CHAPTER QUALITY NETWORK
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Chapter Quality Network Improving Antibiotic Prescribing for Children | Change Package

American Academy of Pediatrics

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Evidence and Guidelines Regarding Improving Outpatient Antibiotic Prescribing for Children

Antibiotic use is a major driver of antibiotic resistance and a critical global public health threat.[1] Most antibiotic use in the United States occurs in the outpatient setting[2] and young children have the highest per capita use.[3] Annually, over 65 million outpatient antibiotic prescriptions are dispensed to children,[4] at least 29% of which are unnecessary[5] and many more are of broader spectrum than recommended.[6] Of antibiotics prescribed to children in doctor's offices and emergency departments, 31% are for acute otitis media (AOM) and viral upper respiratory infections (URI). Practice in concordance with AAP and other published guidelines could improve avoidance of antibiotics for URI and use of safety-net antibiotic prescriptions (SNAP) and antibiotic selection for AOM. Appropriate antibiotic use is key to limiting antibiotic resistance and avoiding their adverse effects, which lead to an estimated 70,000 emergency department visits by children yearly.[7] In addition, emerging data suggest that antibiotic use in young children may increase long-term risk of autoimmune, allergic, and infectious diseases, likely mediated through microbiome disruption.[8]

Antibiotic stewardship aims to optimize antibiotic use. In 2016, the Centers for Disease Control and Prevention (CDC) released the *Core Elements of Outpatient Antibiotic Stewardship*, providing a framework for implementing antibiotic stewardship in outpatient practices.[9] (see Figure 1). The *Core Elements* recommends evidence-based interventions, including SNAP, commitment posters, clinical decision support and algorithms, and communication tools like viral prescription pads. Antibiotic stewardship programs are found primarily in academic settings or delivery systems that leverage infectious disease specialists and hospital quality improvement (QI) programs. However, physicians in small independent practices prescribe higher volumes of antibiotics than those in larger group practices.[10] The AAP's Chapter Quality Network (CQN) has demonstrated the effectiveness of improving care and adherence to guidelines in pediatric practices in a quality improvement initiative.[11]

Figure 1: CDC Core Elements of Outpatient Antibiotic Stewardship

About the Chapter Quality Network Improving Outpatient Antibiotic Prescribing for Children Initiative

The AAP Chapter Quality Network (CQN) partnered with the CDC's Division of Healthcare Quality Promotion and the AAP Virginia and Colorado Chapters to engage in a series of pediatric practice-based quality improvement (QI) projects to achieve measurable improvements in appropriate antibiotic prescribing for children in outpatient settings. CQN used a modified IHI Breakthrough Series Collaborative Model. In its generic form, a collaborative is usually a collection of healthcare organizations of a similar type that come together over a fixed period of time to pursue a shared and measurable improvement aim[12]. The CQN initiative featured three phases, each consisting of a seven-month learning collaborative of 8-14 pediatric practice teams committed to testing and implementing changes leading to a sustainable antibiotic stewardship program and measurable improvements in antibiotic prescribing as defined by the specific areas of focus for each project[13].

Source: American Academy of Pediatrics, Chapter Quality Network (CQN) **July, 2019**

The curriculum was designed with content and implementation experts, incorporating ongoing input from collaborative practice teams to inform areas of focus and support to achieve outcomes. Monthly reporting on QI measures was required as part of collaborative participation with summary reports provided for feedback. Face to face and webinar sessions utilized expert presentations and patient case-based studies to highlight existing evidence, educational resources, and academic research. Through face to face and webinar sessions, project leadership sought to create optimal conditions for peer to peer learning while reinforcing use of quality Improvement (QI) methods using plan- do- study- act cycles to move from incremental to sustainable changes in processes, staff responsibilities, and organizational culture. The curriculum, built over these three phases, is the basis for the content in this change package. We gratefully acknowledge the individuals and organizations that provided resources that are included in this document (listed on pages 3-4).

About the CQN Change Package

A change package is a compilation of tools and resources that can be used to implement changes at both the clinician/care team level and the practice/facility level. The change package is not a "how to" or a step by step guide. Rather it is a repository of resources organized by key drivers of improvement, which we will describe below. The purpose of this change package is to provide a clinician/practice easy access to a repository of resources to bolster their ability to improve evidence-based antibiotic prescribing and create an antibiotic stewardship program based on the CDC recommendations. Certainly, it can also be used as a comprehensive package if a practice seeks to implement a QI project. The intended audience for the change package is pediatric and family medicine practices.

This change package contains a number of organizing frameworks, a measurement grid, resource tables and appendices comprised of resources from the AAP, CDC, the Pediatric Infectious Disease Society (PIDS), the Institute for Healthcare Improvement (IHI), National Initiative for Children's Healthcare Quality (NICHQ), and presentations and articles from infectious disease researchers and implementation experts provided in one or more phases of the project. Some tools were created by participating practice teams; these tools are provided in word format so that they can be adapted.

The package is organized by four key drivers derived from this initiative's Key Driver Diagram. (see Appendix A). A key driver diagram is a visual framework that outlines a set of drivers that are evidence-based or show promise to improve outcomes. A driver diagram displays the relationship between the overall aim of the project, the key drivers that contribute directly to achieving the aim, and specific change ideas and interventions associated with each key driver.

CQN Improving Antibiotic Prescribing for Children Implementation and Measurement Strategy

Implementation Strategies Using Quality Improvement Methodologies

Putting evidence into practice is challenging; it takes an average of 17 years to implement sound research at the front lines of care[14]. A number of factors require consideration in the selection of the right method for spreading effective change, including the nature of the innovation, size and nature of the audience we seek to reach, available resources and infrastructure, and the time frame to drive change [15]. Quality improvement methodologies have been established as effective in achieving demonstrable change in health care environments[16,17]. There are several QI methodologies used in health care today, such as Toyota's Lean Methodology and Six Sigma. CQN has adapted the Institute for Healthcare Improvement's Model for Improvement (MFI) implementation framework, which has been used by thousands of improvement teams across the world. There are many open-sourced resources available to learn more about these methodologies; we have included a glossary of QI terms in Appendix C and explanation and resources for the MFI and other QI resources in Appendix D.

The Measurement Strategy for CQN's Improving Antibiotic Prescribing for Children

Monitoring and measuring office processes and outcomes is a critical part of quality improvement work. The measures set that was developed for the Improving Outpatient Antibiotic Prescribing Initiative is included in Appendix B for reference and adaptation. The grid includes the following elements in a table format for each measure:

Improving Antibiotic Prescribing for Children Measures Table Description

Condition: Antibiotic Prescribing conditions associated with the measure (AOM, Pharyngitis, Sinusitis, URI)
Measure Name: Standard nomenclature for each CQN measure
Measure Definition: How CQN defined the measure
Source of Measure: The source for measure (e.g., developed by CQN or an outside source)
Measure Calculation: Numerator and denominator definitions
Exclusion Criteria: Data not to be included when calculating the measure

Key Drivers to Improve Antibiotic Prescribing for Children

The four key drivers are listed below with a brief description of each driver. Next, a table of resources is provided for each key driver, which includes the resource, author/affiliation, a brief description and link or location of the resource.

Figure 2. Improving Outpatient Antibiotic Prescribing for Children Key Drivers

1. Optimize antibiotic prescribing through practice-level standards, processes and policies	2. Embed evidence-based recommendations into practice workflows and protocols	3. Use data to understand, track and provide ongoing feedback on antibiotic prescribing	4. Ensure access to necessary expertise and resources for practice teams, caregivers and patients

1. **Optimize antibiotic prescribing through practice-level standards, processes and policies (Table 1).**

   Developing and documenting procedures and policies are essential to a reliable system, ensuring that clinicians and staff are consistent in antibiotic prescribing. Resources for this driver include scientific journals, the CDC and Pediatric Antibiotic Stewardship (ASP) Toolkit.

2. **Embed evidence-based recommendations into practice workflows and protocols (Table 2).**

   Revising and updating EMR and paper workflows and protocols to ensure evidence- based recommendations are embedded into daily practice aligns with CDC *Core Elements* of Commitment and Action. Resources for this driver include examples of workflows and protocols from scientific journals, CDC resources, Pediatric ASP Toolkit and from the CQN curriculum.

3. **Use data to understand, track and provide ongoing feedback on antibiotic prescribing (Table 3).**
   Tracking and reporting is a CDC *Core Element.* At this point in time, there are few resources available that provide direct support to implementing a practice- based tracking and reporting system. We have included a research brief from CHOP that outlines the evidence regarding the intervention of tracking and reporting in changed practice patterns. We also feature a

CQN presentation by the lead CHOP researcher, Jeff Gerber, on how they developed a tracking and reporting system within their practice clinic.

4. **Ensure access to necessary expertise and resources for practice teams, caregivers, and patients (Table 4).**

Access to necessary expertise and resources is a CDC *Core Element*. Resources for this driver include links to resource platforms for parent and patient education that can be downloaded and tailored for your practice. We have also included a number of presentations that could be used for training clinicians and staff across a number of topics.

Improving Antibiotic Prescribing for Children Change Package for Clinicians and Care Teams

Note: all links are current as of September 1, 2019.

Table 1 | Improving Antibiotics Prescribing for Children Change Package for Clinicians and Care Team
Key Driver 1: Commit to Optimizing Antibiotic Prescribing Through Practice Level Standards, Policies and Processes

Intervention	***Tools & Resources***	***Where to Access***
Identify a physician champion to direct antibiotic stewardship activities within your practice	**CDC Core Elements Checklist: Commitment and Action** **Pediatric Antibiotic Stewardship (ASP) Toolkit (PIDS Toolkit)** Toolkit includes building the case for such an effort, obtaining commitment from institutional leadership, and developing a stewardship policy	https://www.cdc.gov/mmwr/volumes/65/rr/rr6506a1.htm?s_cid=446506a1_w www.pids.org/asp-toolkit.html
Incorporate antibiotic stewardship-related duties into position descriptions or job evaluation criteria for practice leadership/management	**CDC Core Elements Checklist: Commitment and Action** **Pediatric ASP Toolkit: Commitment to Improve**	https://www.cdc.gov/mmwr/volumes/65/rr/rr6506a1.htm?s_cid=446506a1_w http://www.pids.org/asp-toolkit/html
Communicate expectations that all staff support judicious use antibiotics and manage	**CDC Core Elements Checklist: Commitment and Action** CDC recommends that outpatient clinicians take steps to implement antibiotic stewardship activities by using this checklist as a baseline assessment of policies and practices that are in place. Then use the	https://www.cdc.gov/mmwr/volumes/65/rr/rr6506a1.htm?s_cid=rr6506a1_w

Source: American Academy of Pediatrics, Chapter Quality Network (CQN) **July, 2019**

patient/caregiver expectations regarding antibiotic prescribing	checklist to review progress in expanding stewardship activities on a regular basis. **Pediatric ASP Toolkit** Toolkit includes developing a stewardship policy **CDC Antibiotic Prescribing and Use in Doctor's Offices, Print Materials for Everyone, Checklists for Patients Sample Return to Daycare Letter**	www.pids.org/asp-toolkit.html https://www.cdc.gov/antibiotic-use/community/materials-references/print-materials/everyone/index.html
Write and display public commitments in support of antibiotic stewardship	**CDC Antibiotic Stewardship Commitment Posters** **Fact Sheets for Patients and Providers Prescription Pad**	https://www.cdc.gov/antibiotic-use/community/materials-references/print-materials/hcp/index.html

Table 2 | Improving Antibiotics Prescribing for Children Change Package for Clinicians and Care Team
Key Driver 2: Embed evidence-based recommendations into practice workflow and protocols

Intervention	***Description***	***Where to Access***
Use evidence based diagnostic criteria and treatment recommendations	**CDC Pediatric Treatment Recommendations:** This table summarizes the most recent principles of antibiotic prescribing for children obtaining care in an outpatient setting for the four diagnoses	https://www.cdc.gov/antibiotic-use/community/for-hcp/outpatient-hcp/pediatric-treatment-rec.html
Use evidence based diagnostic criteria and treatment recommendations	**Allergy Testing in Children with Low Risk Penicillin Allergy Symptoms.** Article by David Vyles, DO and colleagues, Pediatrics, 2017. **Clinical Pathway developed by Children's Hospital Colorado, "Penicillin Allergy De-labeling"**	https://downloads.aap.org/DOCCSA/18 CQN_VoylesAllergyTestingPenicillinAllergy.pdf https://downloads.aap.org/DOCCSA/29_CQNABXPenicillinAllergyDelabelinChildrensHospCo.pdf

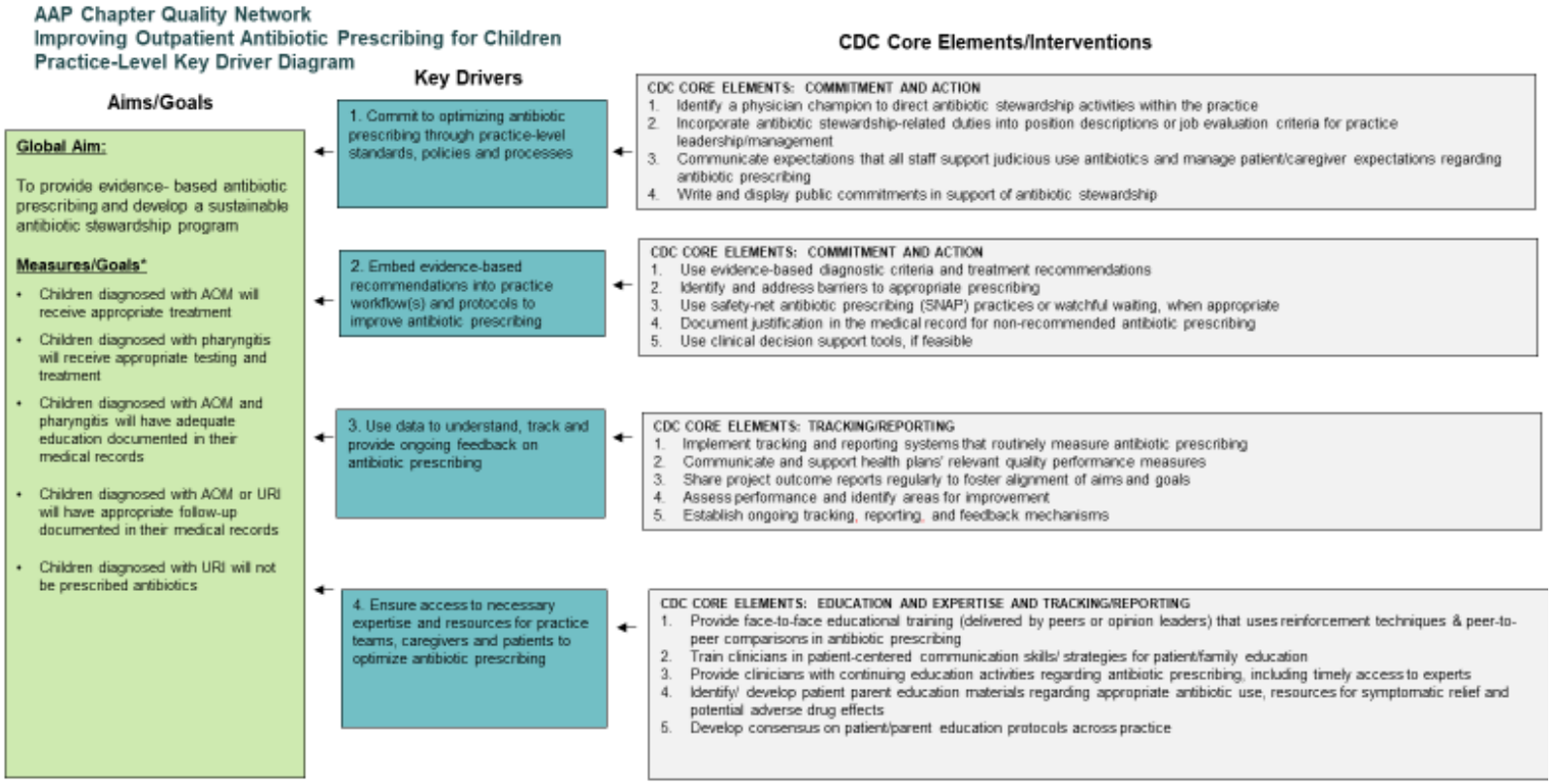
Use evidence based diagnostic criteria and treatment recommendations	**CQN Antibiotic Stewardship High Level Process Map** A practice level process map for providing a visual display of a practices workflow when a caregiver has concerns about their child's health status.	https://downloads.aap.org/DOCCSA/20_CQNAntibiotic Prescribing_High-Level Process Map.pdf
Use evidence based diagnostic criteria and treatment recommendations	**Appropriateness of outpatient antibiotic prescribing among privately insured US patients: ICD-10-CM based cross sectional study** Article by Chua Kao-Ping MD, PhD and colleagues, 2019 To assess the appropriateness of outpatient antibiotic prescribing for privately insured children and nonelderly adults in the US using a comprehensive classification scheme of diagnosis codes in ICD-10CM	https://academic.oup.com/jpids/article/4/4/297/2580073 https://downloads.aap.org/DOCCSA/07_CQN_ChauBox1_ICD 10 codesandABX Prescribing2018.pdf
Identify barriers that prevent antibiotic prescribing	**MMWR Report Initial Steps for ABX Stewardship** See Box 2: Initial steps for ABX Stewardship: recognize opportunities by identifying high priority conditions, identifying barriers and establishing standards.	https://www.cdc.gov/mmwr/volumes/65/rr/rr6506a1.htm?s_cid=rr6506a1_w https://downloads.aap.org/DOCCSA/03CQN_MMWR Report_Core Elements of Outpatient Antibiotic Stewardship.pdf
Identify barriers that prevent antibiotic prescribing	**Approaches to Modifying the Behavior of Clinicians Who Are Noncompliant with Antimicrobial Stewardship Program Guidelines** Article by Ellie Goldstein MD and colleagues, 2016 This article outlines strategies to establish a successful ASP that reviews appropriate efforts to achieve the goal of modifying outlier physicians' behavior.	https://www.ncbi.nlm.nih.gov/pubmed/27098167 https://downloads.aap.org/DOCCSA/11_Goldstein. ApproachestomodifyingbehaviornoncompliantwithASPguidelines. CID2016_.pdf
Identify barriers that prevent antibiotic prescribing	**Variation in Antibiotic Prescribing Across a Pediatric Primary Care Network** Article by Jeff Gerber MD, PhD and colleagues, 2015 Antibiotic prescribing for common pediatric infections varied substantially across practices. This variability could not be explained by patient-specific factors. These data suggest the need for and provide high impact targets for outpatient antimicrobial stewardship interventions.	https://academic.oup.com/jpids/article/4/4/297/2580073 https://downloads.aap.org/DOCCSA/16CQN_JPIDS VariationAntibioticPrescribingPrimaryCareGerber 2015.pdf

Table 3 | Improving Antibiotics Prescribing for Children Change Package for Clinicians and Care Team Key Driver 3: Use data to understand, track and provide ongoing feedback		
Intervention	***Tools/Resources***	***Where to Access***
Implement tracking and reporting system /Establish ongoing tracking/reporting	**Promoting Antibiotic Stewardship in Pediatric Outpatient Settings: A Research Brief** by Jeff Gerber, MD, PhD and Colleagues, 2018 Produced by the Center for Pediatric Clinical Effectiveness at Children's Hospital of Philadelphia. Outlines research including outcomes from peer to peer audit and feedback and sustainable APS.	https://cpce.research.chop.edu/sites/default/files/CPCE_Research_Brief_2018.pdf https://downloads.aap.org/DOCCSA/01_CQN_CHOP_PromotingAnbioticStewardshipinOutpatientSettings_2018.pdf
Implement tracking and reporting system /Establish ongoing tracking/reporting	**Outpatient Antimicrobial Stewardship: Interventions that Work.** Presentation by Jeff Gerber, MD, PhD FAAP	https://downloads.aap.org/DOCCSA/19_CQN_Gerber CHOP_InterventionsThatWork.pdf

Table 4 | Improving Antibiotics Prescribing for Children Change Package for Clinicians and Care Team Key Driver 4: Ensure access to necessary expertise and resources for practice teams, caregivers and patients		
Intervention	**Tools/Resources**	**Where to Access**
Identify and tailor parent educational materials	**CDC Be Antibiotics Aware Program Print Materials For Everyone, For Parents, For HCP's, Prescription Adherence Tool**	https://www.cdc.gov/antibiotic-use/community/materials-references/printed materials/index.html
Identify and tailor parent educational materials	**Viral Infection Parent Handout** General instructions for parents to ameliorate symptoms for a child who does not have a bacterial infection	https://downloads.aap.org/DOCCSA/12_RTC Pediatrics_ViralRxParentHandout.pdf

Provide clinicians with educational training	**Clinical Questions Regarding Sinusitis and Pharyngitis Antibiotic Prescribing** Presentation by Adam Hersh, University of Utah	https://downloads.aap.org/DOCCSA/15_CQN_AntibioticPrescribingforSinusitusandPharyngitis_Hersh.pdf
Train clinicians in patient centered communication skills and patient/family education materials	**Parent Communication for Appropriate Antibiotic Use** Presentation by Katherine Fleming-Dutra, MD	https://downloads.aap.org/DOCCSA/09_CQN_FlemingDutra_CommunicationforAppropriateAntibioticUse.pdf
Train clinicians in patient centered communication skills and patient/family education materials	**Parent Communication Training** Presentation by Rita Mangione- Smith, MD Features DART (Dialogue around Respiratory Illness Treatment) **CDC Training Module 6 Antibiotic Stewardship**	https://www.seattlechildrens.org/research/centers-programs/child-health-behavior-and-development/labs/mangione-smith-lab/dart-learning-modules/ https://www.train.org/cdctrain/training plan/3697
Train clinicians in patient centered communication skills and patient/family education materials	**The Pediatric Antibiotic Stewardship Program Toolkit**	www.pids.org/asp-toolkit.html

Appendix A| CQN Improving Antibiotic Prescribing in Children Key Driver Diagram



*Clinical Practice Guideline for the Diagnosis and Management of Group A Streptococcal Pharyngitis: 2012 Update by the Infectious Diseases Society of America;
Clinical Practice Guideline for the Diagnosis and Management of Acute Otitis Media in Children Aged 1 to 18 Years

Source: American Academy of Pediatrics, Chapter Quality Network (CQN) **July, 2019**

Appendix B| CQN Improving Antibiotic Prescribing for Children Measures Grid

Condition	Measure Name	Measure Definition	Source of Measure	Measure Calculation (Numerator/Denominator)	Exclusion Criteria
Acute Otitis Media (AOM)	Antibiotic prescribed for patients with AOM	% of patients ≥6 months with a diagnosis of AOM who had an antibiotic prescribed[a]	Adapted from Utah Pediatrics Partnership to Improve Healthcare Quality's (UPIQ) Using Antibiotics Wisely Project and EQIPP's Judicious Use of Antibiotics' Acute Otitis Media Track	Numerator: # of patients ≥6 months with: 1. a diagnosis of AOM AND 2. an antibiotic prescribed Denominator: # of patients ≥6 months with: 1. a diagnosis of AOM	Patients <6 months old Visits with another (competing) diagnosis that warranted an antibiotic
Acute Otitis Media (AOM)	Use of first-line antibiotics to treat AOM	% of antibiotic prescriptions for patients ≥6 months old with a diagnosis of AOM that were written for a 1st line antibiotic	Adapted from UPIQ's Using Antibiotics Wisely Project	Numerator: # of patients ≥6 months old with: 1. a diagnosis of AOM AND 2. a 1st line antibiotic prescribed (amoxicillin or amoxicillin/clavulanate) Denominator: # of patients ≥6 months old with: 1. a diagnosis of AOM AND 2. an antibiotic prescribed	Patients <6 months old Visits with another (competing) diagnosis that warranted an antibiotic
Acute Otitis Media (AOM)	Use of safety-net antibiotic prescriptions (SNAPs) for patients with AOM	% of antibiotic prescriptions for patients ≥6 months old with a diagnosis of AOM that were written as a SNAP	Adapted from UPIQ's Using Antibiotics Wisely Project	Numerator: # of patients ≥6 months old with: 1. a diagnosis of AOM AND 2. an antibiotic prescribed as SNAP Denominator: # of patients ≥6 months old with: 1. a diagnosis of AOM AND 2. an antibiotic prescribed	Patients <6 months old Visits with another (competing) diagnosis that warranted an antibiotic

Source: American Academy of Pediatrics, Chapter Quality Network (CQN) **July, 2019**

Condition	Measure Name	Measure Definition	Source of Measure	Measure Calculation (Numerator/Denominator)	Exclusion Criteria
Acute Otitis Media (AOM)	Appropriate AOM treatment education	% of patients ≥6 months old with a diagnosis of AOM who were educated regarding appropriate treatment for AOM	Adapted from UPIQ's Using Antibiotics Wisely Project	Numerator: # of patients ≥6 months old: 1. with a diagnosis of AOM AND 2. who were educated regarding appropriate treatment for AOM Denominator: # of patients ≥6 months old with: 1. a diagnosis of AOM	Patients <6 months old Visits with another (competing) diagnosis that warranted an antibiotic
Acute Otitis Media (AOM)	Appropriate treatment education for SNAPs	% of patients ≥6 months old with a diagnosis of AOM and a SNAP who received appropriate education about SNAPs	Adapted from UPIQ's Using Antibiotics Wisely Project to focus on SNAPs	Numerator: # of patients ≥6 months old: 1. with a diagnosis of AOM AND 2. an antibiotic prescribed as a SNAP AND 3. who received appropriate education about SNAPs Denominator: # of patients ≥6 months old with: 1. a diagnosis of AOM AND 2. an antibiotic prescribed as a SNAP	Patients <6 months old Visits with another (competing) diagnosis that warranted an antibiotic

Condition	Measure Name	Measure Definition	Source of Measure	Measure Calculation (Numerator/Denominator)	Exclusion Criteria
Pharyngitis	Appropriate testing for children with pharyngitis	% of patients ≥3 years old with a diagnosis of pharyngitis and an antibiotic prescribed who had a positive strep test	Adapted from HEDIS[b] & UPIQ's Using Antibiotics Wisely Project	Numerator: # of patients ≥3 years old with: 1. a diagnosis of pharyngitis AND 2. an antibiotic prescribed AND 3. documentation of a positive strep test (rapid strep, culture or molecular test) Denominator: # of patients ≥3 years old with: 1. a diagnosis of pharyngitis AND 2. an antibiotic prescribed	Patients <3 years old Visits with another (competing) diagnosis that warranted an antibiotic
Pharyngitis	Use of first-line antibiotics to treat pharyngitis	% of antibiotic prescriptions for patients ≥3 years old with a diagnosis of pharyngitis that were written for a 1st line antibiotic	Adapted from UPIQ's Using Antibiotics Wisely Project	Numerator: # of patients ≥3 years old with: 1. a diagnosis of pharyngitis AND 2. A first-line antibiotic prescribed (penicillin/amoxicillin) Denominator: # of patients ≥3 years old with: 1. a diagnosis of pharyngitis AND 2. an antibiotic prescribed	Patients <3 years old Visits with another (competing) diagnosis that warranted an antibiotic

Condition	Measure Name	Measure Definition	Source of Measure	Measure Calculation (Numerator/Denominator)	Exclusion Criteria
Sinusitis	Use of antibiotics to treat acute sinusitis	% of patients ≥2 years old with a diagnosis of sinusitis who were prescribed an antibiotic	Adapted from UPIQ's Using Antibiotics Wisely Project	Numerator: # of patients ≥2 years old with: 1. a diagnosis of sinusitis AND 2. an antibiotic prescribed Denominator: # patients ≥2 years old with: 1. a diagnosis of sinusitis	Patients <2 years old Visits with another (competing) diagnosis that warranted an antibiotic
Sinusitis	Use of first-line antibiotics to treat acute sinusitis	% of antibiotic prescriptions for patients ≥2 years old with a diagnosis of sinusitis that were written for a first-line antibiotic	Adapted from UPIQ's Using Antibiotics Wisely Project	Numerator: # of patients ≥2 years old with: 1. a diagnosis of sinusitis AND 2. a first-line antibiotic prescribed (amoxicillin or amoxicillin/clavulanate) Denominator: # of patients ≥2 years old with: 1. a diagnosis of sinusitis AND 2. an antibiotic prescribed	Patients <2 years old Visits with another (competing) diagnosis that warranted an antibiotic
Sinusitis	Use of safety-net antibiotic prescriptions (SNAP) to treat acute sinusitis	% of antibiotic prescriptions for patients ≥2 years old with a diagnosis of sinusitis that were written as a SNAP	Adapted from UPIQ's Using Antibiotics Wisely Project	Numerator: # of patients ≥2 years old with: 1. a diagnosis of sinusitis AND 2. an antibiotic prescribed as a SNAP Denominator: # of patients ≥2 years old with: 1. a diagnosis of sinusitis AND 2. an antibiotic prescribed	Patients <2 years old Visits with another (competing) diagnosis that warranted an antibiotic

Condition	Measure Name	Measure Definition	Source of Measure	Measure Calculation (Numerator/Denominator)	Exclusion Criteria
Sinusitis	Appropriate acute sinusitis management education	% of patients ≥2 years old with a diagnosis of sinusitis who were educated regarding appropriate management of sinusitis	Adapted from UPIQ's Using Antibiotics Wisely Project	Numerator: # patients ≥2 years old: 1. with a diagnosis of sinusitis AND 2. who received education regarding appropriate management of sinusitis Denominator: # patients ≥2 years old with: 1. a diagnosis of sinusitis	Patients <2 years old Visits with another (competing) diagnosis that warranted an antibiotic
Upper Respiratory Infection (URI)	Appropriate treatment for children with URI[c]	% of patients ≥3 months old with a diagnosis of upper respiratory infection who had no antibiotic prescribed	HEDIS	Numerator: # of patients ≥3 months old with: 1. a diagnosis of upper respiratory infection AND 2. no antibiotic prescribed Denominator: # of patients ≥3 months old with: 1. a diagnosis of upper respiratory infection	Patients <3 months old Visits with another (competing) diagnosis that warranted an antibiotic
Upper Respiratory Infection (URI)	Appropriate URI treatment education	% of patients ≥3 months old with a diagnosis of upper respiratory infection who were educated regarding appropriate treatment for URI	Adapted from EQIPP's Judicious Use of Antibiotics' Upper Respiratory Infection Track	Numerator: # of patients ≥ 3 months old: 1. with a diagnosis of upper respiratory infection AND 2. who were educated regarding appropriate treatment for URI. Denominator: # of patients ≥ 3 months old with: 1. a diagnosis of upper respiratory infection	Patients <3 months old Visits with another (competing) diagnosis that warranted an antibiotic

Notes:
a) The Chapter Quality Network initiative assessed rates of antibiotic prescribing for patients with AOM separately for patients <2 years old and ≥2 years old but found that there was no difference in prescribing rates between the two age groups.

b) HEDIS measure name: Appropriate testing for children with pharyngitis
- HEDIS measure definition: The percentage of children 3–18 years of age who were diagnosed with pharyngitis, dispensed an antibiotic and received a group A streptococcus (strep) test for the episode. A higher rate represents better performance (i.e., appropriate testing).
- Source: https://www.qualitymeasures.ahrq.gov/summaries/summary/49702/appropriate-testing-for-children-with-pharyngitis-percentage-of-children-3-to-18-years-of-age-who-were-diagnosed-with-pharyngitis-dispensed-an-antibiotic-and-received-a-group-a-streptococcus-strep-test-for-the-episode

c) HEDIS measure name: Appropriate treatment for children with upper respiratory infection
- HEDIS measure definition: The percentage of children 3 months-18 years of age who were given a diagnosis of URI and were not dispensed an antibiotic prescription. A higher rate indicates appropriate treatment of children with URI (i.e., the proportion for whom antibiotics were not prescribed).

Source: http://www.ncqa.org/report-cards/health-plans/state-of-health-care-quality/2015-table-of-contents/uri#sthash.fJcnfT0a.dpuf

Appendix C| Quality Improvement Glossary

Action Period
The period of time between learning sessions. During these periods, practice teams work on improvement in their practice or office settings.

Aim
A written, measurable, and time-sensitive statement of the expected results of an improvement process.

Change Concept
A general idea for changing a process. Change concepts are usually at a high level of abstraction but evoke multiple ideas for specific processes. “Simplify,” “reduce handoffs,” and “consider all parties as part of the same system,” are all examples of change concepts.

Key Changes
The list of essential process changes that will help lead to breakthrough improvement.

Key Driver Diagram
The Key Driver Diagram organizes the theory of improvement for a specific aim. It is a way to organize and visualize the relationship between the project's goal, the high-level changes that will get you to your goal (key drivers), and the specific activities that a practice needs to complete (interventions). The key drivers provide a focus for changes to test.

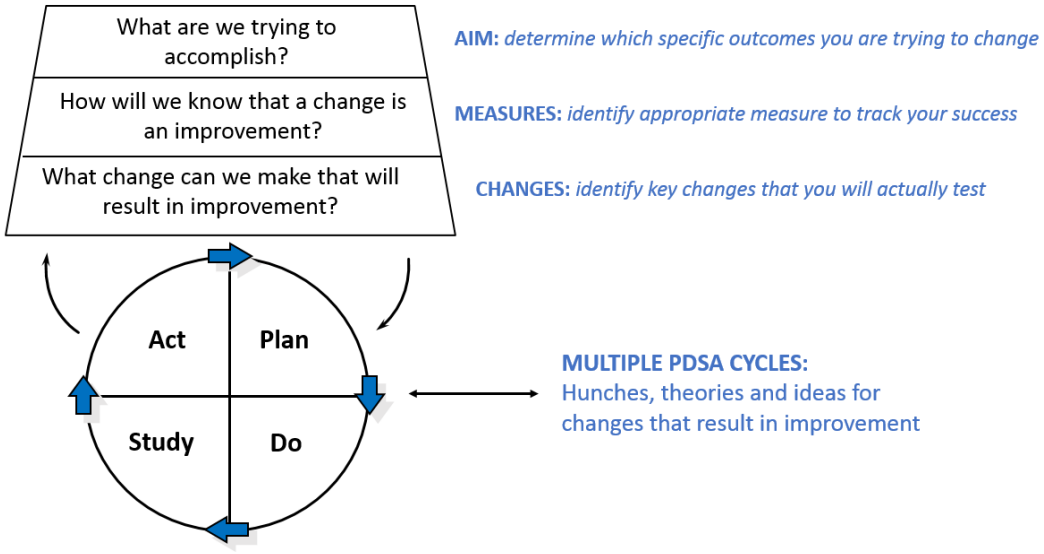
Learning Session
Learning sessions are webinar and face to face practice team educational sessions, tailored to a condition or administrative topic of focus. A key feature of the IHI Breakthrough Series Learning Collaborative.

Implementation
Taking a change and making it a permanent part of the system. A change may be tested first and then implemented throughout the organization. Key Changes: The list of essential process changes that will help lead

Measure
An indicator of change. Key measures should be focused, aligned with the aim, and be reportable. A measure is used to track the delivery of proven interventions to patients and to monitor progress over time.

Model for Improvement
An approach to process improvement, developed by Associates in Process Improvement, which helps core QI teams accelerate the adoption of proven and effective changes. The model is composed of three foundational questions and PDSA cycles.

Institute for Healthcare Improvement's Model for Improvement:[18]



PDSA Cycle

A structured way to test a process change in the real work setting. This includes:

Plan: a specific planning phase;
Do: a time to try the change and observe what happens;
Study: an analysis of the results of the trial; and
Act: devising next steps based on the analysis.

This PDSA cycle will naturally lead to the "plan" component of a subsequent cycle.

Process Change
A specific change in a process in the organization. More focused and detailed than a change concept, a process change describes what specific changes should occur. "Institute a pain management protocol for patients with moderate to severe pain" is an example of a process change.

Run Chart
A graphic representation of data over time, also known as a "time series graph" or "line graph." This type of data display is particularly effective for process improvement activities.

Sampling Plan
A specific description of the data to be collected, the interval of data collection, and the subjects from whom the data will be collected. It emphasizes the importance of gathering samples of data and how to obtain "just enough" information.

Spread
The intentional and methodical expansion of the number and type of people, units, or organizations using the improvements. The theory and application come from the literature on Diffusion of Innovation (Everett Rogers, 1995, see endnote 15).

Tests of Change
A small-scale trial of a new approach or a new process. A test is designed to learn if the change results in improvement and to fine tune the change to fit the practice and patients. Tests are carried out using one or more PDSA cycles.

Appendix D| Quality Improvement Resources

Key Driver Diagram Video (Source: IHI)

IHI's Don Goldman provides a brief description of a key driver diagram and how it can be used as an organizing framework across key stakeholders and practice teams http://www.ihi.org/resources/Pages/Tools/Driver-Diagram.aspx

Online Modules: Quality Improvement 101 and 102 Courses (Source: IHI)

Quality Improvement 101: This digital course is the first step in understanding the fundamentals of QI methodology, from aim statements to Plan-Do-Study-Act (PDSA) cycles. Users will gain a robust understanding of how they can use QI to lead change initiatives in their communities. Take the course.

Quality Improvement 102: Completed QI 101? Get started with QI 102, the next step in understanding and implementing improvement best practices. You'll learn how to move confidently from one PDSA cycle to another, testing your improvement ideas to increase their impact. Take the course.

PDSA Cycle Skill Building (Source: NICHQ)

The PDSA cycle is a fundamental tool in the quality improvement tool belt—it helps teams test, implement and spread change ideas in a systematic way. Here are five articles with strategies to help you maximize learning during your PDSA cycle.

- How to Avoid the Most Common Pitfalls in Planning PDSA Cycles
- 9 Tips for Moving from One PDSA Cycle to the Next
- Mastering the Planning Stage of PDSAs
- 5 Tips for Testing to Optimize Your Next PDSA
- How to Avoid Analysis Paralysis and Under Planning in PDSAs

Do More with Data (Source: NICHQ)

Tracking and evaluating data can transform your improvement efforts. Use these resources and ideas to help you effectively leverage data at every phase of a QI initiative.

- Introduction to Using Control Charts, a statistical tool that can help users identify variation and use that knowledge to guide their improvement work.
- Why Data Collection is a Necessary Part of Quality Improvement
- Use Evaluation to Guide PDSAs Rather Than Derail Them
- 3 Tips for Transforming Data into Visuals That Tell a Clear Story

Sustainability Frameworks and Factors

A 2019 article *Evidence-based Intervention Sustainability Strategies: A Systematic Review*[19] by Maji Hailemariam and colleagues is the first comprehensive systematic review that summarized definitions of sustainment and evidence-based intervention sustainment strategies. They reviewed 26 articles published from 2004-2019. Table 6 includes a list of facilitating and hindering factors for sustaining evidence- based interventions.

Below include links to resources from NICHQ:

- Setting the Stage for Sustainability in Quality Improvement Projects
- Holding your Gains without the Pain
- Tips for Sustaining Leadership Involvement in your QI Projects

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