

## Overall Goal and Objectives

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The University of North Texas Health Sciences (UNTHSC) Center Office of Professional and Continuing 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 UNTHSC proposes to develop the following Performance Improvement Continuing Medical Education (PI-CME) initiative, *Utilizing Population Health Outcomes Data to Increase Immunization Rates in Adolescents*, which is designed to increase the rates of vaccination for eligible adolescents. The UNTHSC 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 will contain 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. Semi-annual reports will be provided for the aggregate analysis with de-identified system and regional data. Individual providers will receive a custom report of their own performance in practice.

The focus of the interventions will be patient-centered care that personalizes risk management and engages patients and their guardians in self-management related to their decisions for vaccination. The program will report the electronic capture for clinical performance patient data from 3 selected health systems and / or integrated delivery networks within the Humedica network. 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 adolescents eligible for vaccination.

### 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 150 hospitals and 1,500+ outpatient clinics, representing over 16,000 US-based primary care clinicians and healthcare team members.
- All US-based health care providers and the supporting inter-professional healthcare team
- Health system administrators and directors of quality improvement

### Key Objectives

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 such as being in a “high-risk” group
- 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

#### Activity Components

- 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:
  - *Clinical Performance Dashboard:* baseline and semi-annual report of each participant’s clinical performance in practice for selected measures. Integrated clinical reminder system providing alerts for healthcare providers.
  - *Faculty consensus meeting for curricula development* with representation from experts in infectious disease, vaccines education, primary and pediatric care, case management, clinical informatics and quality improvement professionals
  - *Case-based, interactive, online educational activities* to directly address the performance gaps identified from the assessment for adolescent vaccination

- *Slide Library* capturing most recent clinical research data for adolescent vaccines and the use of Health Information Technology solutions to support quality and performance improvement efforts
- *A two-year longitudinal outcomes report* with comparative de-identified aggregate data for a performance analysis across the network

## Technical Approach

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### Assessment of Need

The data below represents 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 <sup>a</sup>	Meningococcal <sup>a</sup>	HPV <sup>a</sup>
Midwest	35%	32%	24%
Northeast	38%	45%	21%
Pacific	47%	47%	46%
Mountain	29%	24%	28%
Southeast	34%	29%	25%
Total	36%	34%	26%

<sup>a</sup> % 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.<sup>1</sup> 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.<sup>2</sup>

Meningococcal disease is the leading cause of bacterial meningitis in children 2–18 years of age.<sup>3</sup> 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.<sup>4</sup> Approximately 800–1,200 cases are reported annually in the United States (US).<sup>3</sup> 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.<sup>3</sup> 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.<sup>5</sup> 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.<sup>6</sup> 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.<sup>7</sup>

Six million new infections due to the human papilloma virus (HPV) are reported annually in the US.<sup>8</sup> 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.<sup>9</sup> 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.<sup>6</sup> 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.<sup>6</sup>

**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 Adolescents<sup>10</sup>**

<b>Recommended immunizations for adolescents</b>	<b>Baseline (2008)</b>	<b>Target (2020)</b>
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).<sup>7</sup> 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.<sup>11</sup>

**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).<sup>12–15</sup>

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.<sup>15</sup>

### **Performance Measures: Adolescent 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 three vaccination measures. Reported outcomes will include percentage of adolescents receiving immunization broken down by age cohorts within the 11 – 17 range, as well as by gender for each provider with comparisons to the performance of their overall health system.

**Measure 1:** Percentage of adolescents 11 to 17 years receiving 1 dose of **tetanus-diphtheria-acellular pertussis (Tdap)** booster vaccine

Numerator: Number of adolescents age 11 to 17 who received 1 dose of tetanus-diphtheria-acellular pertussis (Tdap) booster vaccine

Denominator: Number of adolescents age 11 to 17 in patient panel, within data fact mart\*

- Denominator Exclusion: None

**Measure 2:** Percentage of adolescents 11 to 17 years receiving 1 or more doses of **meningococcal conjugate vaccine**

Numerator: Number of adolescents 11 to 17 years who received 1 or more doses of **meningococcal conjugate vaccine**

Denominator: Number of adolescents 11 to 17 years in patient panel, within data fact mart\*

- Denominator Exclusion: None

**Measure 3:** Percentage of adolescents 11 to 17 years receiving 1 or more doses of **human papillomavirus (HPV)**

Numerator: Number of adolescents 11 to 17 years who received 1 or more doses of human papillomavirus (HPV)

Denominator: Number of adolescents 11 to 17 years in patient panel, within data fact mart\*  
Denominator Exclusion: None

## Intervention Design and Methods

### 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 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 and other relevant immunization tables as available to Humedica within the electronic health

record extract. Each assessment will focus on patients meeting evaluation inclusion and exclusion criteria for the clinical performance measures. Assessments will be performed on a semi-annual basis for the period of two years.

#### 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

#### 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's clinical data repository 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 quality improvement strategies

#### LEARNING MANAGEMENT SYSTEM

An educational learning management system that will automatically trigger the delivery of appropriate content (case vignettes, slide library, periodic reminders, 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 adolescent vaccine 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

#### 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. UNTHSC, 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 (Pediatric Vaccines Specialist), Primary and Pediatric Care Leadership (3), Director of CME, Director of Quality Improvement and a 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.<sup>16</sup> 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 adolescents eligible for vaccination.

**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 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 UNTHSC's 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).<sup>17</sup>

## 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.

- Methods to Collectively Examine Your Entire Patient Population to Help Them Meet Health Care Quality Standards for Pre-adulthood Vaccinations
- Effective Ways to Communicate the Safety and Efficacy of Vaccines to Your Patients and Guardians
- Overcoming Barriers to Care in Underserved Communities to Increase Adolescent 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 two-year course of the activity to reflect new evidence and treatment strategies.

**Distribution:** Web links to the Educational Slide Library will be placed on UNTHSC's website.

**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 UNTHS 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 eligible for 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.

## Evaluation Design

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

The proposed integrated approach to this certified PI CME activity will utilize advanced technologies and data collection systems to access, extract, and analyze health care provider process and clinical performance data. It will integrate these analyses into a customized learner portfolio supported by the UNTHSC content and learning management system to improve vaccination rates among adolescents. 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.

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 (% adolescents with Tdap vaccination from the fictitious Dr. R. Jones' entire population of adolescent patients (n=124) over a two-year period and compared his clinical performance to his institution, the Monroe Clinic (n=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.

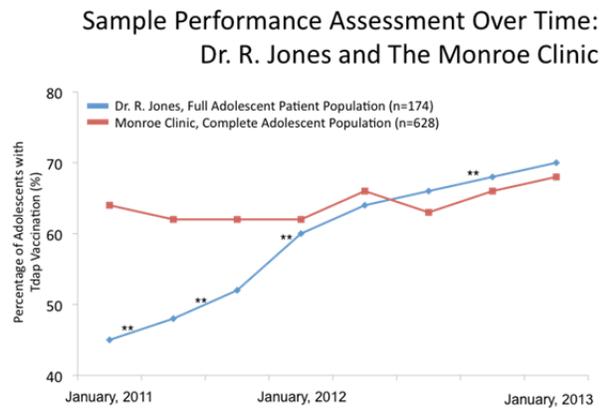


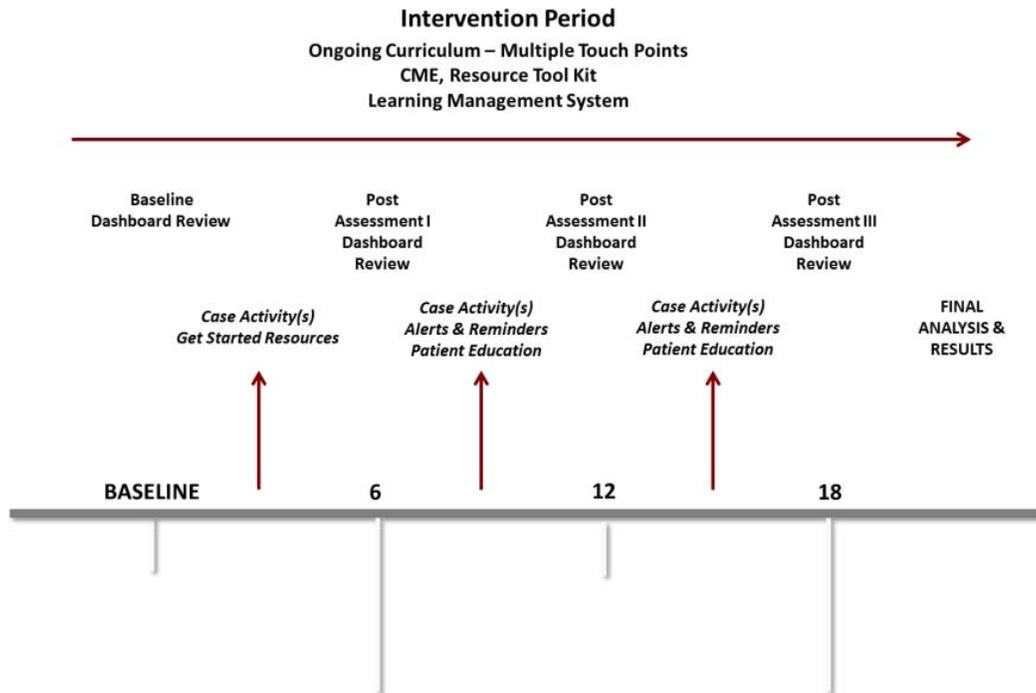
Figure 1

## Detailed Workplan and Deliverables Schedule

The educational design will ensure that the physician participants are actively engaged in the performance improvement process throughout the intervention period. After the initial baseline review of data, physicians will receive ongoing alerts and reminders to come back to the learning management system for subsequent interventions and educational messages. This curriculum-based design allows for continuous learning in between each post intervention review of individual performance data.

The personalized learner dashboard will be refreshed semi annually for a total of four times including the initial baseline data run. This proposed plan allows enough time for the physicians to disseminate the education across the healthcare team and implement key learnings into practice. This plan also provides sufficient time for Humedica to fulfill their data integrity and data quality assessment standards. As part of the quality assurance protocols, providers' data are subject to analytic checks and examination of the fact mart data in the Humedica database to ensure that the processed data matches that of the electronic health record source from which it was extracted. 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. Lastly, Humedica performs over 2000 queries of the fact marts each month. These tests ensure that requisite logical relationships exist in the data that will be exposed by the analytics.



## Publication Plan

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, and JCEHP.

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