

REQUEST FOR EDUCATIONAL GRANT SUPPORT

Utilizing Population Health Outcomes Data to
Increase Adult Pneumococcal Immunization Rates

The University of Cincinnati
Office of Continuing Medical Education

Humedica, Inc.

Confluent Healthcare Solutions

Direct One Communications

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Executive Summary

As a world-class academic and healthcare system, the University of Cincinnati Office of Continuing Medical Education strives to transform medicine and health locally and globally through innovative scientific research, rapid translation of breakthrough discoveries, educating future clinical and scientific leaders, advocating and practicing evidence-based medicine to improve community health, and leading efforts to eliminate health inequalities. To support its mission, the University of Cincinnati Office of Continuing Medical Education at the School of Medicine will develop the following Performance Improvement Continuing Medical Education (PI-CME) initiative, *Utilizing Population Health Outcomes Data to Increase Adult Pneumococcal Immunization Rates*, which is designed to address and improve the quality of care and health outcomes for people at risk for pneumococcal infection. The University of Cincinnati Office of Continuing Medical Education will partner with Humedica, Inc., Confluent Healthcare Solutions, and Direct One Communications for this educational program.

The program design will link 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. The first phase will help clinicians better understand their own performance based upon immunization rates for their entire population of people at risk for infection via an individualized clinical performance dashboard. Phase 2, in alignment with the elements for an effective Plan, Do, Study, Act (PDSA) cycle, will contain a series of case-based educational activities, and a slide library capturing the most recent clinical research data, advances in vaccines, and the fundamental curricula for this activity related to immunization. Semi-annual reports will be provided of the aggregate and regional performance analysis with de-identified system and regional data.

The focus of the interventions will be patient-centered care that personalizes risk management and engages patients in self-management related to their decisions for pneumococcal vaccination. The program will report the electronic capture for clinical performance patient data from more than 16,000 individual primary care providers from more than 1,500 health systems. The population health data for each clinician will link to a learning management system to inform them of the most recent evidence to advance the care for their populations of patients at risk for pneumococcal infection.

Target Audience

- 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 which represents a target population to evaluate for pneumococcal vaccine administration to prevent infection.
 - The AMGA, with its medical informatics subsidiary, Anceta, will target the Humedica network of provider health systems for whom patient level data is available, and work closely with five provider groups specifically with high volumes of at risk

patients, and identified gaps in care when treating these patients, for active participation in this quality and performance improvement program

- All US-based primary care providers and the supporting inter-professional healthcare team members who see patients at risk for pneumococcal infection, and;
- Health system administrators, directors of quality improvement

Educational Learning Objectives

With the goal of improving the rates of vaccination amongst eligible patients as the foundation for this educational program, learners should be able to:

- Utilize the web based reporting tools provided under the auspices of this program to more readily identify their populations of patients at risk for pneumococcal infection
- Implement data-informed process and quality improvement strategies (ex. patient reminder systems) to increase vaccination rates amongst eligible people at risk 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 improve patient self-management
- 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 and the related health outcomes particularly for those populations that are underserved
- Design approaches to reduce the risk of pneumococcal infection including lifestyle modification, available to the patient/physician accountable care team

Quality and Performance Improvement Goals for Pneumococcal Vaccination

This educational program will report and seek to improve clinical outcomes and address the barriers related to pneumococcal vaccination. The primary goal and expected improvements for clinical performance and patient health outcomes are:

- *Pneumococcal Vaccination status in older adults:* increase the percent of eligible patients - aged 65 and older who have received a pneumococcal vaccination within the defined time period for electronic health data capture
- *Pneumococcal Vaccination status in special populations:* increase the percentage of people at high risk (age > 65 years old and age 18-64 who have chronic illness or are at high risk for infection, including chronic cardiac, pulmonary, liver disease or diabetes).

Adult Learning Principles

Malcolm Knowles, a theoretician known for his work in the field of educational psychology, assumed of adult learners that they:

- Are self-directed increasingly as they mature;
- Possess personal experiences that they bring to any learning environment;

- Are socially ready and able to learn; and
- Are ready to apply learning to actual settings.

With this principle in mind, we have designed an educational plan that uses the performance/process improvement model to help healthcare providers in addressing gaps in knowledge and performance that ultimately affect patient care.

This model, particularly the activity components mentioned below, is an ideal solution in identifying and urging changes in performance.

Activity Components

- Baseline and longitudinal data collection that is continuous over time with ease of extraction, automated individual and system level reporting and validation;
- Data exchange module for data transfer from the practice to the learning management system;
- Customized learning management system for pneumococcal vaccination including the needs assessment and educational performance gaps so as to provide an intuitive and individualized learning environment as part of a structured clinical performance and quality improvement program;
- Curriculum-based design:
 - *Clinical Performance Dashboard*: baseline and semi-annual report of each participants clinical performance in practice for selected measures;
 - *Faculty consensus meeting for curricula development* with representation from experts in infectious disease, vaccines and infectious disease education, primary care, case management and care coordination, clinical informatics and quality improvement professionals;
 - *Case-based, interactive, online educational activities* to directly address the most significant performance gaps identified during the performance assessment for vaccination;
 - *Slide Library* capturing most recent clinical research data for pneumococcal vaccines, special populations and the use of Health Information Technology (HIT) solutions to support quality and performance improvement efforts;
 - *A two-year longitudinal outcomes report* with comparative data to aggregate, de-identified regional and national performance analysis across the network

Needs Assessment

Identified Gaps:

- 1) Clinicians are not recommending pneumococcal vaccination in those patients who should be receiving immunization resulting in significant morbidity and mortality.
- 2) Clinicians are not recognizing patients who are at high-risk for pneumococcal infection resulting in suboptimal immunization and significant morbidity and mortality.
- 3) Clinicians are inadequately recommending and providing pneumococcal vaccination in minority and underserved populations.
- 4) Clinicians have a lack of awareness of adult vaccination clinical practice guidelines which results in suboptimal pneumococcal vaccination rates.
- 5) Clinicians are not adequately educating their patients at risk of pneumococcal disease about the importance of pneumococcal vaccination and the prevention of significant morbidity and mortality.

Educational Learning Objectives:

- 1) Utilize web-based reporting tools provided under the auspices of this program to more readily identify their populations at risk for pneumococcal infection. (Gap #2, #3, #4)
- 2) Implement data-informed process and quality improvement strategies to increase vaccination rates among eligible people at risk in their patient panel. (Gap #1 and #3)
- 3) Utilize team members to case manage, care coordinate, educate and modify patient behaviors and perceptions related to vaccination in order to improve patient self-management. (Gap #5)
- 4) Understand the rationale and protocols for pneumococcal vaccination and the health outcomes consequences that may result from the lack of patient adherence. (Gap #4)
- 5) Describe the early need for vaccination and the related health outcomes particularly for those populations that are underserved. (Gap #2, #3 and #4)

Perspective – Burden of Disease

Over the last 10 years, the availability pneumococcal conjugate vaccine (PCV7) in childhood vaccination programs has significantly reduced both invasive pneumococcal (eg, bacteremia, meningitis) and mucosal disease (eg, community-acquired pneumonia [CAP] and otitis media).ⁱ However, there is no coordinated public health infrastructure to support an adult immunization program as there is for children and little coordination among adult healthcare providers in terms of vaccine provision.ⁱⁱ Thus, the burden of pneumococcal disease remains high in adults ≥ 50 years of age. Indeed, US data suggest 30,000 cases of invasive pneumococcal disease, 500,000 cases of CAP and 25,000 deaths occur annually.ⁱⁱⁱ Half of all mortality associated with invasive pneumococcal disease is in patients ≥ 65 years of age.^{iv} 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.^v Patients hospitalized with pneumococcal pneumonia are at increased risk for myocardial infarction, arrhythmia, or congestive heart failure.^{vi}

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.^{vii} 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; diminished quality of life affects all patients with pneumococcal disease.^{vii} Thus the

prevention of pneumococcal infection is critical, particularly in the context of increasing resistance of *S. pneumonia* to antibiotic therapy.^{viii}

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%.^{ix,x} Vaccination rates are lower among older African-Americans (53%), Hispanics (45%) and Asians (48%).^{x,xi} The disparities in pneumococcal vaccination exist even for minority residents of US nursing homes.^{xii} An estimated 73 million adults have an indication for pneumococcal vaccination and have not received it.^{xiii}

Moreover, there has been minimal impact on disease due to serotypes unique to PPSV23.^{xiv} Thus, a recent Cochrane meta-analysis does not provide compelling evidence to support the routine use of PPSV23 to prevent all-cause pneumonia or mortality.^{xv} Moreover, its effectiveness in preventing pneumonia in patients with chronic pulmonary diseases is uncertain.^{xvi} Thus, new vaccines and strategies for vaccinating older adults are critically needed.

These findings led to the development of a pneumococcal conjugate vaccine (PCV13). While PCV13 has proven effective in children, its effectiveness in adults is still being investigated. However, the vaccine serotypes cover approximately 50% of invasive pneumococcal disease cases among patients aged 50 to 64 years and ≥ 65 years.^{xvii} Importantly, data suggests that PCV13 use in adults, regardless of whether they were naïve or previously vaccinated with PPSV23, have an overall superior antibody response compared to PPSV23.^{xviii} Importantly, PCV13 elicits immunological memory and primes the immune system for either natural exposure subsequent booster vaccination with either conjugate or polysaccharide vaccine.^{xviii} Model projections indicate revaccination every 5 to 10 years would reduce expected lifetime cases of invasive pneumococcal disease by 15,000, expected disease-related deaths by 60,000, expected lifetime total healthcare costs by \$3.5 billion and expected total societal costs by \$7.4 billion.^{xix}

Thus, PCV13 offers a new approach to preventing the morbidity and mortality associated with pneumococcal disease.

Current Recommendations for Pneumococcal Vaccination

While antibiotics are the cornerstone of treating pneumococcal infections, increasing antimicrobial resistance in pneumococci has steadily increased. Thus, efforts have turned to pneumococcal prevention.

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.^{xvii} Vaccination rates are suboptimal in all these groups.^{xx} 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.**^{xxi}

Special Populations

Among elderly patients, pneumococcus is the most common organism isolated from CAP and accounts for 30% of all CAP cases. Although age is an important risk factor for acquiring invasive pneumococcal infection,^{xxii} other include ethnicity, low socioeconomic status, chronic underlying COPD, heart disease, diabetes, renal disease and smoking and alcohol abuse; at particularly high risk are those with recent respiratory viral illnesses (eg, influenza). Importantly, the elderly are at highest risk for invasive pneumococcal disease and the pneumococcal polysaccharide vaccine is less effective in this population than younger adults.^{xxii}

Pneumococcal infections are particularly problematic in patients with immune deficiencies (eg, sickle cell disease, transient hypogammaglobulinemia).^{xxii}

Despite universal access to intensive measures to prevent pneumococcal disease, *S. pneumonia* remains a major cause of morbidity and mortality in HIV-infected individuals.^{xxiii} It is the most common bacterial respiratory pathogen in HIV(+) patients and the disease is frequently complicated by bacteremia and/or recurrences. Therefore, it is recommended that HIV(+) patients receive pneumococcal vaccination as close to diagnosis as possible.^{xxii} In addition to HIV(+) patients, morbidity and mortality from invasive pneumococcal disease remains high in dialysis patients.^{xxiv}

Identified Barriers to Immunization

The National Foundation for Infectious Diseases (NFID) recently convened a multidisciplinary task force to identify and prioritize barriers to pneumococcal vaccination among adult patients.^{xx}

Identified barriers to pneumococcal vaccination include lack of attention to pneumococcal prevention among healthcare professionals, competing priorities during patient visits, failure to assume responsibility for vaccination, incomplete or inaccessible documentation of previous vaccines, and lack of public awareness about pneumococcal disease and available prevention.^{xx}

While data show that physicians are the prime motivators of patient vaccination decisions and are familiar with age-based recommendations for pneumococcal vaccination, there is evidence to suggest that far fewer are actually recommending vaccination to their patients.^{xxv} Indeed, far too few providers are recommending vaccination.^{vi} Fewer than 30% of physicians and 20% of other healthcare professionals report recommending pneumococcal vaccination for patients with known risk factors for pneumococcal disease.^{xxv} Reasons for suboptimal recommendation of pneumococcal vaccination may lie in part, to clinician lack of awareness of current ACIP adult immunization guidelines.^{xxv}

Barriers to pneumococcal vaccination are not limited to healthcare professionals. For example, **only 15% of adults ≥65 years of age are familiar with pneumococcal disease** which suggests increased public awareness is critical to improving pneumococcal vaccination rates.^v Even for those patients who know about pneumococcal disease, frequently skip vaccination because their physician did not recommend it.^{xxv} Educational efforts should focus on potential disease impact, the safety and efficacy of vaccination, and CDC recommendations for vaccination. Engaging trusted community leaders may be beneficial for older adults with a mistrust of vaccines or the medical system; a recognized issue with older African-Americans.^{xxvi} In addition to challenges in access to culturally competent care, lower vaccination rates are compounded by an increased prevalence of pneumococcal risk factors in African-American and Hispanic adults who are more likely to have asthma, diabetes, cardiovascular disease and stroke.^{xxvii}

Role of Healthcare Professionals in Vaccination Recommendation

While physicians are a major driver for pneumococcal vaccination, they are not the only healthcare professionals who can recommend pneumococcal vaccination. Indeed, data suggest that vaccination decisions can be influenced by other healthcare professionals.^v

Healthcare professionals who frequently interact with older adults include nurse practitioners, nurses, pharmacists, physician assistants, public health nurses and officials, hospital staff, and office support staff. **Each of these healthcare professionals should be extensively educated on the importance of pneumococcal prevention and be able to counsel patients about needed vaccinations.**^v Indeed, the use of educational interventions to improve participation in quality improvement and the collection and analysis of quality improvement data has been shown to improve immunization rates.^{xxiv}

Professional associations and medical societies can support efforts to encourage counseling, referral, collaboration and vaccine delivery. Importantly, tools and resources (templates, prompts, checklists, posters, fact sheets, websites, newsletters, voicemails, screening tools, standing orders programs) to help healthcare professionals improve adult pneumococcal vaccination rates and promote patient education are readily available.^v

Performance Measures and Quality Improvement

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. However, for the purposes of this educational initiative, the primary focus will be on improving pneumococcal vaccination in older adults and high-risk populations including those over 65 years of age and 18 to 64 years of age with medical comorbidities and underserved populations (NQF measures #0043, #0617).^{xxix}

The Joint Commission has included vaccination as a 2012 performance measure for hospitals, with implications on accreditation.^{xxx} Failure to vaccinate older patients before hospital discharge puts them at risk for illness and rehospitalization.^{xxxi} Indeed, about 60% of patients who get pneumococcal disease requiring hospitalization had been hospitalized within the previous 4 years; most are patients with high-risk conditions.^{xiii}

Conclusion

Even in an era of routine vaccination, the morbidity and mortality associated with pneumococcal disease remains high, particularly in adults. New conjugate vaccines offer an effective tool for significantly enhancing and prolonging immune protection and meeting the significant unmet medical need in preventing pneumococcal disease, even in previously immunized adults in whom revaccination with polysaccharide vaccine is not possible.

National quality improvement initiatives for increasing pneumococcal vaccination rates must be supplemented by educational activities and programs designed to take advantage of advances in information technology to not only improve pneumococcal vaccination rates but reduce the

incidence of pneumococcal disease in susceptible and elderly patients. Only through these measures can the significant morbidity and mortality of pneumococcal disease be reduced.

Baseline Assessment for the Targeted Network of Learners

The data below represents retrospective electronic health record data from the past three years for 14 health systems (over 1,000 ambulatory clinics) within the American Medical Group Association member base. This quantitative analysis is displayed regionally for the purposes of this assessment. Like Google Earth, we will be able to zoom in and report on each measure for the health system and the individual provider.

For the purposes of this proposal, we have displayed the data aggregated at a regional level, however, we also have this same analysis for each of the networked 14 health systems. On both levels the analysis indicates a significant gap for pneumococcal vaccination in people greater than 65 years of age. The goal and primary outcome of this program is very clear – to increase the percentages of eligible people who have received a pneumococcal vaccination.

Pneumococcal Vaccination Rates for the Networked Health Systems				
Region	# Primary Care Physicians	# People ≥ 65 years	# People ≥ 65 years with PneuVacc	% with PneuVacc
Midwest	3483	246,833	17,211	7.0%
Northeast	5089	148,897	13,275	8.9%
Pacific	1824	37,092	6,251	16.9%
Rocky Mountain	606	32,141	2,515	7.8%
Southeast	5118	327,865	106,101	32.4%
Total	16,120	792,828	145,353	18.3%

Assessment and Performance Improvement Continuing Medical Education

The accuracy and reliability of the performance assessment utilized to identify and support educational interventions to close gaps in the care of people at risk for pneumococcal infection is not well determined. That determination is one of the goals of this initiative. A new paradigm is emerging in CME. A number of converging aspects of CME and government oversight of health care certification are driving the integration of physician performance improvement and continuing medical education into an amalgam currently identified as Continuous Performance Improvement (CPI). The traditional educational models for CME activities lend themselves to knowledge transfer and the development of competencies for the health care professional. However, an increased focus has been placed on the development of activities linked to actual change in performance and/or patient health outcomes, idealized by the Performance Improvement CME structure (PI CME) as promulgated by the AMA in 2004. These changes are taking place within the CME system, but are also a result of the overall health system redesign that focuses on quality and effectiveness of care and patient safety and aligns reimbursement with those conditions.

A redirection forward for PI CME activities by the medical education profession coincident with new requirements for the Maintenance of Licensure (MOL) and the Maintenance of Certification (MOC) processes represent an effort toward new and innovative educational formats designed to modify the current sub-optimal physician practice behaviors and performance in order to help advance the improvement of care and patient health outcomes. The PI CME model is the culminating work of two American Medical Association (AMA) convened national task forces that were given the assignment of exploring newer formats in medical education focused on measurable performance and quality improvement. This model follows a three-step process, which begins and ends with the physician examining his or her practice and performance against established evidence-based measures. Physicians are able to obtain up to 20 *AMA PRA Category 1 Credits™* by participating in a PI CME activity.

To be approved for *AMA PRA Category 1 Credits™*, the learning/instructional activities must:

- Be based on data measuring performance gaps in health care delivery in a specific setting;
- Link educational initiatives to the specific root causes of the measured performance gap(s);
- Relate CME efforts directly to the knowledge, skill, attitudes, or system changes required for success in the practice improvement initiative;
- Evaluate improvement in terms of improved competence, performance or patient health status.

The three-step process for an educational activity or program to meet the satisfaction of the AMA designation for PI CME credit is:

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 the 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 require 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. These shortcomings include (1) assessments that are largely based upon clinical process measures and are generally not quality oriented, (2) 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 (3) 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 (1) including automated and electronic capture of quality and process oriented assessment data, (2) seeks to include the entire population of eligible patients for pneumococcal vaccination for all participants with no limitation except for pre-determined and validated exclusion criteria, and (3) requires 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. This model can be described, mathematically, as follows:

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

Performance Measures: Pneumococcal Vaccination

Performance Gap Analysis – Determination of Individual Learner Needs

Over the course of this PI CME activity each individual participant's educational needs will be determined based upon their own performance gap analysis for the following two measures:

- 1) Pneumococcal Vaccination Status for Older Adults
- 2) Pneumococcal Vaccination Status for Special Populations

Definition and Rationale for the Identified Vaccination Performance Measures

The following four patient health status quality and clinical performance measures have been developed in order to meet the best available evidence for the highest quality of care for vaccination status and are referenced and endorsed by the National Quality Forum (NQF).

Measure: Pneumococcal Vaccination Status for Older Adults

Measure: Percentage of older adults receiving pneumococcal vaccine

- Numerator: Number of eligible adults (aged 65 years and older) who received pneumococcal vaccination in the past 12 months
- Denominator: Number of eligible older adults in patient panel, within data fact mart*
 - Denominator Exclusion: None
- Reported Outcomes:
 - Process: Percentage of eligible older adults who were vaccinated against pneumococcal infection

Measure: Pneumococcal Vaccination Status for Special Populations

Measure: Percentage of people at high risk for infection receiving pneumococcal vaccination

- Numerator: Number of people at high risk (age > 65 years old and age 18-64 who have chronic illness or are at high risk for infection, including chronic cardiac, pulmonary, liver disease or diabetes)
- Denominator: Number of people at high risk for pneumococcal infection, within data fact mart*
 - Denominator Exclusion: Patients newly enrolled in care during last 12 months
- Reported Outcomes:
 - Process: Percentage of patients at high risk who received a pneumococcal vaccination

* *Note: the data fact mart provides a retrospective view of patient health records up to 3 years back.*

Program Details

Objective

The primary objective of this activity is to provide educational interventions through a learner-centered e-portfolio to help close the health care quality gaps identified through the automated and electronic development of a denominator of the full panel of patients eligible for pneumococcal vaccine in a clinician's population. The University of Cincinnati Office of Continuing Medical Education and its educational partners will develop a flexible, easy-to-implement technical infrastructure to existing clinical practice data and apply targeted interventions from within a learning management system. The effort is directed towards 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 will be collected can be used to provide each individual provider and the entire health system with a view of customized patient populations to support quality efforts.

Health quality and process from more than 16,000 community-based primary care providers and nearly 800,000 eligible patients around the country will be the primary sources for clinical performance and patient health outcomes assessment. The participating health systems will be given access to their quality and performance data on a semi-annual basis to provide a reflection of their performance against the nationally accepted standards for pneumococcal vaccination. These performance data will be transferred into the learning management system so as to provide each participant with a learning environment in which they can view their data and participate in educational and quality interventions designed to improve quality through the application of knowledge, the development of competencies, or improvements in system processes. Educational outcomes will be provided at the levels of competency, individual provider clinical performance in practice and patient health status changes.

Participants

- 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 which represents a target population to mine for prevention of pneumococcal infection.
 - The AMGA, with its medical informatics subsidiary, Anceta, will target the Humedica network of provider health systems, and work closely with five provider groups specifically with high volumes of at risk patients, and identified gaps in care when treating these patients, for active participation in this quality and performance improvement program
- All US-based primary care providers and the supporting inter-professional healthcare team members who see patients at risk for pneumococcal infection, and;
- Health system administrators, directors of quality improvement

Clinical Performance Measurement for Pneumococcal Vaccination

Each health care provider seeking to participate in this clinical performance and quality improvement activity will have a complete practice profile for all of their patients eligible for pneumococcal vaccination assembled for them. Each data assessment will focus on patients meeting evaluation inclusion and exclusion criteria for the clinical performance measures. Pre-and post-educational intervention assessments will be performed on a semi-annual basis for the period of two years.

Activity Plan

- **Assess** the clinical performance and unmet educational needs for the treatment of more than 800,000 eligible people for pneumococcal vaccination based on the *electronic* capture of full denominator clinical performance measures in the *existing population* of more than 16,000 clinicians;
- **Provide** educational interventions designed to achieve quality and performance improvement to participants via a data/education integrated learning management system to close the competency and performance gaps;
- **Improve** the rates of vaccination for eligible and high risk patients.

Educational Learning Objectives

With the goal of improving the rates of vaccination amongst eligible patients as the foundation for this educational program, learners should be able to:

- Utilize the web based reporting tools provided under the auspices of this program to more readily identify their populations of patients at risk for pneumococcal infection
- Implement data informed process and quality improvement strategies (ex. patient reminder systems) to increase vaccination rates amongst eligible people at risk 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 improve patient self-management
- 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 and the related health outcomes particularly for those populations that are underserved
- Design approaches to reduce the risk of pneumococcal infection including lifestyle modification, available to the patient/physician accountable care team

Quality and Performance Improvement Goals for Pneumococcal Vaccination

This educational program will report and seek to improve clinical outcomes and address the barriers related to pneumococcal vaccination. The primary goal and expected improvements for clinical performance and patient health outcomes are:

- *Pneumococcal Vaccination status in older adults*: increase the percent of eligible patients - aged 65 and older who have received a pneumococcal vaccination within the defined time period for electronic health data capture
- *Pneumococcal vaccination status in special populations*: increase the percentage of people at high risk (age > 65 years old and age 18-64 who have chronic illness or are at high risk for infection, including chronic cardiac, pulmonary, liver disease or diabetes) who received pneumococcal vaccination.

Performance Improvement Module Goals

As result of this activity, primary care providers and the coordinated care team will be able to:

- View their population of eligible patients who have not received pneumococcal vaccination
- Track and analyze their performance based on data from their own individual practice and in aggregate compared to their health system and the broader, national network
- Review data-informed performance gap analysis and educational needs assessment for the individual provider and the practice or health system
- Link actual performance deficiencies to tailored educational interventions designed to translate the process of initiating a plan with their patients for pneumococcal vaccination
- Provide and identify educational interventions that are relevant and meaningful to closing the quality gaps related to their current practice patterns
- Formulate and implement office-based systems to manage treatment and facilitate therapeutic advancement
- Follow a quality and performance improvement plan on a systematic and ongoing level to improve patient outcomes

Clinical Performance Dashboard

With access to web-based screens of their patient data, health care professionals can quickly and reliably view population-based, quality-oriented measures of performance that can be compared to evidence-based standards.

- A flexible data architecture that allows for:
 - Physician performance level data for pneumococcal vaccination process measures
 - Ability to aggregate measures for the individual physician, system, region and national levels
 - Ability to easily add new measures, quality indicators and physicians
- An easy-to-use reporting function that provides users with:
 - Graphical displays of their performance (physician, site and system level)
 - Historical/trended view of performance measures

- Health care provider level performance data will be refreshed semi-annually over a two-year period

Humedica's Provider Network Characteristics

Humedica MinedShare® is an innovative, clinical intelligence software as a service platform that enables robust clinical benchmarking and comparative analytics across the continuum of care. The platform has been developed to meet a myriad of evolving requirements and needs for providers by enabling continuous access and interaction to robust data for individualized clinical performance assessment. The PI CME program will utilize clinical and operational data feeding into Humedica MinedShare® to support this quality and performance improvement initiative for health care professionals. The application does the following:

- Integrates clinical and administrative data from disparate IT systems to provide each participant with a complete view of their patient populations
- Provides advanced analytics to define appropriate patient cohorts, treatment pathways and health outcomes
- Provides treatment effectiveness and outcomes analysis to support evidence-based process improvements
- Facilitates comparative analytics and benchmarking by aggregating data from participating medical groups into a single, standard clinical ontology
- Supports the development and sharing of best practices and performance improvement strategies

Learning Management System

An educational learning management system that will automatically trigger the delivery of appropriate content (case vignettes, slide library, etc.) based on the identified individual gaps in clinical performance to participants will be utilized. The full denominator, individualized clinical performance data from the Humedica patient database will be electronically exported to the learning management system. The learning management system will contain the following features for each user:

- A web based interface design with an online content management system
- Fully automated data capture for selected pneumococcal measures
- Analytics and reporting:
 - Auto-calculate performance to standardized measures
 - Report to learner areas for improvement
 - Compare versus benchmarks, peers and goals
- Performance improvement:
 - Provides educational interventions specific to each learner for each identified performance gap

The PDSA Cycle

At the beginning of the activity and then for two years each participant will receive a report of their clinical performance for the process and quality measures based on their patient data. This practice report will provide an excellent opportunity for each participant to reflect on his or her own clinical performance gaps. The faculty will facilitate a Plan Do Study Act cycle (PDSA) practice improvement plan. This methodology and educational design approach has been shown to be very effective in the continuum of professional development (CPD). The potential to place the PDSA cycle at the core of this educational activity is tremendous. Contributing factors to this potential include the emphasis on the scientific methods for the populations of patients at risk for pneumococcal infection, the relationship between clinical education and practice, the capacity to define and measure health outcomes, and the ongoing pressure for change in health care and education.

With the PDSA cycle at the core of the educational activities, learners will be encouraged to reflect on their own clinical performance data based on their own patient population at risk for pneumococcal infection and plan for a change in practice behavior based on validated measures. Learners will then be encouraged to make a small change in their practice followed by another assessment of performance every six months. Provided that their change resulted in a positive net response in patient health, learners will then be instructed to act on incorporating their new practices with their entire panel of patients.

Faculty Consensus Meeting

A faculty consensus meeting will be held to develop the educational design and curricula for the educational interventions as a part of this PI CME program. The University of Cincinnati Office of Continuing Medical Education in collaboration with their educational partners will convene a series of meetings to develop the curriculum and quality improvement tools for this activity. All of the content for each of the educational activities identified below will be developed based upon the core curricula set forth by the Faculty Consensus Panel. The following individuals will participate:

- Chair (Vaccines Specialist)
- Primary Care Leadership (3)
- Vaccines Education Expert
- Director of CME
- Director of Quality Improvement
- Clinical Informatics Specialist

The Faculty Consensus Meeting will take place immediately following the initial baseline assessment of performance from the practice participants and individual clinicians. The timing for this meeting will allow for the Faculty Consensus Panel to review and discuss the actual baseline assessment for the gaps in the quality of care and performance noted in the program. As a result, the Faculty Consensus Panel will be able to design a curriculum and tools for the educational interventions that will be very relevant to this entire population of learners and others based upon actual clinical performance data. Following the initial meeting, the Faculty Consensus Panel will meet to discuss and make revisions to the curriculum and the educational design based upon the

observed changes in the clinical performance data. The Faculty Consensus Panel will be responsible for the development and execution of the publication plan.

Interactive Case-Based Learning

By simulating a patient profile, the interactive clinical case study activity can record the physician's diagnostic and treatment decisions as he or she works through the case, show the likely outcome of each decision, and provide individualized feedback to identify and correct inappropriate decisions. The case study simulation functions as an assessment instrument and a problem-based learning activity. An interactive case-based study activity using clinical case simulations and adaptive branching technology is an ideal approach to measuring the impact of a CME activity on the learner's clinical practice. It can directly measure the decisions made in diagnosis, treatment, follow-up, and by extension, how well that physician is likely to perform when confronted with an actual patient.

This methodology for teaching has been traditionally utilized for the assessment of and development of clinical competency.^{xxxii} We will directly measure the impact of this methodology with electronic capture of each individual's clinical performance data based on their entire population of people at risk for pneumococcal infection.

Distribution: The CME certified interactive case based study activities will be electronically distributed to learners within the learning management system based on their individual educational needs. The cases will also be hosted on the University of Cincinnati Office of Continuing Medical Education Web portal and CME Ohio for vaccines education resources and available as an educational tool for all other interested health care providers including primary care. The case study activities will be downloadable so that they can be used for other educational purposes including grand rounds, journal club presentations, and other educational and quality improvement initiatives.

Participation: Learners in the PI CME activity may be repeatedly exposed to each case activity for educational reinforcement based upon their individual performance at each assessment interval. Other learners who do not wish to enroll into the PI CME option may access this activity directly from the University of Cincinnati Office of Continuing Medical Education Web portal.

Educational Design and Purpose: The content for the interactive, web-based case studies will be developed for each of the tracked performance measures based upon the baseline assessment of the participants. The content for each of these cases will focus on the opportunity to improve knowledge, attitudes, and skills and discuss mechanisms to overcome barriers to optimal care that will lead to a performance change in practice based upon each of the measure sets. Each case study activity will provide opportunities to learn more about the right and wrong decisions presented and why they may or may not be appropriate and their consequences. Serial and longitudinal exposure to each of these interventions will occur at each assessment interval based upon each participant's own performance in practice profile.

Educational Outcomes Measured: Level 3 (Learning), Level 4 (Competence), Level 5 (Performance) and Level 6 (Patient Health).^{xxxiii}

Potential Topics

Based on our initial performance analysis and educational needs assessment and the anticipated individual performance data collected during this activity, it is expected the following topics will be considered as the core content development of the case vignettes. Over the course of the activity these topics and case vignettes will be updated to reflect the newly identified performance and quality of care gaps.

- You and The PDSA Cycle: Addressing Barriers Toward Achieving Performance and Quality Improvement Goals for Pneumococcal Vaccination
- Methods to Collectively Examine Your Entire Patient Population to Help Them Meet Health Care Quality Standards for Pneumococcal Vaccination
- Effective Ways to Communicate the Safety and Efficacy of Pneumococcal Vaccines to Your Patients
- Translating the Latest Clinical Evidence for Pneumococcal Infection and Vaccines into Practice to Improve Patient Health Outcomes
- Overcoming Barriers to Care in Underserved Communities to Increase Pneumococcal Vaccination Rates

Online Educational Slide Library

Slide tutorials provide an excellent educational format for learners to receive quick updates on the advancing base of clinical and scientific evidence. We will initially construct a core deck of slides that covers the fundamental curricula for this activity. The slide library will be updated over the 2-year course of the activity to reflect new evidence and treatment strategies.

Distribution: Web links to the Educational Slide Library will be placed on the University of Cincinnati Office of Continuing Medical Education website home page.

Participants: Learners and/or faculty may download these slides for grand rounds, symposia presentations, or other teaching modalities. All faculty who utilize the slides for the purposes of teaching will agree to the terms and conditions of the University of Cincinnati Office of Continuing Medical Education Resolution of Conflict of Interest Policy.

Educational Design and Purpose: A PowerPoint slide library consisting of 40-50 slides will be produced and hosted on the activity website. The content for this educational activity will be developed by the Faculty Consensus Panel and will address the overall activity and performance improvement goals to improve the quality of care for people in need of pneumococcal vaccination. The content will be refreshed depending upon the clinical performance gaps identified and any new relevant clinical findings that occur through or during the course of this activity.

Annual Timeline for Two Years

TIME: BASELINE ASSESSMENT

- Baseline performance characteristics of the health care provider participants
- Determination of individualized practice gaps utilizing a full denominator and identified numerators (measures)

TIME: 0–6 MONTHS

- Participants enroll into e-portfolio educational system
- Performance and quality gaps for closure will be identified
- Faculty Consensus Meeting
- Individual (learner) specified educational interventions will be delivered to each participant

TIME: 6 MONTHS

- Reassessment of performance data set (rebuild of the complete patient denominator) per Performance Measures PI CME protocol to assess whole-practice changes
- Longitudinal educational outcomes assessment

TIME: 6-12 MONTHS

- Performance and quality gaps for closure will be identified
- Faculty Consensus Meeting
- Individual (learner) specific educational interventions will be delivered to each participant through their e-portfolio

TIME: 12 MONTHS

- Reassessment of performance data set (rebuild of the complete patient denominator) per Performance Measures PI CME protocol to assess whole-practice changes
- Longitudinal educational outcomes assessment

TIME: 12-18 MONTHS

- Performance and quality gaps for closure will be identified
- Faculty Consensus Meeting
- Individual (learner) specific educational interventions will be delivered to each participant through their e-portfolio

TIME: 18 MONTHS

- Reassessment of performance data set (rebuild of the complete patient denominator) per Performance Measures PI CME protocol to assess whole-practice changes
- Longitudinal educational outcomes assessment

TIME: 18-24 MONTHS

- Performance and quality gaps for closure will be identified
- Faculty Consensus Meeting
- Individual (learner) specific educational interventions will be delivered to each participant through their e-portfolio

Outcomes Assessment

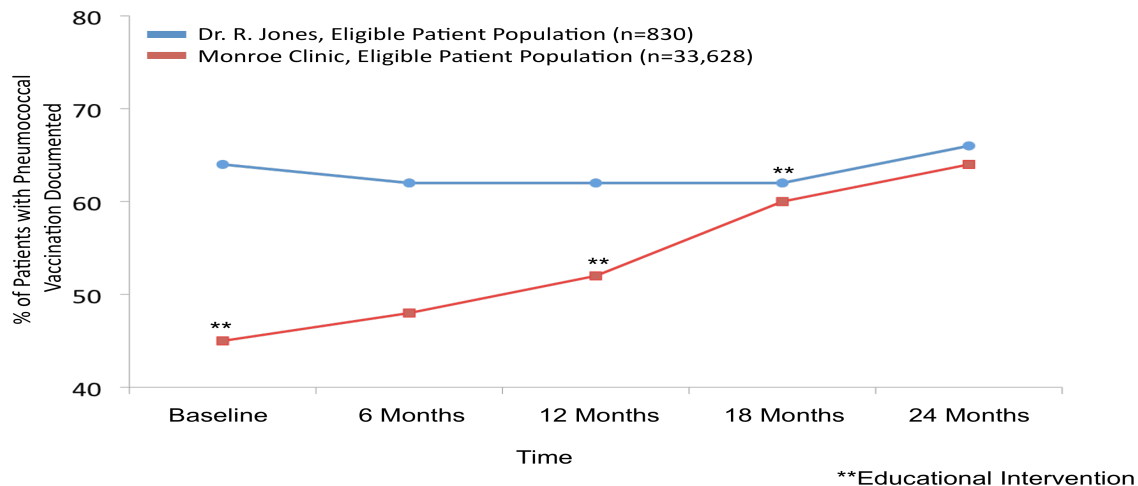
In addition to learning (Levels 3a and 3b) and competency (Level 4), individual process and clinical performance (Level 5), and patient health status data-based outcomes (Level 6) will be achieved through this initiative.^{xxxiii} Once the data are linked and a denominator is established, the process and clinical measures will be assessed quarterly for two years. Data will be analyzed to determine longitudinal improvements over the course of the program.

This integrated approach to certified PI CME utilizes advanced technologies and data collection systems to access, extract, and analyze health care provider clinical performance data. It will integrate these analyses into a customized learner portfolio supported by the expert content (Web-based, print, and live) and learning management system to improve the quality of care for people who are eligible for pneumococcal vaccination or at high risk for infection. This information reflects the most advanced mechanism for an educational outcomes assessment of not only individual needs, but also of those on a health care system, regional and national basis. *The study design includes two control groups to determine the impact of the education and the reporting of performance to providers. These two control groups are: 1) receive clinical performance via dashboard, no educational intervention and 2) no dashboard and no educational intervention.*

Figure 1 describes the type of clinical performance outcomes data that will be collected through this PI CME activity. In this example, we have measured and reported the clinical outcomes data (percentage of patients pneumococcal vaccination documented) from the fictitious Dr. R. Jones' entire population of pneumococcal vaccine eligible patients (n=830) over a two-year period and compared his clinical performance to his institution, the Monroe Clinic (n=33,628). With this educational design, we are able to track and report the impact for each educational activity, introduced through the individualized learning management system, on clinical performance. We also have the ability to adjust the delivery of content to accommodate new learning, remedial learning or learning for reinforcement.

FIGURE 1

Sample Performance Assessment: Dr. R. Jones and The Monroe Clinic



Publication Plan

The exchange of information, ideas and experiences is essential among CME professionals as a professional responsibility that promotes improvements in care. It is our intention to actively and aggressively assess the educational impact of this program by looking at both participant evaluation and feedback, and actual data on changes in physician behavior and patient outcomes. It is our intention to publish data from individual projects and aggregate data covering multiple activities. We will target journals covering medical professional education with reports on the technical development of activities and with the analyzed data. We also will look to both infectious disease specialty, primary care and health outcomes medical journals to report outcomes data to inform clinicians of our experiences with this approach, encourage them to participate in PI CME interventions, and adopt a continuing and systematic performance improvement approach to their practice. It is our intent to present and publish the outcomes of this project at the CME/CPD professional meetings and publications such as the Alliance for CME Annual Meeting, AAMC, SACME, Educational Measures and JCEHP.

Faculty Recruitment and Development

The activity chair will direct the recruitment of faculty for this educational activity. As part of the University of Cincinnati's continuing effort to ensure independence in certified CME/CE, the faculty will also be required to participate in the National Faculty Education Initiative (NFEI), designed by the Alliance for CME (ACME) and Society for Academic Continuing Medical Education (SACME) in collaboration with the Association of American Medical Colleges (AAMC) and endorsed by AHME. This initiative provides online training, as well as a searchable database of medical education faculty who have completed the program. Each faculty member signs and attests to the terms of the Resolution of Conflict Interest Policy established by the University of Cincinnati Office of Continuing Medical Education. Among the scientific and medical criteria that will be considered for the selection of faculty are: published in peer-reviewed journals, participation in vaccines research, faculty appointment at the individual's teaching institution, participation in previous educational activities and adherence to all policies regarding disclosure and resolution of conflict of interest with commercial entities.

Learner Recruitment and Program Distribution

The University of Cincinnati Office of Continuing Medical Education and their educational partners will promote this PI CME activity to its entire network and to US-based infectious disease and primary care clinicians using the following channels:

Humedica

Direct integration of the relevant measures into the clinical performance dashboard each learner already has. At the start of this activity AMGA / Anceta will directly contact each provider medical organization within Humedica's data network and seek to enroll those groups and their clinicians in the PI CME program. AMGA / Anceta will plan to engage up to five health organizations and monitor these participating groups, including clinician participation levels, working in close coordination with the leadership of those organizations to ensure optimal enrollment and adherence.

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