

Final Grant Report

Utilizing Population Health Outcomes Data to Increase Immunization Rates in Adolescents

Andrew Crim, CHCP, FACEhp

Kelly Zarwell

Pam McFadden, FACEhp

The University of North Texas Health Science Center
Office of Professional and Continuing Education

Walter Wolyniec

Confluent Healthcare Solutions

Jack Rush

Direct One Communications

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Structured Abstract

Purpose:

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 adolescent vaccination in an individual clinician's patient population.

Scope:

The program design 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. Phase one helped 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 two contained a series of educational activities paired with an electronic clinical alert system for performance improvement to help remind clinicians of their responsibility to assist and administer immunizations according to guidelines and national health standards. Regular reports were provided for the aggregate analysis with de-identified system and regional data. Individual providers received a custom report of their own performance in practice.

Methods:

- Baseline and longitudinal data collection that is continuous over time
- Data exchange module for the transfer of data to the learning management system
- Customized learning management system for adolescent 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:

Results:

- **One third (78/231) of the physicians** completed all three stages of the Performance Improvement Continuing Medical Education (PI CME) program.
- **Adolescent vaccination rates:** 47,048 adolescents between 11 and 17 years of age in only four medical groups received vaccinations for Tdap, meningitis, and HPV in just 18 months.
- **Access to the Clinical Performance Dashboard alone** improved adolescent vaccination rates from 38% to 60% on average, with some groups reporting as much as 88% improvement.
- **Clinicians who completed CME** showed greater improvement, 40% to 67%, with some groups reporting as much as an 82% increase, as compared with those who did not.

In 9 out of 12 assessments, those who participated in CME showed greater improvement.

Key Words: Quality Improvement, Vaccines, Adolescent, QI, CME, CPD, Pediatrics

Purpose (Objectives of Study).

The program design 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. Phase one helped 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 two contained a series of educational activities paired with an electronic clinical alert system for performance improvement to help remind clinicians of their responsibility to assist and administer immunizations according to guidelines and national health standards. Regular reports were provided for the aggregate analysis with de-identified system and regional data. Individual providers received a custom report of their own performance in practice.

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

- Outline the most recent adolescent immunization recommendations of the Advisory Committee on Immunization Practices (ACIP)
- Explore the epidemiologic evidence that indicates vaccines are underutilized among adolescents in the United States and the inherent risks
- Describe the barriers to more effective or complete utilization of ACIP-recommended adolescent immunizations
- Formulate plans to effectively administer vaccines to adolescents who may have missed certain vaccines, fallen behind in their immunization schedule, or require immunization due to special circumstances.
- Discuss strategies designed to improve adolescent immunization rates in clinical practice
- Identify immunization strategies that will work best in different practice settings
- Implement data-informed process and quality improvement strategies (ex. clinical reminder systems) to increase vaccination rates amongst adolescents

Quality and Performance Improvement Goals for Adolescent Vaccination

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

- *Tetanus-diphtheria-acellular pertussis (Tdap) vaccination status in adolescents:* increase the percentage of adolescents aged 11-17 who received the Tdap immunization
- *Meningococcal conjugate vaccination status in adolescents:* increase the percentage of adolescents aged 11-17 who received the Meningococcal conjugate immunization
- *Human papillomavirus (HPV) status in adolescents:* increase the percentage of adolescents aged 11-17 who received a HPV immunization

Scope (Background, Context, Settings, Participants, Incidence, Prevalence).

The data below represent a preliminary review of statistically de-identified data from nearly two dozen health systems, based on data documented from 2007 through 2012, and is displayed regionally for the purposes of this baseline assessment. The data indicate a significant gap for

the rate of vaccination administrations amongst adolescents (with a narrow focus here on patients age 13-15 years). Like Google Earth, we will be able to zoom in and report on each measure for the physicians from each opt-in provider organization. Ultimately, eligible patients will directly benefit from this educational activity.

Region	Tdap ^a	Meningococcal ^a	HPV ^a
Midwest	35%	32%	24%
Northeast	38%	45%	21%
Pacific	47%	47%	46%
Mountain	29%	24%	28%
Southeast	34%	29%	25%
Total	36%	34%	26%

^a % of adolescents (n=155,667) aged 13-15 with 1+ vaccination administered and documented

Disease burden. Adolescents (ages 10 to 19) make up 13.8% of the US population—nearly 44 million preteens and teenagers.¹ Although illness and death are uncommon in this population and largely due to preventable causes (injuries, motor vehicle accidents, suicide, etc), certain infectious diseases can take a considerable toll in adolescents and young adults who have not been adequately immunized.²

Meningococcal disease is the leading cause of bacterial meningitis in children 2–18 years of age.³ Even with antibiotic treatment, it kills 10%–15% of those infected; of those who survive, 11%–19% lose their arms or legs, become deaf, suffer seizures or strokes, or have other long-term complications.⁴ Approximately 800–1,200 cases are reported annually in the United States (US).³ The incidence of meningococcal disease peaks among persons in three age groups: infants and children under 5 years of age, adolescents and young adults 16–21 years of age, and adults 65 and older.³ A vaccine (meningococcal conjugate vaccine, or MCV4) has been available since 2005 for immunizing children and adults 55 years of age and younger.

Despite high vaccination rates in early childhood, pertussis (whooping cough) remains poorly controlled in the US. A total of 27,550 pertussis cases were reported in 2010, and the incidence is rising, even reaching epidemic proportions last year in the state of Washington.⁵ Since 2005, the Advisory Committee on Immunization Practices (ACIP) has promoted vaccination with tetanus toxoid, reduced diphtheria toxoid, and acellular pertussis (Tdap) for adolescents and adults to improve their immunity against pertussis.⁶ The effort appears to have had its intended effect: in 2011, 78.2% of adolescents 13–17 years of age had received at least one dose of Tdap vaccine since the age of 10 years.⁷

Six million new infections due to the human papilloma virus (HPV) are reported annually in the US.⁸ Although these infections are typically cleared by the immune system, they can become chronic and lead to cervical cancer. In 2013, 12,340 new cervical cancer cases are anticipated, and 4,030 women are expected to die from this largely preventable disease.⁹ In addition, about 3,000 cases of other HPV-related cancers, including anal, vaginal, vulvar, and oropharyngeal cancers, in women and 7,000 in men could be prevented by HPV immunization in adolescence.

Recommended immunizations for adolescents. The ACIP recommends administration of the

following vaccines at ages 11 or 12 years: MCV4, 1 dose followed by a booster dose at age 16; Tdap, 1 dose; HPV, 3 doses; and influenza, 1 dose annually.⁶ In addition, the ACIP recommends “catch-up” vaccinations for adolescents who have not been adequately immunized in childhood against measles, mumps, rubella, varicella, hepatitis B, and polio and, for those at high risk, hepatitis A and pneumonia.⁶

Gaps between recommendations and implementation. In 2010, the US Department of Health and Human Services launched *Healthy People 2020*, a 10-year program outlining its goals and objectives for health promotion and disease prevention by the year 2020. One of its goals is to increase routine vaccination coverage levels for adolescents based on a comparison of coverage levels reported by the National Immunization Survey (NIS) in 2008 with target goals for 2020:

Healthy People 2020 Target Immunization Goals for Adolescents¹⁰

Recommended immunizations for adolescents	Baseline (2008)	Target (2020)
1 dose of tetanus-diphtheria-acellular pertussis (Tdap) booster vaccine by age 13–15 years	62%	80%
1 dose of meningococcal conjugate vaccine (MCV) by age 13–15 years	55%	80%
3 doses of human papillomavirus (HPV) vaccine for females by age 13–15 years	23%	80%

The most recently published NIS data (2011) show substantial progress in immunization coverage among adolescents 13–17 years old who have received at least one vaccination for Tdap (80.5%) and MCV (71.5%), moderate improvement in immunization coverage for varicella (71.8%), and little or no progress in coverage for HPV (30.0% in females, 1.3% in males).⁷ Seasonal influenza vaccinations among adolescents 13–17 years of age continue to lag well behind the 2020 target goal; for the 2011–2012 flu season, only 33.7% of adolescents in this age group received a flu vaccination.¹¹

Barriers to improvement in immunization coverage among adolescents. Among the reasons cited for low immunization rates among adolescents are the lack of regular preventive care visits in this age group, lack of awareness among adolescents and/or their caregivers of the need for adolescent immunizations, inaccurate assessment of the risks involved in skipping recommended immunizations, incomplete or scattered documentation of childhood vaccinations, lack of health insurance, and missed opportunities (for example, when pre-teens receive middle school–required vaccines but not other ACIP-recommended vaccines).^{12–15}

Adolescent immunization coverage varies widely among states, which may reflect differing vaccination-promotion initiatives among local health agencies and communities; working relationships and communications between state immunization programs and vaccination providers, local professional organizations, and schools; school vaccination requirements; promotion of reminder/recall systems; vaccine financing; and healthcare infrastructure, local outbreaks, and communication efforts leading to increased consumer demand.¹⁵

Methods (Study Design, Data Sources/Collection, Interventions, Measures, Limitations).

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 adolescent vaccination in an individual clinician's patient population. The UNTHSC and its educational partners will develop a flexible, easy-to-implement technical infrastructure to existing clinical practice data and apply targeted interventions and periodic reminders 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 (e.g., vaccination rates) that will be collected can be used to provide each individual provider and the entire health system with aggregate views of customized patient populations to support quality improvement efforts.

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 adolescent 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 vaccination rates through the application of knowledge, the development of competencies, or improvements in system processes.

ACTIVITY PLAN

- **Assess** the clinical performance and unmet educational needs for adolescent vaccination based on the *electronic* capture of full denominator clinical performance measures
- **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 paired with periodic reminders to alert them when new information is available
- **Improve** the rates of vaccination for eligible adolescents

CLINICAL PERFORMANCE MEASUREMENT FOR ADOLESCENT 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 adolescent vaccination assembled for them, based on the administrative billing data, Rx data, diagnosis codes, procedure codes. In order to pull in relevant immunization data history, Humedica will also extract data documented in the health maintenance or immunization tables of the electronic medical records, as available to Humedica for each provider group. Each assessment will focus on patients meeting evaluation inclusion and exclusion criteria for the clinical performance measures.

In order to increase the frequency with which providers will view their data, and receive feedback, assessments will be performed every four months for a total of six (6) times over the two years.

ABOUT HUMEDICA'S DATA

Humedica has an ongoing data quality maintenance and monitoring system as part of its arrangement with each provider group in the network. Data are extracted from the provider systems and are then normalized and validated employing specifications developed by Humedica's Clinical Informatics Group. Normalization ensures proper interpretation of the data and comparability across groups. Industry standard diagnosis and procedure codes, such as those found in claims submissions, discharge dictations and problem lists, are validated by comparison to ICD, CPT and HCPCS dictionaries and used by Humedica, along with their standard descriptors, in their standard format.

More broadly, 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 data queries, examination of data sets and field level validation matching data back to the individual records in a group's electronic medical record system.

PERFORMANCE IMPROVEMENT MODULE GOALS

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

- 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 appropriate vaccination
- Provide and identify educational interventions that are relevant and meaningful to closing the quality gaps related to their current practice patterns
- Follow a quality and performance improvement plan on a systematic and ongoing level to improve vaccination rates in their population

CLINICAL PERFORMANCE DASHBOARD

With access to web-based screens of their patient data, health care professionals can quickly and reliably view population-based measures of performance.

- A flexible data architecture that allows for:
 - **Physician performance level data for adolescent vaccination measures**
 - **Ability to aggregate measures for the individual physician, system and national levels**
- 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
- Clinical reminder system for healthcare professionals
- Health care provider performance data will be refreshed semi-annually for a two-years

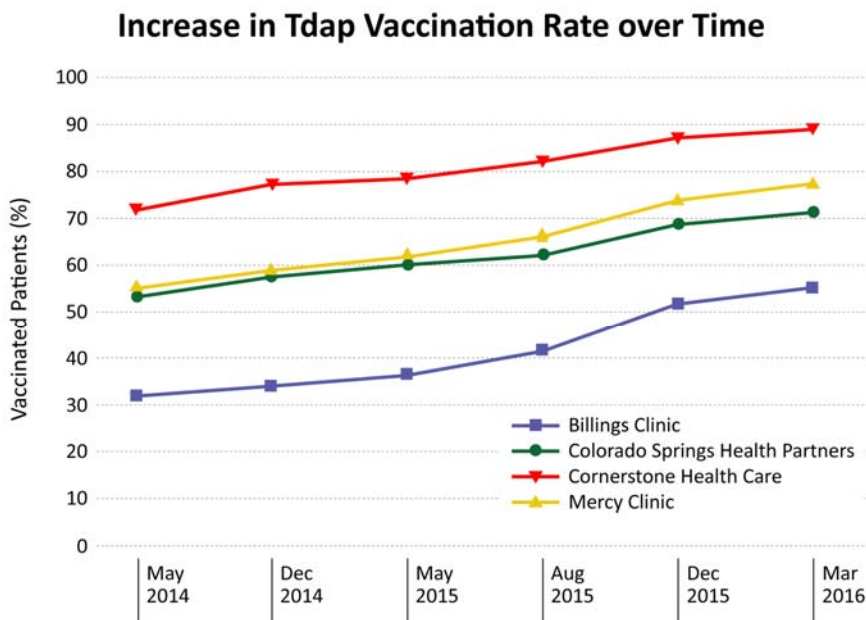
Results (Principal Findings, Outcomes, Discussion, Conclusions, Significance, Implications).

Summary:

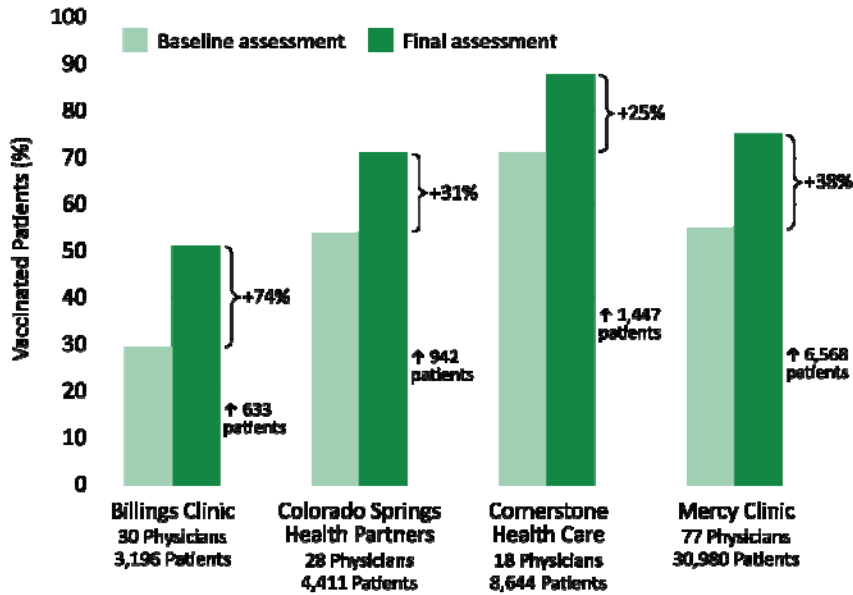
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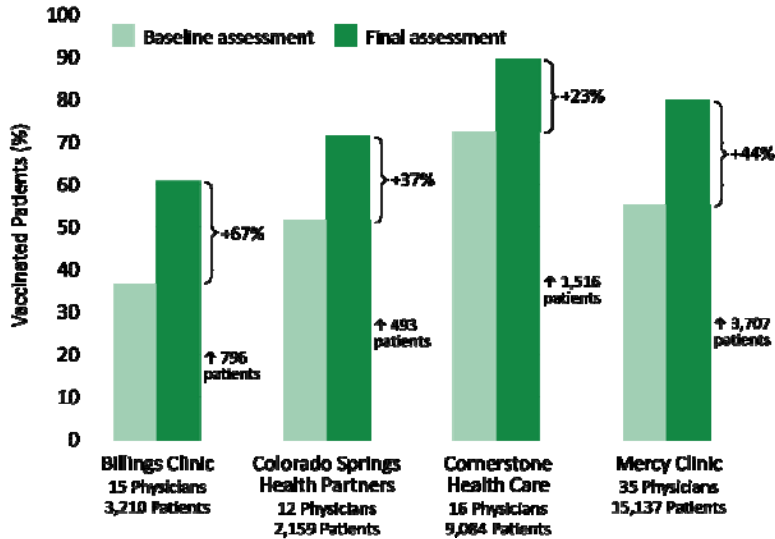
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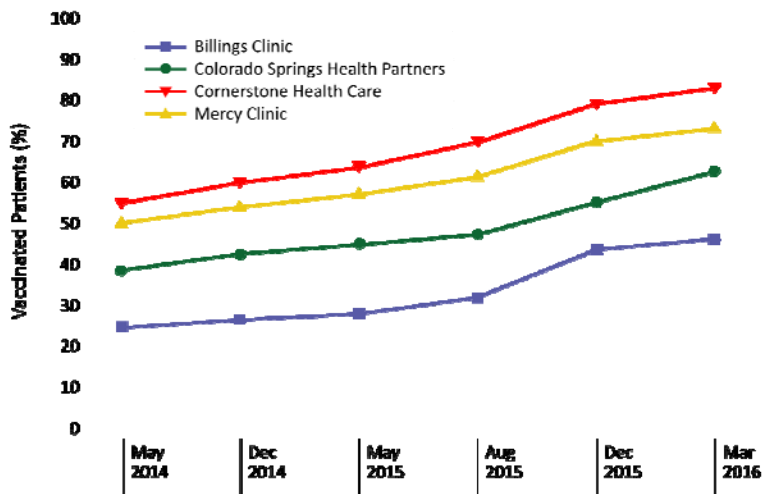
Increase in Tdap Vaccination Rate / CPD Only



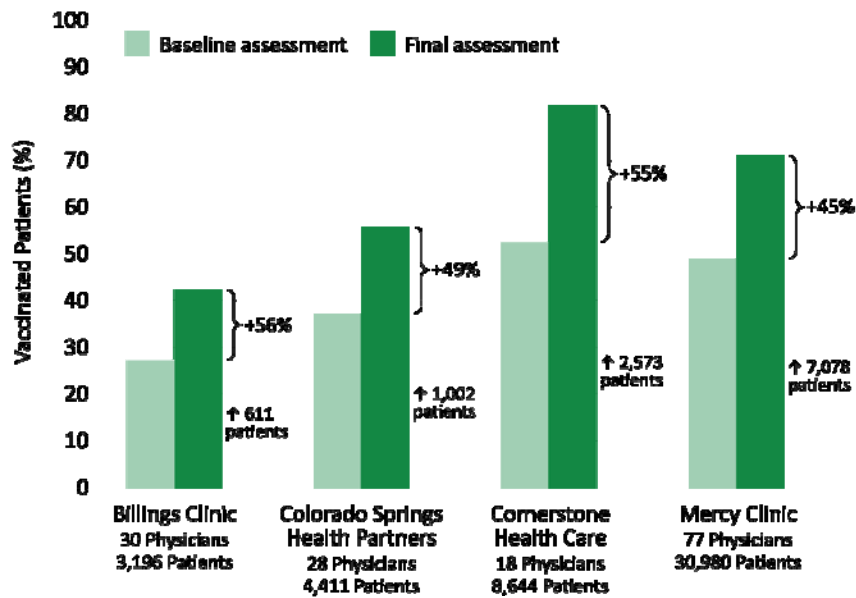
Increase in Tdap Vaccination Rate / CPD + CME



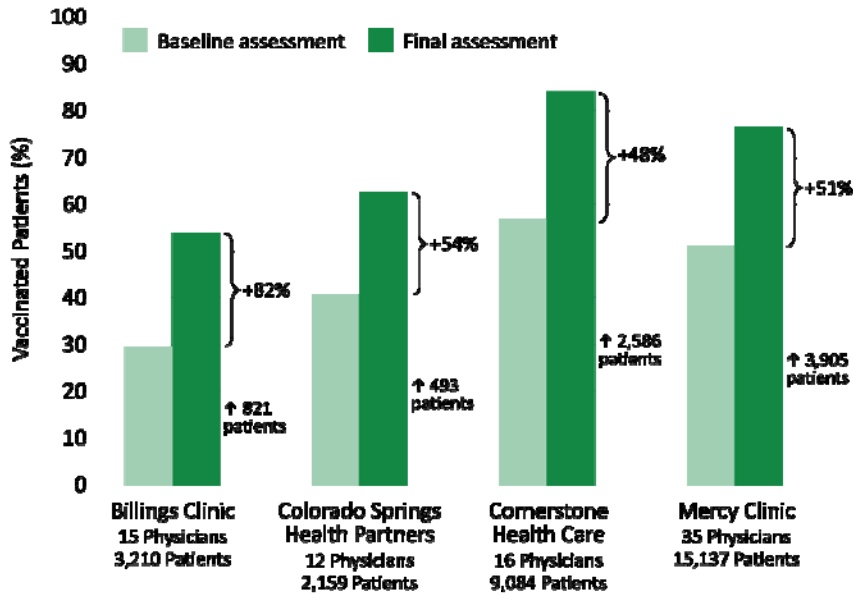
Increase in Meningococcal Vaccination Rate over Time



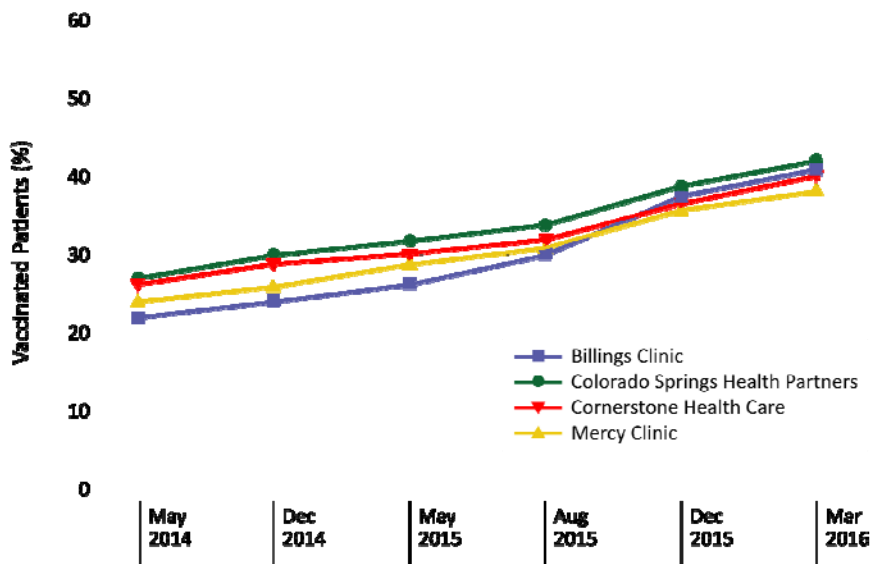
Increase in Meningococcal Vaccination Rate / CPD Only



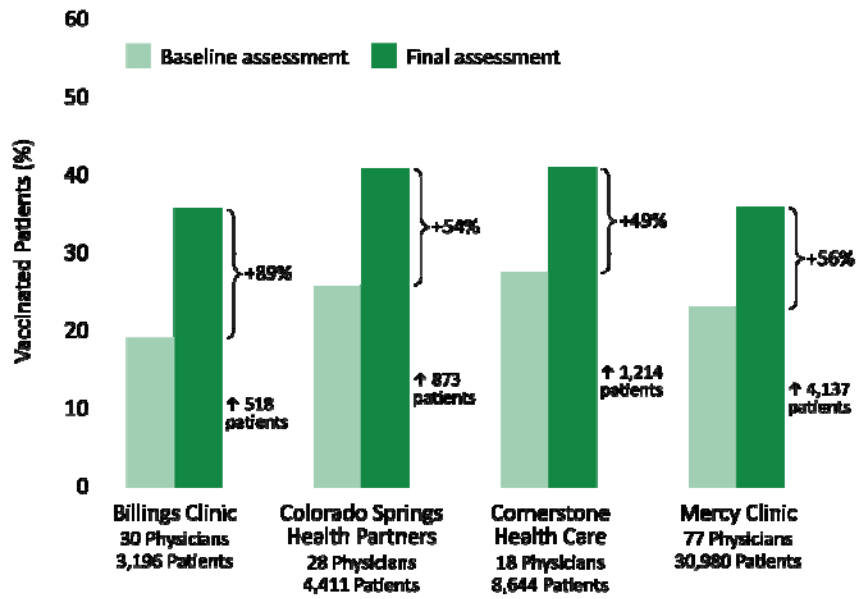
Increase in Meningococcal Vaccination Rate / CPD + CME



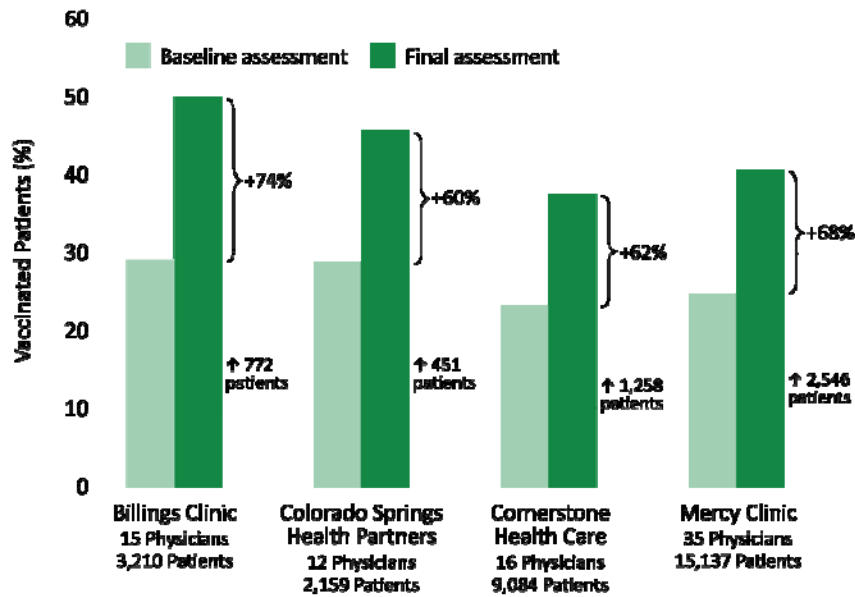
Increase In HPV Vaccination Rate over Time



Increase in HPV Vaccination Rate / CPD Only



Increase in HPV Vaccination Rate / CPD + CME



Impact on Number of Patients Vaccinated

Vaccine	Number of 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	
Tdap	78	Yes	29,590	17,577	24,089	+ 6,512	+ 40.2%
	153	No	47,231	27,084	36,634	+ 9,560	+38.4%
Total	231	-	76,821	44,661	60,763	+ 16,102	+ 39.1%
Meningo-coccal	78	Yes	29,590	15,015	22,868	+ 7,853	+ 54.6%
	153	No	47,231	47,231	23,355	+ 11,264	+ 52.0%
Total	231	-	76,821	38,370	57,487	+ 19,177	+ 52.9%
HPV	78	Yes	29,590	7,635	12,662	+ 5,027	+ 66.7%
	153	No	47,231	11,457	18,199	+ 6,742	+ 59.9%
Total	231	-	76,821	19,092	30,861	+ 11,769	+ 62.3%

List of Publications and Products

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