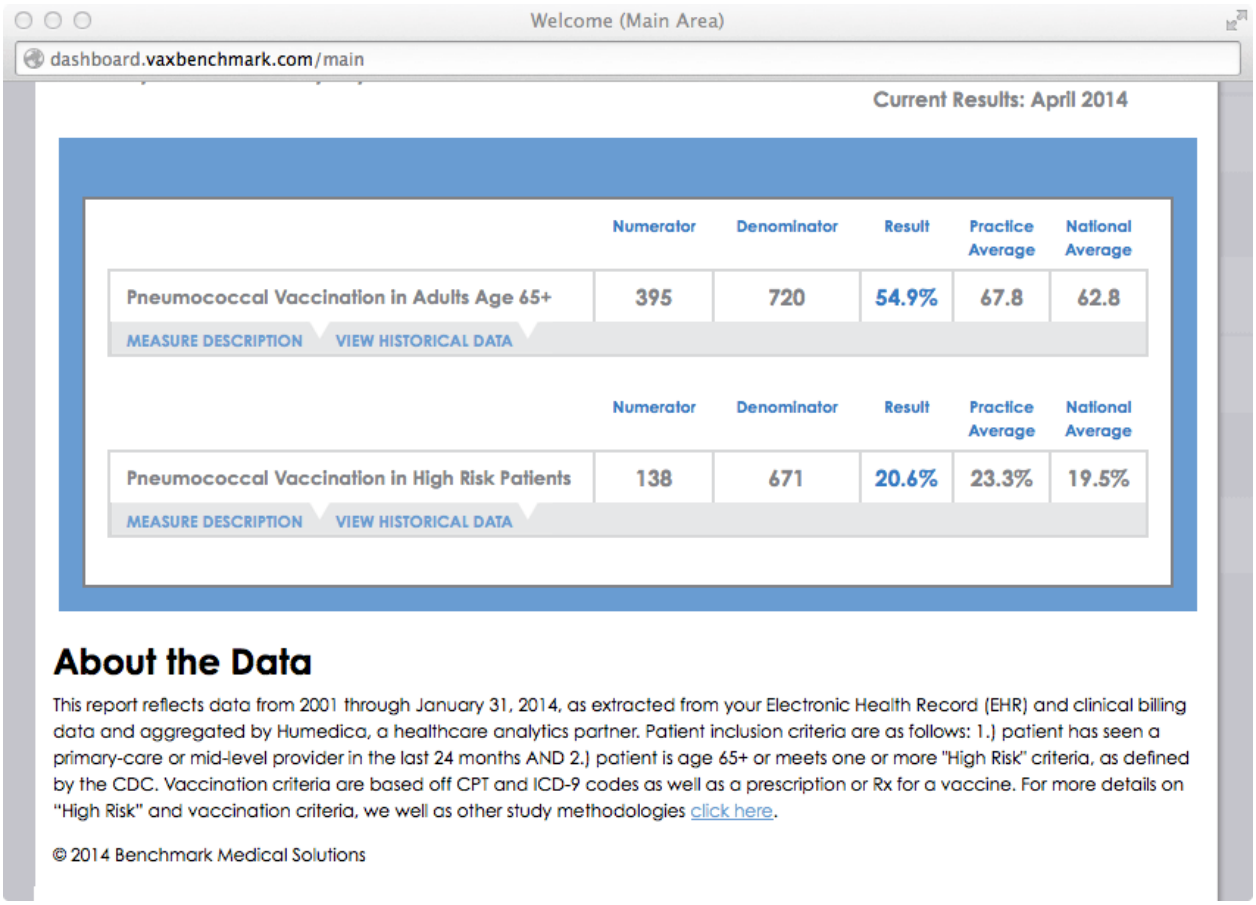


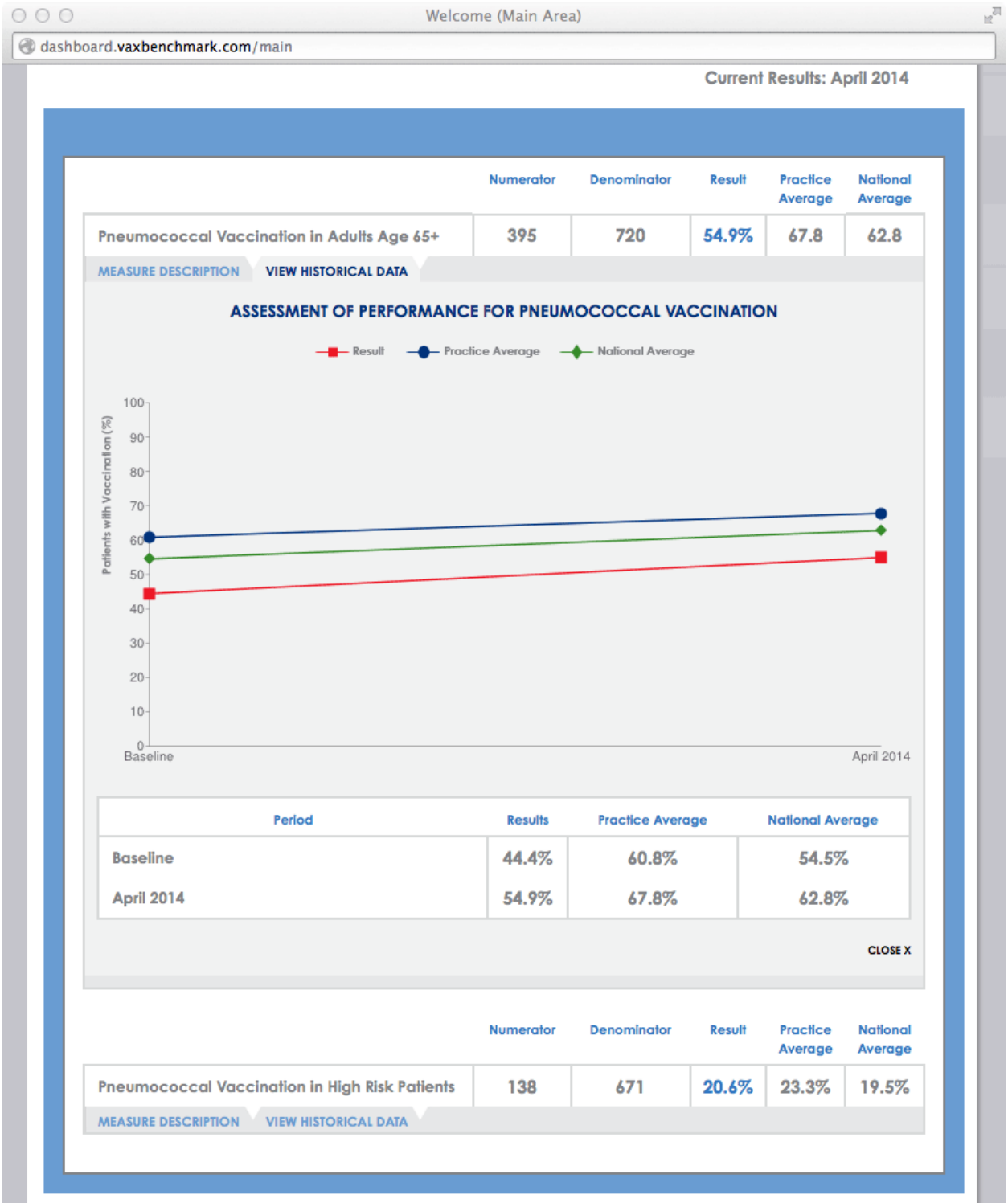
Appendix D: Field Testing Results

Data is extracted by Humedica from each health system's EHR and other relevant IT systems. Humedica maintains robust quality control and validation procedures to ensure accurate data capture. Data integrity is ensured by a series of data quality assessments to which client data are subjected throughout the data pipeline from the initial ingestion, through the mapping process, and then on the data repository through analytic checks and examination of the database. These assessments range from volumetric comparisons at the point of receipt of data to assessments of unmapped or previously unseen values at the point of normalizations and validation. In addition, a sample of patients is identified for validation. Client-side EMR data and Humedica-side extracted and processed data are compared, field by field, to ensure that encounters, procedures, diagnoses, medications, labs, vitals, etc in the processed data match that in the EMR.

Appendix E: Examples of Feedback Reports

Each participant has an individual "Clinical Performance Dashboard" within the educational system that includes data extracted from their electronic health records for their own patients. This is presented so that the participants can see their rates, and compare them to those of their practice as well as to national averages.





About the Data

This report reflects data from 2001 through January 31, 2014, as extracted from your Electronic Health Record (EHR) and clinical billing data and aggregated by Humedica, a healthcare analytics partner. Patient inclusion criteria are as follows: 1.) patient has seen a primary-care or mid-level provider in the last 24 months AND 2.) patient is age 65+ or meets one or more "High Risk" criteria, as defined by the CDC. Vaccination criteria are based off CPT and ICD-9 codes as well as a prescription or Rx for a vaccine. For more details on "High Risk" and vaccination criteria, we well as other study methodologies click here.

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Appendix F: Performance Measures and Improvement Goals

The educational intervention provides helpful and informative information about the national initiative to improve pneumococcal vaccination rates.

nchmark.com/elderly7.cfm

CITI Home Page | Free Hotmail | The University of Ci... | Web Slice Gallery | Get the latest definit... | Getting Started | Imported From IE

AXBenchmark

NATIONAL INITIATIVES TO PROMOTE PNEUMOCOCCAL VACCINATION

There are a number of promotional and educational efforts under way in the United States to achieve higher rates of pneumococcal vaccinations among adults aged 65 years and older. The US Department of Health and Human Services' *Healthy People 2020* program has established objectives for increasing the percentage of adults vaccinated against pneumococcal disease (including institutionalized adults), as well as reducing new cases of invasive pneumococcal infections in people 65 years of age and older from 40.4 new cases per 100,000 in 2008 to 31 cases per 100,000 in 2020.[3]

The Joint Commission has included vaccination as a 2012 performance measure for hospitals, with implications on hospital accreditation.[46] Failure to vaccinate older patients before hospital discharge puts them at risk for illness and rehospitalization.[47]

The National Foundation for Infectious Diseases (NFID) has promoted a series of goals for healthcare professionals to attain regarding adult pneumococcal vaccinations.[47] These goals include:

- Protecting older Americans from serious pneumococcal disease
- Preventing pneumococcal disease in adults with chronic conditions
- Overcoming disparities in pneumococcal disease vaccination among US adults.

CONCLUSION

IPD remains a major cause of morbidity and mortality among the elderly. Current vaccines are safe and effective and can help to reduce this burden. However, they are effective only if used. Strategies to increase vaccination rates that address patient and provider barriers will help to prevent unnecessary illnesses and deaths. Providers should discuss these vaccines with their patients and ensure that the vaccines are offered and administered. Their patients' lives may depend on just that.

Further information about the NFID's current efforts to improve adult pneumococcal vaccination rates may be found on its Web site (www.adultvaccination.org/profess resources/pneumococcal-cta).

Appendix G: Self-Assessments, Practice Assessments, or Other Tool(s)

Each educational intervention activity has a post-test which must be passed in order for the participant to receive credit.

POST TEST

1. Which of the following statements is true?

A. Vaccination rates differ by physician and are affected by patients' level of education and trust in their healthcare professional.
B. All adults are eligible for a dose of PPSV23 at age 65 years, except those who received a dose prior to age 65.
C. Changes in serotypes are likely a result of the evolving pneumococcal population, now that conjugate vaccines are in widespread use.
D. Upper respiratory infections are a contraindication to pneumococcal vaccination with either PCV13 or PPSV23.

2. One explanation for the underutilization of pneumococcal vaccination in patients 65 years of age and older may be:

A. Lack of knowledge about the benefits of vaccination in apparently healthy older adults.
B. Patients do not want to go to a hospital to receive it.
C. Vaccination requires fasting prior to administration.
D. The vaccine is not covered by Medicare.

3. Which of the following statements about pneumococcal disease is true?

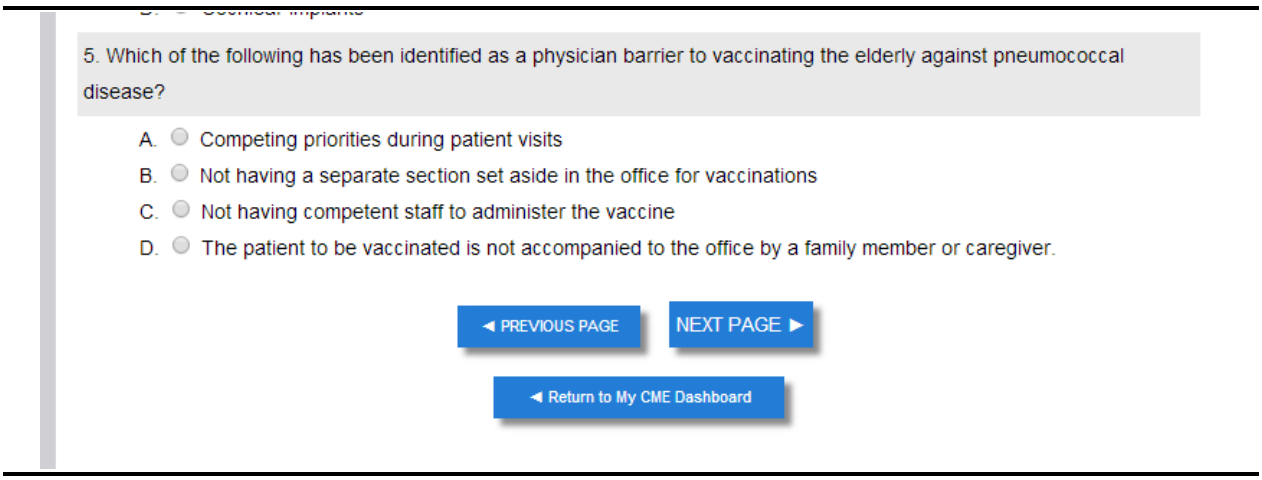
A. Of the two types of pneumococcal disease, invasive pneumococcal disease is considered to be the more common type.
B. The proportion of invasive pneumococcal disease decreases with increasing patient age.
C. In the United States, the overall incidence of invasive pneumococcal disease among adults with AIDS has continued to increase.
D. Bacteremia is associated with most cases of invasive pneumococcal disease.

4. Which of the following is not a risk factor for pneumococcal disease?

A. Asplenia
B. Cerebrospinal fluid leaks
C. Shingles
D. Cochlear implants

5. Which of the following has been identified as a physician barrier to vaccinating the elderly against pneumococcal disease?

A. Competing priorities during patient visits
B. Not having a separate section set aside in the office for vaccinations



Sample letter to introduce project to clinicians at three systems.

Dear Dr. #fname# #lname#,

As you heard in a recent announcement from Dr. G/Dr. R/Dr. C, your practice is collaborating with University of Cincinnati in a data-driven PI CME initiative which is designed to increase rates of pneumococcal immunization among eligible patients.

As a participating provider, you will be asked to review your current pneumococcal immunization rates for both >65 and high risk patients and then to complete an educational module and post-test on evidence-based practice for pneumococcal immunization. Periodically over the next two years, you will be provided with updates on your immunization rates for eligible patients in order to chart your progress.

To view your baseline performance data and begin the CME activities, log-in with the information provided below and then click the link labeled: My Performance Dashboard.

Email: #email#

Password: #password#

Note your baseline performance data has been pre-populated by Humedica, your clinical data analytics partner, in collaboration with Benchmark Medical Solutions. Through the dashboard you will be able to review your personal data and compare it to that of your practice benchmark and the national benchmark of pneumococcal vaccination for patients over 65 and all adult patients identified as ‘at-risk’.

Sincerely,

Tiffiny Diers, M.D.
Associate Professor, Internal Medicine and Pediatrics
University of Cincinnati

Periodic emails are sent to all participants informing them when their patient data has been refreshed so that they can go into the system and view their pneumococcal vaccination rates, compare their own rates with those of others in their system, and with the national averages. The emails also provide a status of what stages of the program have been completed and what they still need to complete in order to receive credit.

Dear Dr. #fname# #lname#,

By way of update, the online data-driven PI CME initiative, which your health system is collaborating with the University of Cincinnati to increase rates of pneumococcal immunization among eligible patients, has been updated. **Log in now to view your personal performance trends, with data updated though May 31, to see how you compare with your peers and the nation overall!**

Log In Details:
Website: www.VAXBenchmark.com
Username: #username
Password: #password

Performance measures include:

1) Percentage of Older Adults Receiving Pneumococcal Vaccine
2) Percentage of People at High Risk for Infection Receiving Pneumococcal Vaccination

Note your performance data has been pre-populated by Humedica, your health system's clinical data analytics partner, in collaboration with Benchmark Medical Solutions. If you would like more information or have any questions, please reach out to one of the organizers:

Jack Rush
Office: 516.364.1020
Mobile: 516.987.3797
Email: jrush@direct1.net

Please feel free to reach out to me if you would like to discuss. Thanks and good luck!
Sincerely,
Jack Rush
VAX Benchmark Team

Data Note: Please note, in an effort to control for changes in the data sources available (i.e. addition of health maintenance or immunization tables) the baseline data is re-run at the same time as the refreshed data. This ensures that changes to immunization rates result from performance improvement and not changes in the data that are available for extraction. In addition, to control for changing patient panels, patients included in each period are only those seen within 24 months prior to the end data of the most recent intervention end date.

Appendix H: Action Plan Template

Examples of tools contained within the educational activities on next 3 pages.

What is your response?

Answer

Since the patient received PPV23 at age 65, no revaccination is required.

STANDING ORDERS

The initiative that has been shown to be most effective is standing orders. Standing orders, or protocols, allow healthcare professionals to vaccinate eligible patients without direct physician intervention or involvement. With standing orders, physician intervention is needed only for patients who decline vaccination (which presents an opportunity for explicit recommendation and education) or who need an assessment for a possible true contraindication. Indeed, there is sufficient evidence to support the notion that standing orders are feasible, increase vaccination rates, and are superior to physician reminders alone.[32,33] The effectiveness of standing orders has been demonstrated in older adults to improve influenza and pneumococcal vaccination rates.[32,34] The ACIP and the independent, nonfederal Task Force on Community Preventive Services strongly recommend the use of standing orders.[35,36]

WALK-IN VACCINATION CLINICS

Other initiatives include eliminating the need to make an appointment ahead of time and avoiding excessive wait times.[28] Therefore, walk-in, vaccination-only clinics are an effective method of increasing patient access to vaccines. These types of clinic-like initiatives may involve extending traditional office hours to include weekends and evenings, as well as having a parallel "express vaccination" service during office hours.[28] In one physician-based survey, it was found that primary care physicians were most willing to initiate in their practices walk-ins (65%), standing orders (35%), patient reminders (23%), and chart reminders (18%).[37] In another survey of a sampling of 6,889 patients seen by primary care physicians, patient complete examinations were more likely to address colorectal cancer screening (79%), mammography (89%), cervical cancer screening (91%), and tetanus immunization (82%) than pneumococcal vaccination (62%).[38]

ELECTRONIC REMINDER SYSTEMS

Another initiative would be implementation of electronic clinical decision-support (CDS) systems. CDS systems can create individualized orders for patients at the time of their visits. Unlike childhood vaccinations, which are based primarily on age and vaccination history, decisions about adult vaccinations often must take into account comorbid medical conditions. Electronic reminder systems are of great benefit and can be easily implemented in most practices that keep electronic health records.[39]

COMPUTERIZED RECORD AND CHART REMINDERS

Computerized record reminders and chart reminders are strategies to alert providers of vaccines needed at upcoming patient visits or vaccines that are past due. With a computerized system and the appropriate software, reminder messages may be generated the night before a patient visit, and reminders can also appear on a patient's record. Simplistic chart reminders that draw attention to the need for immunization (such as a flag or sticker on a chart) are an alternative way to increase such awareness. These strategies are effective at improving vaccination coverage and are inexpensive (assuming an electronic health record system is already in place).[40,41]

ASSESSMENT, FEEDBACK, INCENTIVES, AND EXCHANGE

Another strategy is Assessment, Feedback, Incentives, and Exchange (AFIX), a nationwide quality-improvement strategy focused on provider assessment and performance feedback.[42] Its overall goal is to improve immunization rates and best practices. The four core elements of AFIX are:

- *Assessment* of the healthcare provider's vaccination coverage levels and immunization practices
- *Feedback* of results to the provider along with recommended strategies to improve processes, immunization practices, and coverage levels
- *Incentives* to recognize and reward improved performance
- *eXchange* of healthcare information and resources necessary to facilitate improvement.

Information on AFIX is available online through the CDC's Web site at http://www.cdc.gov/vaccines/programs/afix/index.html.

SIMULTANEOUS ADMINISTRATION OF VACCINES

Simultaneous administration of vaccines is defined as administering more than one vaccine on the same clinic day, at different anatomic sites, and not combined in the same syringe. Simultaneously administering all vaccines for which a person is eligible at the time of a visit increases the probability that a child, adolescent, or adult will be vaccinated fully by the appropriate age.[43] When assessing patients for pneumococcal vaccinations and administering the vaccine, other indicated vaccines, such as influenza and Tdap (tetanus, diphtheria and pertussis), can also be administered the same day.

CASE VIGNETTE 4

Question

A 65-year-old male patient visits your office for the first time requesting to receive both the influenza virus and pneumococcal vaccines. After a thorough analysis of his medical history, he appears to be eligible to receive both vaccines at this time. Before proceeding with the vaccinations, however, he indicates to you that he only has Medicare Part A health insurance coverage. Will he be covered by Medicare for the cost of the vaccinations?

Answer

Unfortunately, in this particular case, the patient's cost will not be covered. Vaccines and their administration are covered only by Medicare Part B. A person's eligibility for Part B coverage is indicated on their Social Security card. The Medicare card clearly displays Part A and/or Part B

improve processes, immunization practices, and coverage levels

- *Incentives* to recognize and reward improved performance
- *eXchange* of healthcare information and resources necessary to facilitate improvement.

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PHARMACOECONOMICS OF PNEUMOCOCCAL VACCINATION OF THE ELDERLY

There is much discussion of the economic benefit of pneumococcal vaccination in relationship to reducing healthcare costs, especially regarding preventable morbidity and mortality. Studies have shown that increasing pneumococcal vaccination rates in patients 65 years of age and older can greatly reduce the costs of care associated with pneumonia and other pneumococcal diseases. One study estimates that if all seniors received this vaccine, health costs could be reduced by nearly $1 billion per year.[44]

In a recently published study, Michaelidis and colleagues concluded that a national vaccination intervention program among patients 65 years of age and older to ameliorate racial disparities in pneumococcal vaccination would be cost-effective.[45] The incremental cost-effectiveness of the vaccination program relative to no program was $45,161 per quality-adjusted life-year (QALY) gained in the base-case analysis. In probabilistic sensitivity analyses, the likelihood of the vaccination program being cost-effective at willingness-to-pay thresholds of $50,000 and $100,000 per QALY gained was 64% and 100%, respectively.[45]

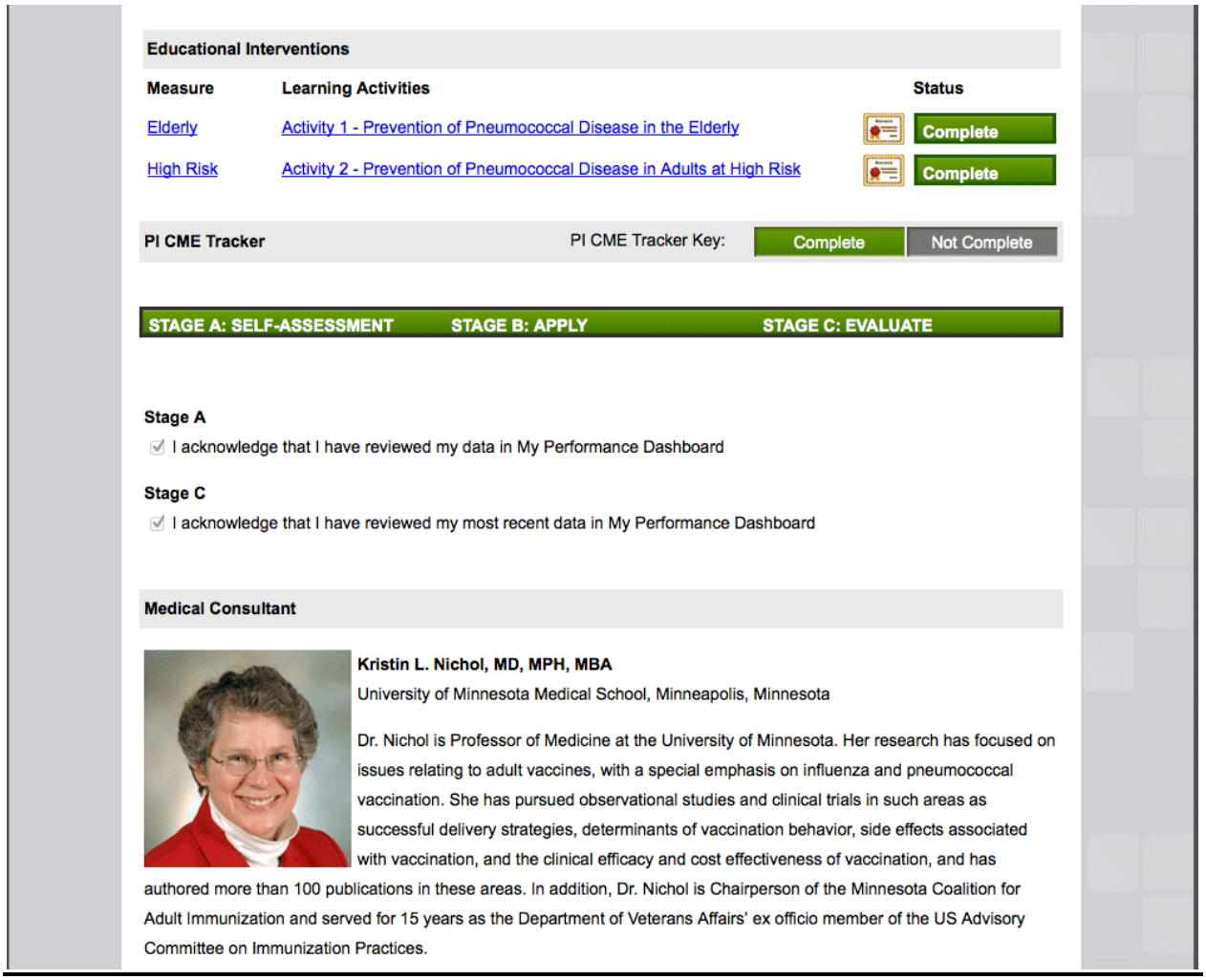
vaccinations, however, he indicates to you that he only has Medicare Part A health insurance coverage. Will he be covered by Medicare for the cost of the vaccinations?

Answer

Unfortunately, in this particular case, the patient's cost will not be covered. Vaccines and their administration are covered only by Medicare Part B. A person's eligibility for Part B coverage is indicated on their Social Security card. The Medicare card clearly displays Part A and/or Part B.

Appendix I: QI Resources, Tools and Educational Materials

This is the dashboard page of the educational activities, listing each activity, the percentage of completion, and a brief explanation of the three step process. Learners proceed at their own pace. The next 3 pages contain examples of tools that are provided within the educational materials.



Educational Interventions

Measure	Learning Activities	Status
Elderly	Activity 1 - Prevention of Pneumococcal Disease in the Elderly	Complete
High Risk	Activity 2 - Prevention of Pneumococcal Disease in Adults at High Risk	Complete

PI CME Tracker PI CME Tracker Key: Complete | Not Complete

STAGE A: SELF-ASSESSMENT **STAGE B: APPLY** **STAGE C: EVALUATE**

Stage A

☑ I acknowledge that I have reviewed my data in My Performance Dashboard

Stage C

☑ I acknowledge that I have reviewed my most recent data in My Performance Dashboard

Medical Consultant

Kristin L. Nichol, MD, MPH, MBA
University of Minnesota Medical School, Minneapolis, Minnesota

Dr. Nichol is Professor of Medicine at the University of Minnesota. Her research has focused on issues relating to adult vaccines, with a special emphasis on influenza and pneumococcal vaccination. She has pursued observational studies and clinical trials in such areas as successful delivery strategies, determinants of vaccination behavior, side effects associated with vaccination, and the clinical efficacy and cost effectiveness of vaccination, and has authored more than 100 publications in these areas. In addition, Dr. Nichol is Chairperson of the Minnesota Coalition for Adult Immunization and served for 15 years as the Department of Veterans Affairs' ex officio member of the US Advisory Committee on Immunization Practices.

AVAILABLE PNEUMOCOCCAL VACCINES FOR ADULTS

There are two types of pneumococcal vaccines recommended for adults: PPSV23 and PCV13 (Table 1). The 23-valent PPSV23 vaccine is recommended for all persons 65 years of age and older, as well as for adults under the age of 65 with certain high-risk conditions, including asthma and cigarette smoking.[5] Recently, the ACIP recommended the use of both PCV13 and PPSV23 in immunocompromised adults between 19 and 64 years of age.[15] However, PCV13 currently is not approved by the US Food and Drug Administration for use in adults under 50 years of age.

TABLE 1: Pneumococcal Vaccines Available in the United States

Year licensed	Generic name	Trade name	Serotypes	Intended for vaccinating
1983	Pneumococcal polysaccharide vaccine, 23-valent (PPSV23)	Pneumovax 23	1, 2, 3, 4, 5, 6B, 7F, 8, 9N, 9V, 10A, 11A, 12F, 14, 15B, 17F, 18C, 19F, 19A, 20, 22F, 23F, and 33F	• Adults ≥ 50 years old • Children ≥ 2 years old and adults at increased risk for pneumococcal disease
2000	Pneumococcal conjugate vaccine, 7-valent (PCV7)	Prevnar	4, 6B, 9V, 14, 18C, 19F, and 23F	Infants and toddlers < 16 months of age
2010	Pneumococcal conjugate vaccine, 13-valent (PCV13)	Prevnar 13	1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F	• Adults ≥ 50 years old • Infants, toddlers, and children 6 weeks through 17 years of age

Both vaccines are safe for use in adults. The efficacy of the PPSV23 vaccine for preventing IPD has varied according to the study population and outcome evaluated. However, recent meta-analyses suggest that PPSV23 is about 50% to 70% or more

Among the more frequent reasons Medicare beneficiaries gave for not being vaccinated were:

• "I did not know the pneumonia shot was needed" (57%)

• "My doctor did not recommend it" (13%)

• "Did not think of it or missed it" (11%)

• "Did not think it would prevent pneumonia" (4%)

• "Thought I was not at risk of catching pneumonia" (4%)

• "Thought the pneumonia shot could have side effects" (2%)

• "Thought that it could cause pneumonia" (2%)

Other factors for the underutilization of pneumococcal vaccination in the elderly may be categorized as economic, educational, geographical/racial, communicational, and provider-related.

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2010	Pneumococcal conjugate vaccine, 13-valent (PCV13)	Prevnar 13	1, 3, 4, 5, 6A, 6B, 7F, 9V, 14, 18C, 19A, 19F, and 23F	• Adults ≥ 50 years old • Infants, toddlers, and children 6 weeks through 17 years of age

Both vaccines are safe for use in adults. The efficacy of the PPSV23 vaccine for preventing IPD has varied according to the study population and outcome evaluated. However, recent meta-analyses suggest that PPSV23 is about 50% to 70% or more

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Other factors for the underutilization of pneumococcal vaccination in the elderly may be categorized as economic, educational, geographical/racial, communicational, and provider-related.

Both vaccines are safe for use in adults. The efficacy of the PPSV23 vaccine for preventing IPD has varied according to the study population and outcome evaluated. However, recent meta-analyses suggest that PPSV23 is about 50% to 70% or more effective against IPD. It should be noted, however, that efficacy among very old persons and among immunocompromised persons has been less well demonstrated.[15] Efficacy date for PCV13 in adults are based largely on immunogenicity studies which generally demonstrated comparable or, in some instances superior immune responses with PCV13 when compared to PPSV23.

Efficacy data against clinical outcomes are still under study. However, a randomized controlled trial of PCV7 in HIV-infected adults in Malawi demonstrated a vaccine efficacy of 75% against IPD.[15]

The accompanying article, "Prevention of Pneumococcal Disease in Adults at High Risk," details the ACIP's current recommendations for vaccinating immunocompromised and other adults at high risk of IPD.

UNDERUTILIZATION OF PNEUMOCOCCAL VACCINATION OF OLDER AMERICANS

Although pneumococcal vaccination is available free of charge to Medicare beneficiaries under Part B and is effective in reducing the incidence and severity of IPD, pneumococcal vaccines are underutilized in all groups, with racial and ethnic disparities persisting among older adults (Figure 1).[16,17] In 2012, the percentage of Americans aged 65 years and older who reported ever having received pneumococcal vaccination was 59.9%, which was lower than the percentage in 2011 (62.3%) and about the same as the percentage reported in 2008 (59.6%).[17] Among adults 65 to 74 years of age, only 49.1% of men and 60.2% of women reported ever having received a pneumococcal vaccine in 2012; the percentage climbed to 66.4% among adults aged 75 years and older but was still less than two thirds of the population eligible to receive the vaccine. In terms of racial and ethnic disparities, 64.0% of whites, 46.4% of blacks, and 43.4% of Hispanics reported having received a pneumococcal vaccine in 2012.[17]

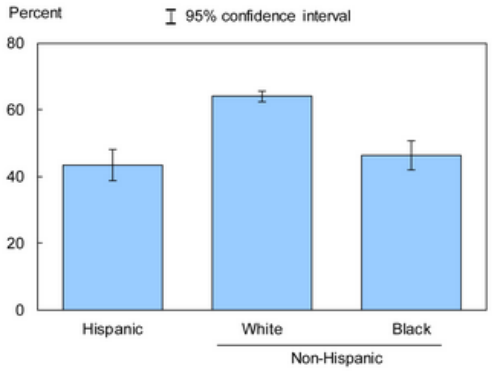


FIGURE 1: Percentage of adults aged 65 years and over in 2012 who reported ever having received a pneumococcal vaccination, by race and ethnicity.[17]

One possible explanation for the underutilization of pneumococcal vaccination may be the lack of awareness of the seriousness of pneumococcal disease and of the benefits

Although pneumococcal vaccination is available free of charge to Medicare beneficiaries under Part B and is effective in reducing the incidence and severity of IPD, pneumococcal vaccines are underutilized in all groups, with racial and ethnic disparities persisting among older adults (Figure 1).[16,17] In 2012, the percentage of Americans aged 65 years and older who reported ever having received pneumococcal vaccination was 59.9%, which was lower than the percentage in 2011 (62.3%) and about the same as the percentage reported in 2008 (59.6%).[17] Among adults 65 to 74 years of age, only 49.1% of men and 60.2% of women reported ever having received a pneumococcal vaccine in 2012; the percentage climbed to 66.4% among adults aged 75 years and older but was still less than two thirds of the population eligible to receive the vaccine. In terms of racial and ethnic disparities, 64.0% of whites, 46.4% of blacks, and 43.4% of Hispanics reported having received a pneumococcal vaccine in 2012.[17]

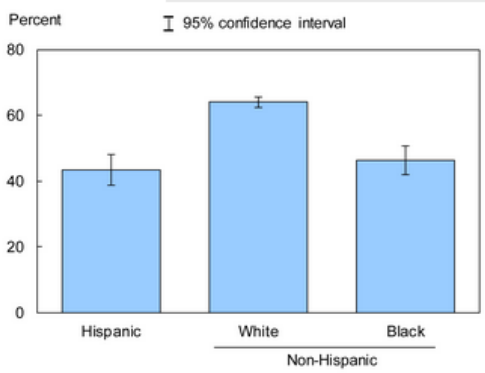


FIGURE 1: Percentage of adults aged 65 years and over in 2012 who reported ever having received a pneumococcal vaccination, by race and ethnicity.[17]

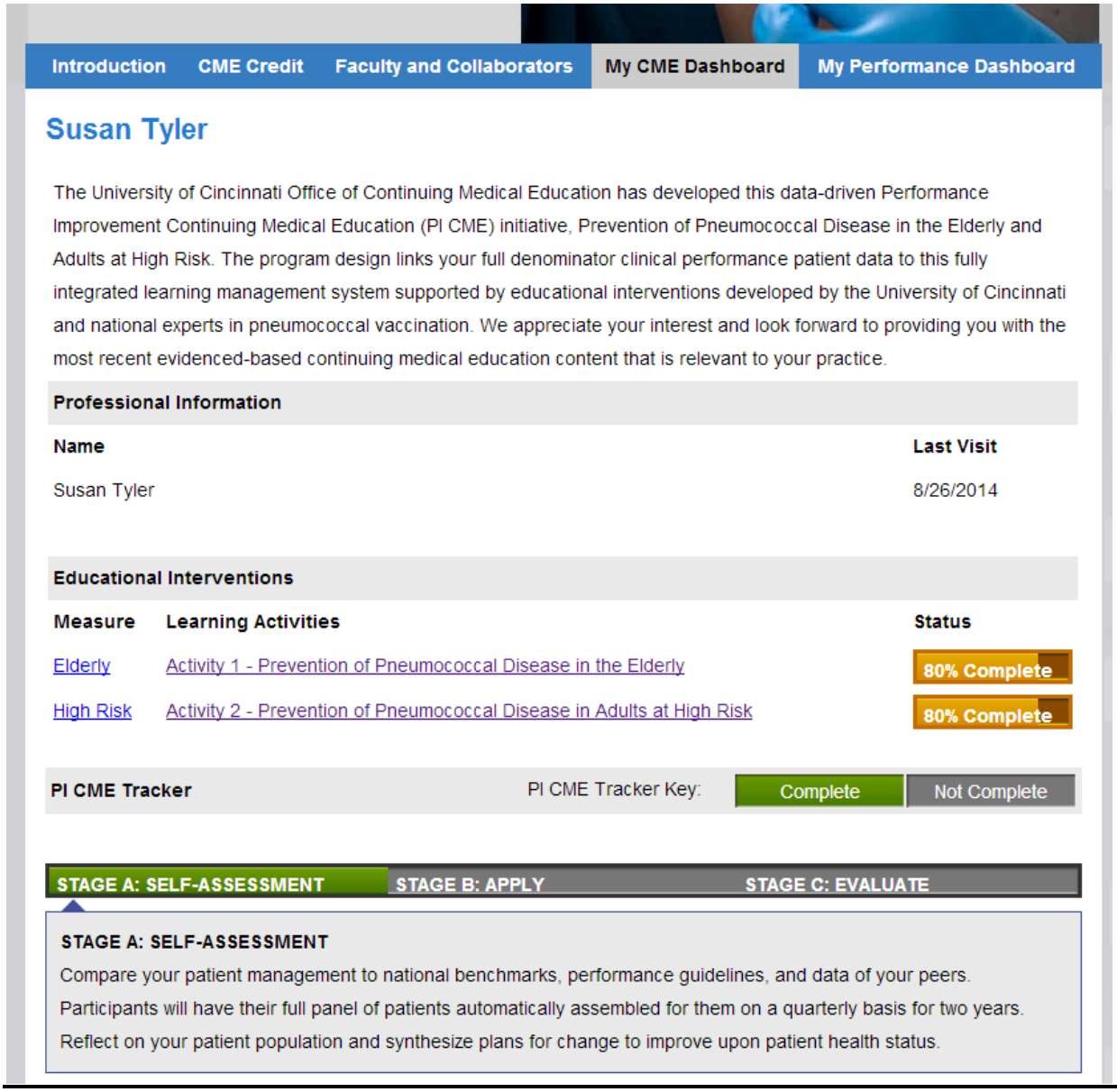
One possible explanation for the underutilization of pneumococcal vaccination may be the lack of awareness of the seriousness of pneumococcal disease and of the benefits of vaccination in apparently healthy older adults. The burden of awareness and benefit falls squarely on the shoulders of healthcare professionals to educate their patients, especially at the community level. It has been shown that healthcare professionals' recommendations for vaccination positively influence patients' decision to be vaccinated.[18] There are additional reasons why pneumococcal vaccines are underutilized in people aged 65 years and older, and they revolve around a lack of patient knowledge about the vaccines available or their eligibility to receive them, misconceptions about pneumococcal vaccines and illnesses, and a lack of recommendations from physicians.[19]

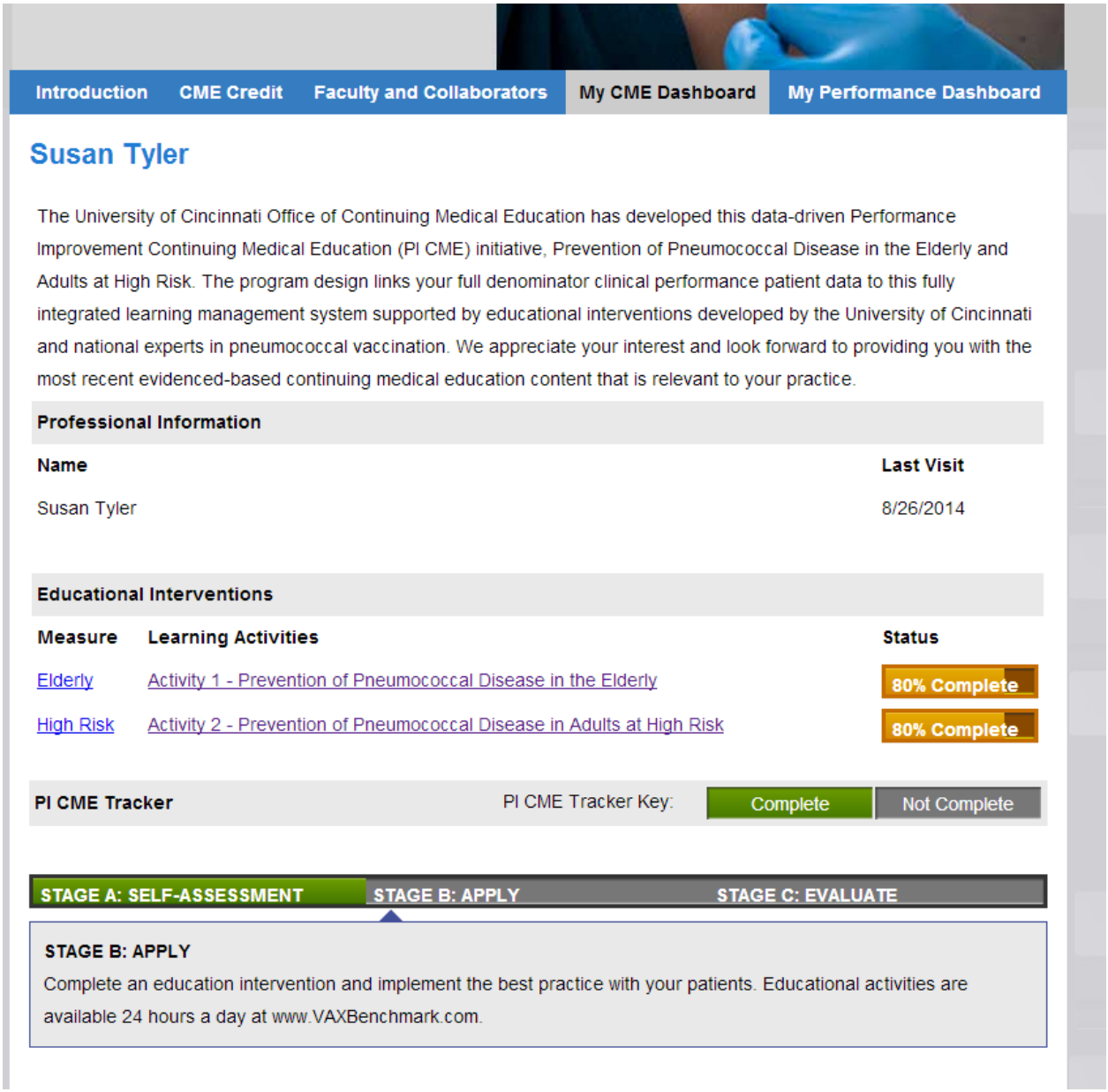
◄ PREVIOUS PAGE NEXT PAGE ►

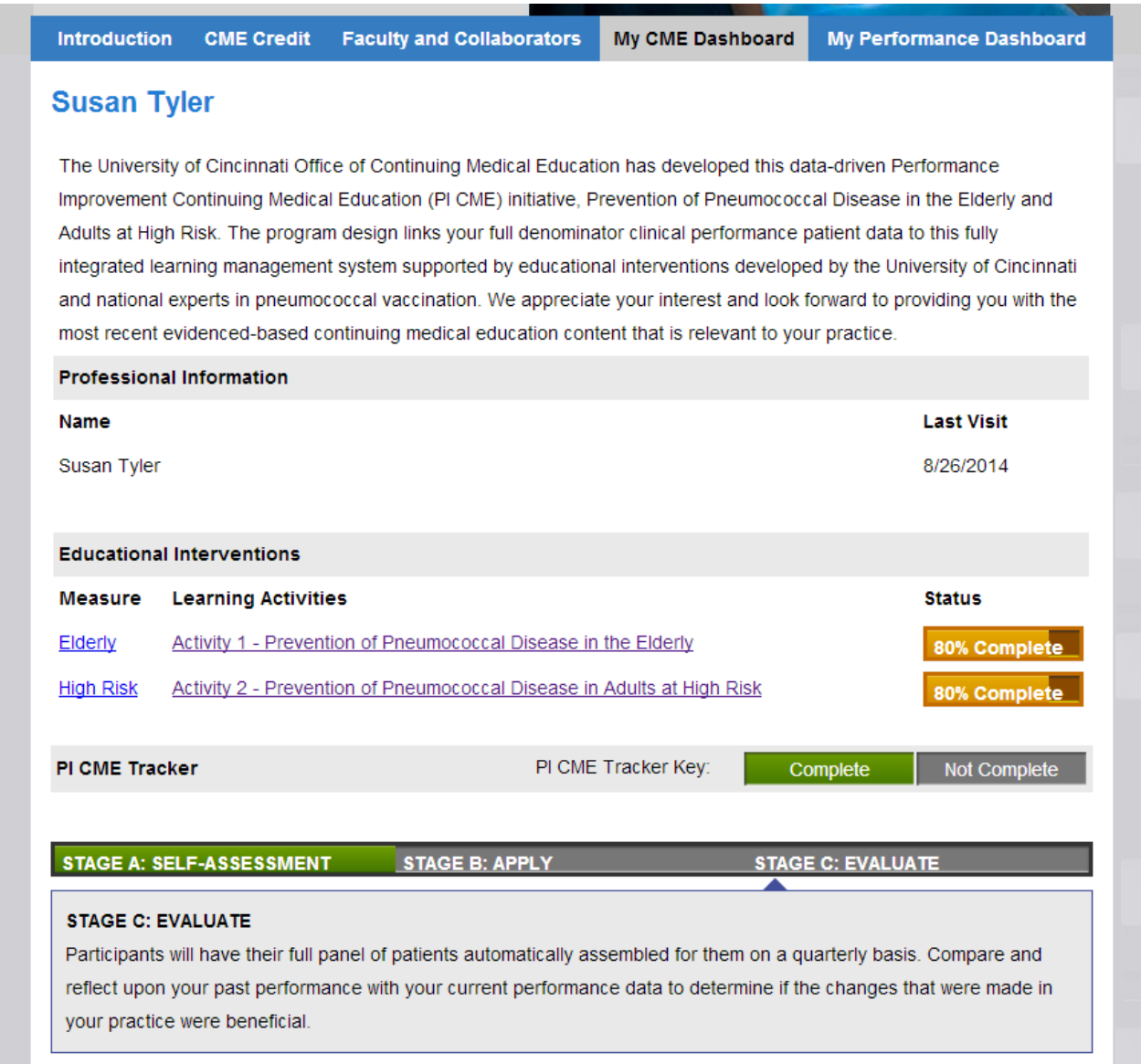
◄ Return to My CME Dashboard

Appendix J: Physician Participation Flow Diagram

The next three pages show the flow chart within the "My Dashboard" section of the educational materials that explain each of the three stages as one hovers over the stage name (Stage A, Stage B, etc.). This chart shows the process flow. In addition, a flow chart depicting the overall process is provided as a fourth page.




Introduction
CME Credit
Faculty and Collaborators
My CME Dashboard
My Performance Dashboard
Susan Tyler
The University of Cincinnati Office of Continuing Medical Education has developed this data-driven Performance Improvement Continuing Medical Education (PI CME) initiative, Prevention of Pneumococcal Disease in the Elderly and Adults at High Risk. The program design links your full denominator clinical performance patient data to this fully integrated learning management system supported by educational interventions developed by the University of Cincinnati and national experts in pneumococcal vaccination. We appreciate your interest and look forward to providing you with the most recent evidenced-based continuing medical education content that is relevant to your practice.
Professional Information
Name
Last Visit
Susan Tyler
8/26/2014
Educational Interventions
Measure
Learning Activities
Status
Elderly
Activity 1 - Prevention of Pneumococcal Disease in the Elderly
80% Complete
High Risk
Activity 2 - Prevention of Pneumococcal Disease in Adults at High Risk
80% Complete
PI CME Tracker
PI CME Tracker Key:
Complete
Not Complete
STAGE A: SELF-ASSESSMENT
STAGE B: APPLY
STAGE C: EVALUATE
STAGE B: APPLY
Complete an education intervention and implement the best practice with your patients. Educational activities are available 24 hours a day at www.VAXBenchmark.com.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Learning Activities
Status
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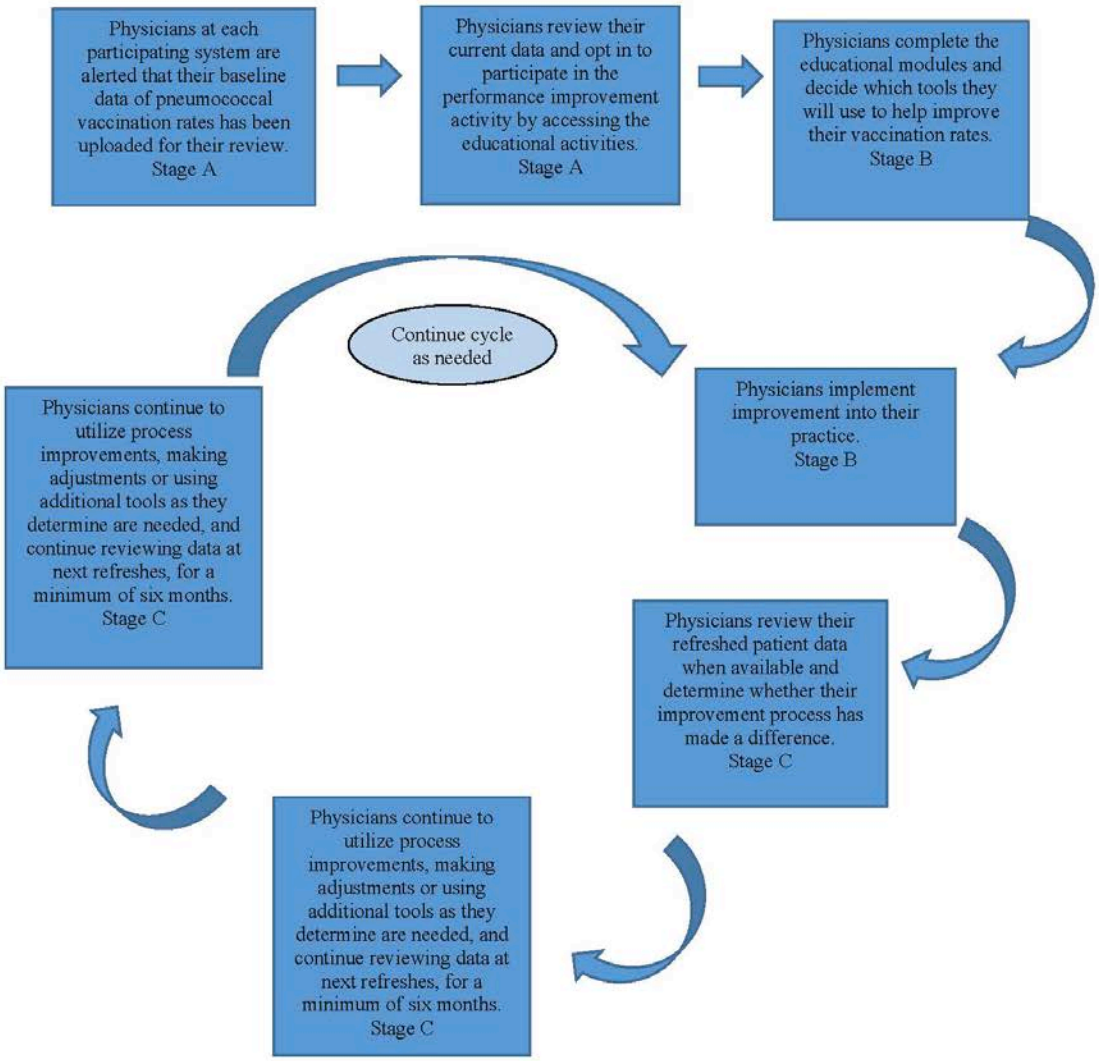
Activity 1 - Prevention of Pneumococcal Disease in the Elderly
80% Complete
High Risk
Activity 2 - Prevention of Pneumococcal Disease in Adults at High Risk
80% Complete
PI CME Tracker
PI CME Tracker Key:
Complete
Not Complete
STAGE A: SELF-ASSESSMENT
STAGE B: APPLY
STAGE C: EVALUATE
STAGE C: EVALUATE
Participants will have their full panel of patients automatically assembled for them on a quarterly basis. Compare and reflect upon your past performance with your current performance data to determine if the changes that were made in your practice were beneficial.

Utilizing Population Health Outcomes Data to Increase Adult Pneumococcal Immunization Rates Flow Chart



Appendix K: Content Committee Roster

Kristin L. Nichol, MD, MPH, MBA, Medical Consultant
Professor of Medicine
University of Minnesota Medical School, Minneapolis, Minnesota

Tiffiny Diers, MD, Program Director
Associate Professor of Internal Medicine and Pediatrics
University of Cincinnati

Appendix L: Outcomes Metrics Report

OUTCOMES METRICS REPORT

Utilizing Population Health Outcomes Data to Increase Adult Pneumococcal Immunization Rates

A collaborative health-improvement program

The University of Cincinnati
Office of Continuing Medical Education

Direct One Communications

Confluent Healthcare Solutions

Optum / Humedica

Program Elements

- **Link full-denominator clinical performance patient data** from individual healthcare providers to a fully integrated learning management system supported by educational interventions developed by national experts in infectious disease prevention.
- **Enable clinicians to better understand** their own performance compared with that of their colleagues in vaccinating elderly patients and those at high risk of pneumococcal infection via an individualized Clinical Performance Dashboard.
- **Challenge clinicians with a series of case-based educational activities** as the foundation of a 20-credit PI CME program, that paired content knowledge about pneumococcal immunizations with systems change as the model for improvement.
- **Provide clinicians with a slide library** capturing the most recent information and clinical advances pertaining to pneumococcal immunization and its impact on patient morbidity and mortality.
- **Generate regional and system-wide reports** of pneumococcal vaccination rates every four months over a period of two years.

Educational Interventions

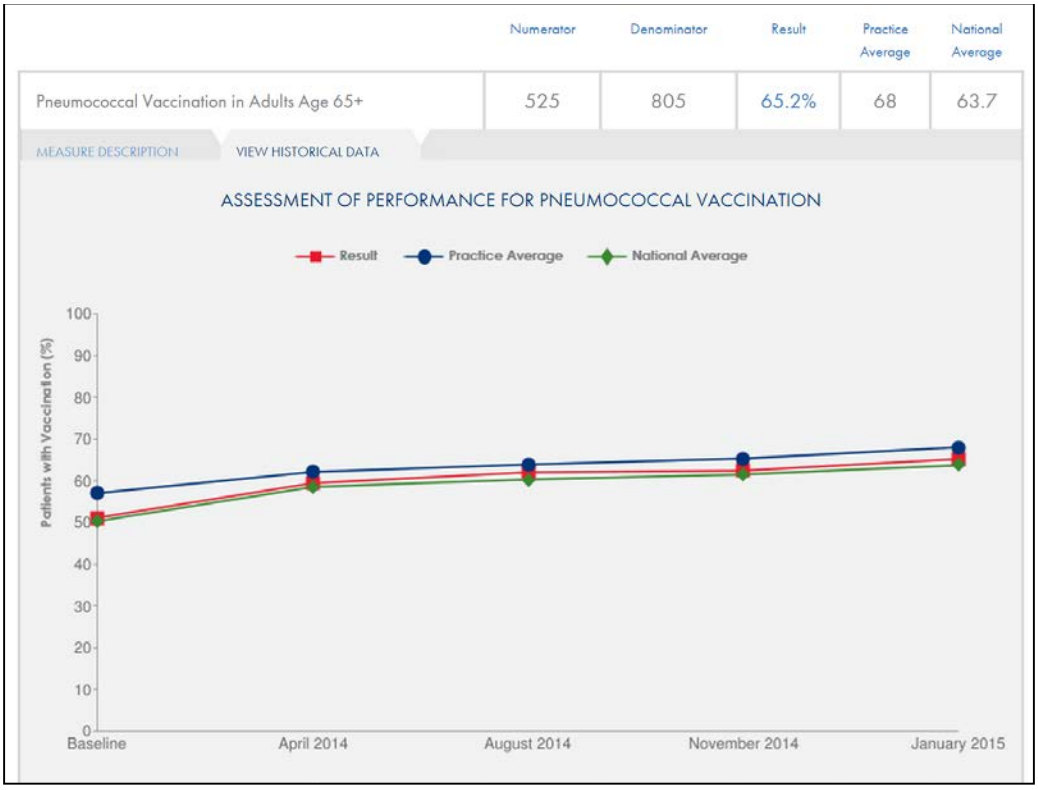
- **Clinical performance dashboard:** baseline and trimester reports of each participant's clinical performance
- **Faculty consensus meetings** with representation from physician champions and experts in pneumococcal infection, immunization, medical education, case management and care coordination, clinical informatics, and quality improvement
- **Case-based, interactive, online educational activities** to directly address the most significant performance gaps
- **Slide library** capturing the most recent clinical research data on pneumococcal immunization, special populations, and the use of Health Information Technology (HIT) solutions to support quality- and performance-improvement efforts
- **A two-year longitudinal outcomes report** populated with aggregate, de-identified data showing trends in pneumococcal immunization rates in each region and system wide

Demographics

- **Participating health systems:**
  - Community Physicians of Indiana (Indianapolis, Indiana)
  - Holston Medical Group (Kingsport, Tennessee)
  - Sentara Medical Group (Norfolk, Virginia)
- **Participating physicians:** 320 primary care physicians
- **Eligible patients:**
  - Age ≥ 65 years: 105,482
  - Age ≥ 18 years at high risk* of pneumococcal infection: 162,675

* Due to chronic medical comorbidities (cardiovascular disease, including stroke; liver, kidney, or lung disease, including chronic renal disease, asthma, and diabetes); immunocompromising diseases (eg, lymphoma, leukemia, HIV/AIDS) or immunosuppressive therapy (eg, corticosteroid therapy, radiotherapy); environmental and occupational risks (eg, skilled nursing facility); cochlear implants; cerebrospinal fluid leakage; alcoholism; and/or cigarette smoking

Clinical Performance Dashboard



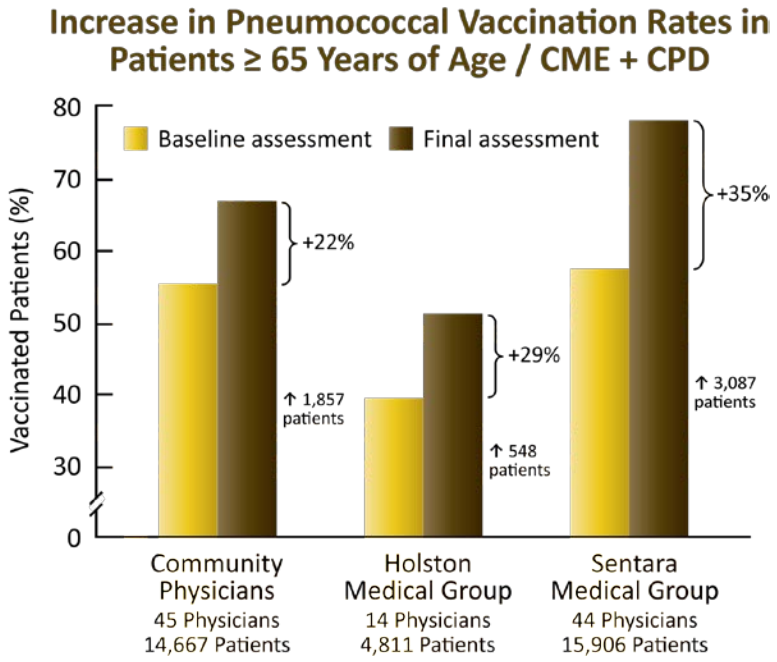
Clinical Performance Dashboard

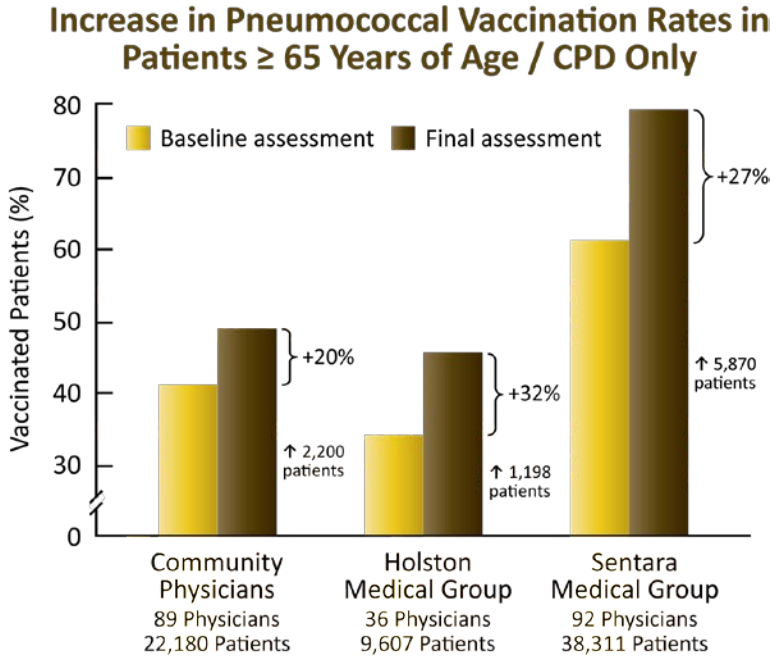
Period	Results	Practice Average	National Average
Baseline	51.1%	57%	50.3%
April 2014	59.4%	62.1%	58.5%
August 2014	62%	63.9%	60.3%
November 2014	62.4%	65.3%	61.5%
January 2015	65.2%	68%	63.7%

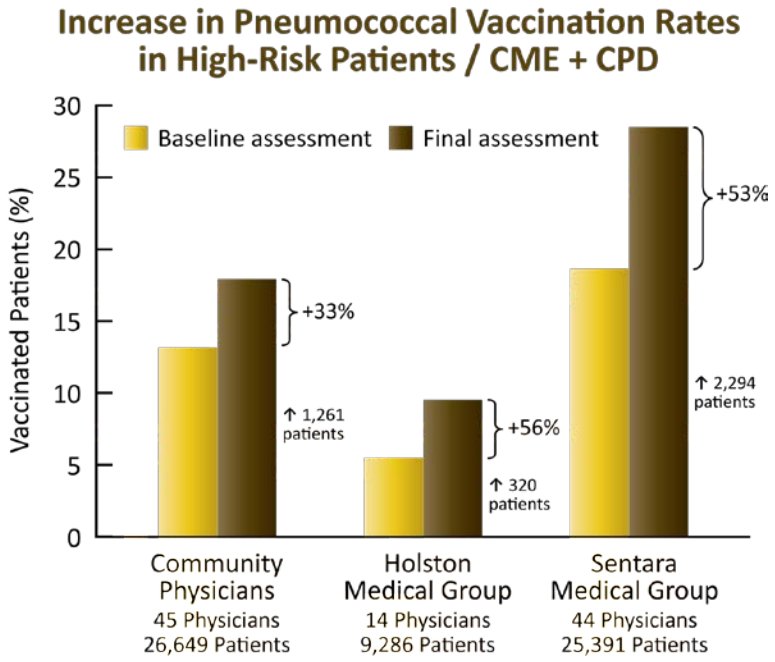
Final Outcomes

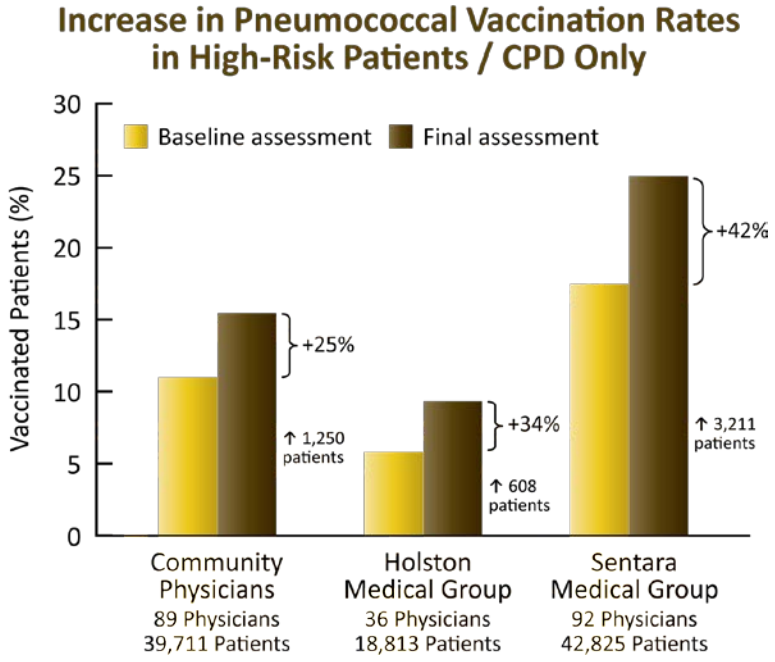
CME & CPD: Outcomes among clinicians who completed the Performance Improvement Continuing Medical Education activities, received *20 AMA PRA Credits*™ and monitored improvement via their individual Clinical Performance Dashboard

CPD only: Outcomes among clinicians who monitored the improvement in pneumococcal immunization rates in their own and their colleagues' patients via their individual Clinical Performance Dashboard, but didn't complete all the Performance Improvement Continuing Medical Education activities


Increase in Pneumococcal Vaccination Rates in Patients ≥ 65 Years of Age / CME + CPD
Vaccinated Patients (%)
80
70
60
50
40
30
0
Baseline assessment
Final assessment
+22%
↑ 1,857 patients
+29%
↑ 548 patients
+35%
↑ 3,087 patients
Community Physicians
45 Physicians
14,667 Patients
Holston Medical Group
14 Physicians
4,811 Patients
Sentara Medical Group
44 Physicians
15,906 Patients


Increase in Pneumococcal Vaccination Rates in Patients ≥ 65 Years of Age / CPD Only
Vaccinated Patients (%)
80
70
60
50
40
30
0
Baseline assessment
Final assessment
+20%
↑ 2,200 patients
+32%
↑ 1,198 patients
+27%
↑ 5,870 patients
Community Physicians
89 Physicians
22,180 Patients
Holston Medical Group
36 Physicians
9,607 Patients
Sentara Medical Group
92 Physicians
38,311 Patients


Increase in Pneumococcal Vaccination Rates
in High-Risk Patients / CME + CPD
Vaccinated Patients (%)
30
25
20
15
10
5
0
Baseline assessment
Final assessment
+33%
↑ 1,261 patients
+56%
↑ 320 patients
+53%
↑ 2,294 patients
Community Physicians
45 Physicians
26,649 Patients
Holston Medical Group
14 Physicians
9,286 Patients
Sentara Medical Group
44 Physicians
25,391 Patients


Increase in Pneumococcal Vaccination Rates
in High-Risk Patients / CPD Only
Vaccinated Patients (%)
30
25
20
15
10
5
0
Baseline assessment
Final assessment
+25%
↑ 1,250 patients
+34%
↑ 608 patients
+42%
↑ 3,211 patients
Community Physicians
89 Physicians
39,711 Patients
Holston Medical Group
36 Physicians
18,813 Patients
Sentara Medical Group
92 Physicians
42,825 Patients

Impact on Number of Patients Vaccinated

Patient group	Number physicians	Finished CME?	Number of eligible patients	Number vaccinated at baseline assessment	Number vaccinated at final assessment	Change from baseline in number of patients vaccinated	
Elderly	103	Yes	35,384	20,853	26,345	+ 5,492	+ 26.3%
	217	No	70,098	43,362	52,630	+ 9,268	+ 21.4%
Total	**320**	**–**	**105,482**	**64,215**	**78,975**	**+ 14,760**	**+ 23.0%**
High-risk	103	Yes	61,326	8,786	12,661	+ 3,875	+ 44.1%
	217	No	101,349	14,576	19,645	+ 5,069	+ 34.8%
Total	**320**	**–**	**162,675**	**23,362**	**32,306**	**+ 8,944**	**+ 38.3%**

Conclusions

- **Nearly a third (103/316) of the primary care physicians** who participated in this program completed the PI CME educational activities offered and received *20 AMA PRA Credits*™.
- **The program was successful in driving up pneumococcal vaccination rates:** a total of 14,760 elderly patients and 8,944 patients at high risk of pneumococcal infection in just three medical groups were vaccinated post baseline over its two-year course.
- **Access to the Clinical Performance Dashboard alone** improved pneumococcal vaccination rates by 20% to 42%.
- **In addition, finishing the CME program worked even better,** improving pneumococcal vaccination rates by 22% to 53%, especially in vaccinating younger patients at high risk.
- **The program achieved both Moore's Level 5 (Performance) and Level 6 (Patient Health Status).**