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National Consensus Development and Strategic Planning for Health Care Quality Measurement

Logic Model Guidance for the Endorsement and Maintenance (E&M) of Clinical Quality Measures

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Introduction

Health care quality measurement is essential for evaluating and enhancing the performance of health care providers and systems in the United States, ensuring that patients receive safe, effective, and patient-centered care. The Partnership for Quality Measurement (PQM)™, formed by Battelle, a Centers for Medicare & Medicaid Services (CMS)-certified consensus-based entity (CBE), plays a crucial role in shaping the health care quality measurement landscape. Under PQM's measure endorsement and maintenance (E&M) process, measure developers must provide a logic model that succinctly and parsimoniously outlines a framework for how specific inputs and activities lead to desired outcomes and impacts related to quality improvement. In general, the measure focus should be equivalent to a logic model element 'outcome' regardless of the measure type (e.g., structure, process, outcome). The logic model should show how to achieve the measure's focus by identifying key investments and activities, while considering feedback loops, assumptions, and external factors. The Blueprint Measure Lifecyle content on the Measures Management System (MMS) Hub provides general guidance in related areas such as information gathering and business case development. This document builds on that guidance and provide measure developers with the tools to effectively construct and utilize logic models, ensuring their measures are robust, evidence-based, and aligned with strategic health care goals.

Purpose and Objectives

This document is intended to provide guidance to measure developers and stewards to support their ability to:

- Describe the purpose of a logic model in the context of quality measurement.
- Describe logic model elements and use them to map out the measure's theory of action (i.e., actionability).
- Identify examples of common approaches, pitfalls, and mitigations for developing a logic model that communicates the theory of action visually and effectively.
- Discuss how the logic model can be used by interested parties (providers, patients, implementers, policymakers) to help them understand and evaluate the claims being made about the theory of action.

Guiding Principles for Logic Models

PQM's guiding principles for logic models in the context of health care quality measurement are as follows:

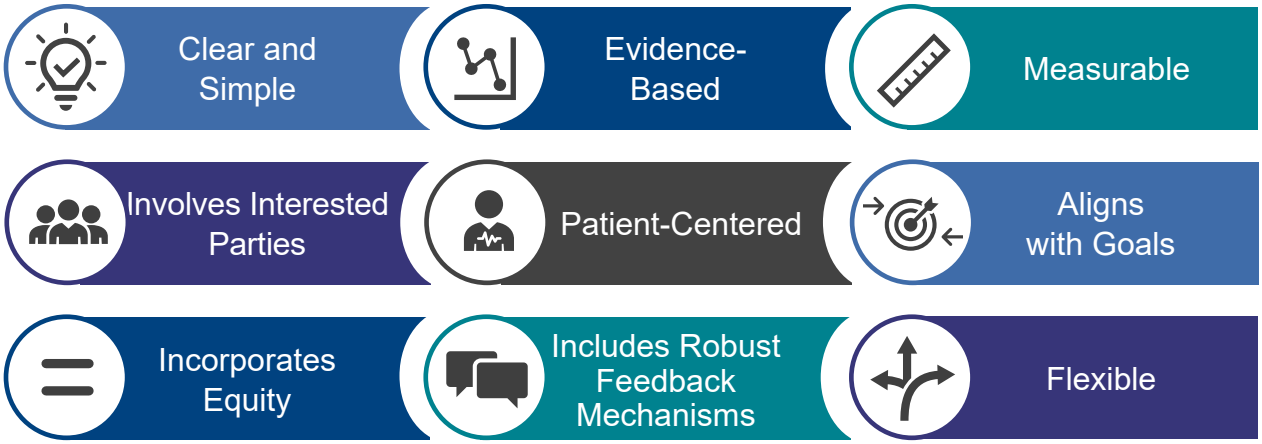

Figure 1: PQM Guiding Principles for Logic Models

- **Clarity and Simplicity:** Logic models should be clear and straightforward. A lot of information/effort should go into developing the logic model, but the model itself should represent the distillation of how specific inputs and activities lead to desired outcomes and impacts related to quality improvement. It should include sufficient information to be plausible but not so detailed that it is not actionable.
- **Evidence Based:** Logic models should be grounded in credible research and evidence to support the chosen strategies and expected outcomes.
- **Measurability:** Include measurable indicators in the model to facilitate effective monitoring and evaluation of progress and outcomes.
- **Interested Party Involvement:** Logic model development should involve a diverse range of interested parties to incorporate multiple perspectives and ensure relevance and buy-in.
- **Patient-Centeredness:** Focus on patient outcomes and experiences, ensuring that the logic model reflects the priorities and needs of patients.
- **Alignment with Goals:** Ensure that all components of the logic model are aligned with the overarching goals and objectives of the overall quality improvement intent.
- **Equity:** Incorporate health equity considerations to address disparities and ensure that quality improvements benefit all population groups.
- **Robust Feedback Mechanisms:** Feedback mechanisms should reflect opportunities for entities to iteratively improve. Feedback should be systematically collected, analyzed, and used to refine all components of the model—from inputs and activities to outputs, outcomes, and impacts.

- **Flexibility:** Design the logic model to be adaptable to changes and new insights, allowing for revisions as necessary.

Intended Audience

This resource guide is intended to support measure developers and stewards in the development of logic models within the context of health care quality measurement. In addition, this guide may be used by measure developers and stewards in preparation for measure submission to PQM for E&M and Pre-Rulemaking Measure Review (PRMR) processes. Measure developers may also use this guide to strengthen their existing logic models by identifying gaps that may be filled by additional field research, evidence gathering, and/or interested party engagement.

Logic Model Definition and Purpose

Definition of a Logic Model

A logic model is a visual representation that outlines how a system, program, or intervention is intended to work. The logic model reflects the underlying *theory of action*,[1] "illustrating a sequence of cause-and-effect relationships—a systems approach to communicate the path toward a desired result."[2] In other words, think of a logic model as a roadmap that shows you how a health care system, program, or intervention is supposed to achieve its goals. It starts with what you put into the system or program (like resources and activities), and then it shows you step-by-step how these inputs lead to the desired health improvements.

Logic Model

A visual representation that outlines how a system, program, or intervention is intended to work. Logic models are used in health care quality improvement to visually map out the relationships between inputs, activities, and expected outcomes of a quality improvement program or initiative.

In health care, a theory of action is developed to improve quality constructs such as safety, effectiveness, patient-centeredness, timeliness, efficiency, and equity. For example, if improving patient-centeredness is the goal, the theory of action might specify implementing patient education programs as a strategic activity. Correspondingly, the logic model for this theory of action would detail these activities and might use patient surveys to measure the impact on patient-centeredness.

[1] McDavid JC, Huse I, Hawthorn LR. 2018. *Program evaluation and performance measurement: an introduction to practice.* 3rd ed. Thousand Oaks, CA: Sage.
[2] Millar, A., R.S. Simeone, and J.T. Carnevale. 2001. Logic models: a systems tool for performance management. *Evaluation and Program Planning* 24:73-81.

Logic models are used in health care quality improvement to visually map out the relationships between resources, activities, and expected outcomes of a quality improvement program or initiative. Logic models facilitate a systematic approach to planning, implementing, and evaluating interventions aimed at enhancing patient care and safety. They clearly outlines how various inputs (such as resources, interested party engagement, and information) are transformed through specific activities (such as interventions, training, and policy implementations) into outputs (tangible products or services delivered). These outputs then lead to desired short-term and long-term outcomes (changes or benefits resulting from the outputs), culminating in broader impacts (long-term effects on the community or population). A few key terms are defined below; logic model elements are defined and discussed in the Logic Model Development section.

Operational Definitions

Theory of Action: A conceptual model that details the specific strategies to be implemented to achieve defined goals. The theory of action (i.e., actionability) describes the causal relationships between the inputs, activities, outputs, and outcomes of a program. It explains how the things to be done (activities) and the resources to be used (inputs) lead to results (outputs) and eventually the change desired (outcomes). It should be achievable, measurable, and testable.

Quality Improvement (QI) Program: A structured approach aimed at enhancing the effectiveness, efficiency, equity, timeliness, patient-centeredness, and overall quality of a system, program, or intervention. In the measure development context, a QI program is one that could be designed by an entity to address the measure focus based on the proposed logic model.

Technical Expert Panel (TEP): A group of interested parties with specialized knowledge and experience relevant to the specific health care quality measure being developed. This panel typically includes a mix of clinicians, statisticians, quality improvement specialists, methodologists, pertinent measure developers, and person/family caregivers.

Purpose of a Logic Model in Quality Measurement

In the context of health care quality measurement, logic models identify the resources and actionable steps an accountable entity could plausibly adopt to improve measure performance and related outcomes. Logic models are useful for developing, implementing, and assessing clinical quality measures. They help to describe the context and environment in which a measure exists and the causal relationship between inputs, activities, outputs, and

Logic Models and Quality Measurement

A logic model specifies the resources and actions an accountable entity could plausibly adopt to improve measure performance and related outcomes.

The measure focus should be equivalent to an outcome in the logic model, regardless of the measure type (e.g., structure, process, outcome).

outcomes. Importantly, the logic model should distinguish between inputs (structures) and activities (processes) to capture what a worse-performing entity "should" do to become a better-performing entity, as well as define the desired outcomes associated with better performance. In general, the measure focus should be equivalent to an outcome in the logic model, regardless of the measure type (e.g., structure, process, outcome). The logic model should depict how to increase the likelihood of the measure focus and consider the most plausible investments and actions that can be implemented.

Logic models are effective tools to support the development and evaluation of quality measures in several ways:

- **Guiding Design and Planning:** Logic models guide developers to concisely specify health care goals, activities, resources, and feedback mechanisms. A logic model makes it easier to identify appropriate evidence to support the linkage of inputs to activities to outcomes.
- **Clarifying Objectives:** Logic models help in clearly defining the objectives of clinical quality measures. By mapping out the desired outcomes and impacts, measure developers can ensure that the measures are designed to effectively address specific health care goals, such as improving patient safety or enhancing treatment effectiveness.
- **Assessing Impact:** The goal of clinical quality measures is to impact patient health and health care system performance positively. Logic models help in evaluating these impacts by providing a clear pathway from activities to broader impacts, such as reduced hospital readmissions, improved patient satisfaction, or lower health care costs.
- **Enabling Communication:** Logic models help clarify a theory or strategy. Effective logic models make complex systems easier to understand by visually displaying the linkage of resources and activities to outputs and outcomes. A logic model should be the distillation of measure information to concisely describe the resources and actionable steps an accountable entity could feasibly implement to enhance measure performance and achieve related outcomes. The simplicity of a logic model makes it an effective tool for communicating across disciplines.
- **Centering Equity:** A logic model is developed by engaging diverse perspectives and creating a shared understanding of the many ways in which a system can function to produce outcomes. Engaging subject matter experts with lived experience in the development of a logic model can capture resource gaps and structural differences that may affect performance on measures.

Supporting Evaluation and Continuous Improvement

A logic model can serve as the basis for program evaluation and performance improvement. It helps evaluate the validity of health care interventions by clearly mapping out the hypothesized

causal relationships between inputs, activities, outputs, and outcomes, ensuring that the measure accurately reflects the proposed theory of change. Logic model elements should be supported by peer-reviewed evidence, interested party input, and measure testing, as applicable. Measure developers should cite findings from scientific and gray literature that support the hypothetical relationships. Developers should also engage interested parties with relevant expertise to the measure's focus area (e.g., patients, providers, accountable entities) to identify gaps in the evidence base and to verify the accuracy of the depicted relationships. The performance score is the chief empirical finding that helps to demonstrate that the logic model is sound (valid). Crucially, the performance score finding is only sound if the other logic model elements are grounded in evidence. Systematically exploring the relationships between logic model elements can identify opportunities for continuous performance improvement and system strengthening.

Logic Model Development

Logic models can vary in their complexity and take many different forms, including tables or flowcharts and other kinds of diagrams, and can include different components. When used in measure development, a well-crafted logic model answers several questions:

- What is the theory of action and the specific quality problem or need the measure is intended to address?
- What are the short- and long-term goals and intended outcomes that the measure seeks to achieve?
- What activities and processes contribute to the outcome of interest?
- What are the relationships between the inputs, activities, outputs, and outcomes related to the quality problem and what evidence supports their relationship?
- How is feedback about providers' performance communicated to them to support continuous improvement?
- How is feedback from interested parties (e.g., patients, providers, policymakers) considered and used for continuous improvement?
- What are the assumptions about the context in which the measure is being assessed?

A logic model uses eight key elements to address these questions:

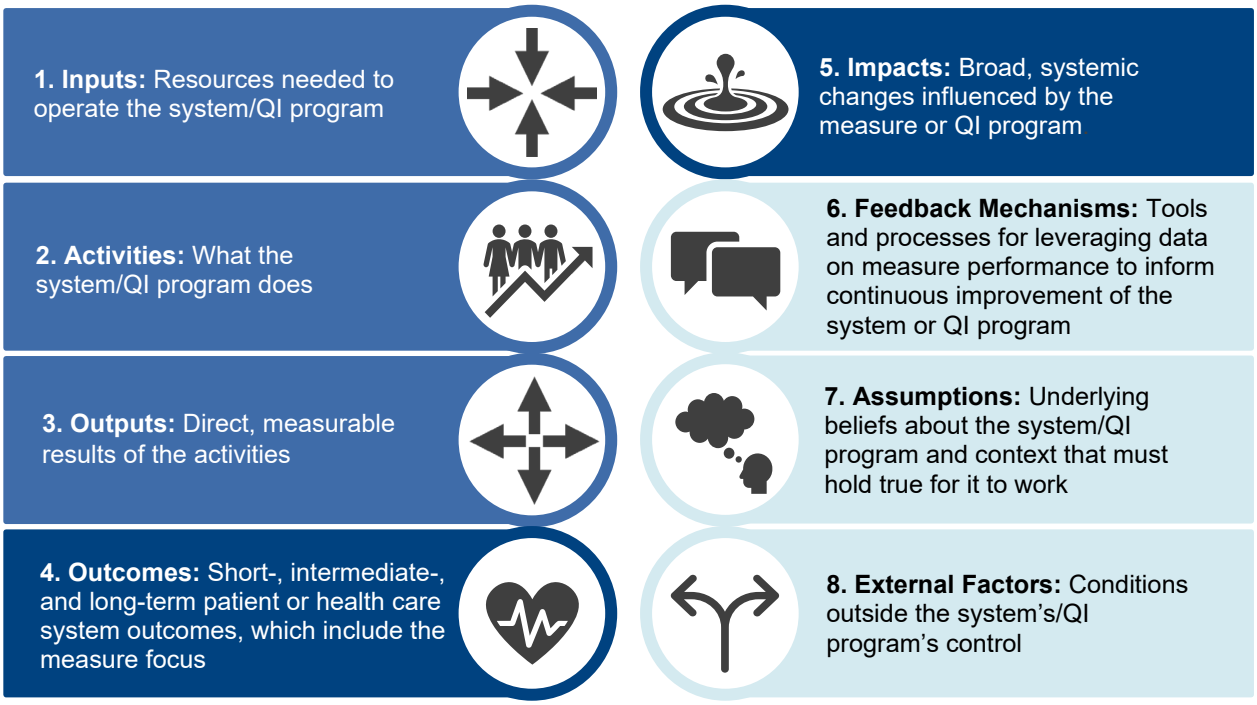

Figure 2: Eight Elements of a Logic Model

Each of these logic model elements is informed by gathering different types of evidence to ensure the model accurately represents the theory for action. This evidence could include primary literature, clinical guidelines, and empirical research studies. Additionally, historical data from similar programs/measures may offer insights into relevant challenges or successes. A TEP plays a crucial role in refining the model and evaluating its face validity, thus promoting buy-in from other interested parties. This panel typically includes a mix of clinicians, statisticians, quality improvement specialists, methodologists, pertinent measure developers, and consumers. Person, family, and caregiver membership on TEPs is a very important part of the measure development, implementation, and maintenance processes, and can be very helpful in providing feedback on quality projects. Measure developers should seat TEP members who can provide input based on their personal experience and training. These diverse perspectives ensure that the model not only adheres to clinical best practices but also addresses the practical and experiential aspects of patient care.

Engaging a TEP is considered a best practice in health care measure development because it ensures that the model reflects a comprehensive understanding of the various factors that influence health outcomes. This includes considering cultural, economic, and social factors that might affect the implementation and effectiveness of the quality measure. We recommend utilizing the TEP in the evaluation of the face validity of the measure through a critical initial review of the logic model and periodically throughout the measure lifecycle. Developers should garner TEP input as to whether the logic model captures the sufficient and necessary elements for a plausible actionability for the measure. This can be done using a Likert scale of disagree to

agree. Developers should keep comprehensive documentation of the logic model development process, including sources of evidence, interested party contributions, and decision-making processes (see Expectations for Endorsement Consideration).

The template below provides a simple framework, including the eight key elements, which are further defined. The description of each element includes guidance for measure developers on how to consider and address the element. Examples are also drawn from logic models from two publicly available, previously submitted measures. Both logic models have been adapted to align with the template. Use of these logic model examples does not have any impact on the measures' endorsement. This optional template can be downloaded here.

Developers may opt to use a different template or style of logic model. For example, a logic model that was designed for the evaluation of patient-centered medical home demonstration models utilizes a flow diagram format to explicitly indicate the role of feedback loops for program improvement.[3] Other models may depict direct causal pathways between specific inputs, activities, outputs, and outcomes. Whatever template is selected, measure developers are encouraged to include the eight elements described in the next section. These elements are essential for constructing a comprehensive and effective model that not only guides the development process but also supports the implementation and evaluation of quality measures.

[3] Petersen D, Taylor EF, Peikes D. *Logic Models: The Foundation to Implement, Study, and Refine Patient-Centered Medical Home Models*. Rockville, MD: Agency for Healthcare Research and Quality, February 2013. AHRQ Publication No. 13-0029-EF.

Inputs (Resources: Means)	**Activities** (What the program does: Ways)	**Outputs** (Direct results of activities)	**Outcomes** (Short-, intermediate-, and long-term)	**Impact** (Systemic changes influenced by the quality program)
			Includes the measure focus	
Feedback Mechanisms (How continuous improvement is achieved)				
Assumptions (Underlying beliefs about the quality program and context)				
External Factors (Conditions outside the quality program's control)				

Figure 3. Logic Model Template

Logic Model Elements, Definitions, and Considerations for Development

Inputs

Definition: Critical resources required for the success of a QI program, such as staff, funding, physical materials, partnering entities (e.g., community-based organizations), tools, technology, or knowledge. Knowledge resources may include clinical guidelines, policy and procedure documentation, or systematic reviews investigating aspects of the theory of action. Tools may include a validated instrument for evaluating the measure focus, such as an assessment tool or patient survey. Investment in an electronic health record (EHR) or other data-collection system may be required for implementation.

Guidance for Development: Measure developers should consider the value of existing resources as well as the investments entities will likely need to make to execute a quality improvement program capable of addressing the measure focus. What is the potential for variation in resources between entities? Are there obstacles such as cost or a lack of consensus on clinical practice? Are existing assessment tools sufficient and accessible? What resources can reasonably be assumed across entities and do not need to be specified?

Activities

Definition: Specific actions, processes, events, and interventions that entities may undertake as part of a QI program to achieve the measure focus and other desired outcomes. Activities

are the services an entity or program delivers, and they directly influence the outputs and outcomes. Depending on the measure type and focus, activities can include training, data analysis tasks, management processes, patient care process (e.g., risk assessments, disease screenings), team meetings, and more.

Guidance for Development: Measure developers should identify the key activities and process steps that influence measure performance. Consider the evidence for and against specific QI efforts in the context of the clinical activities and practice settings relevant to the measure focus. Which interventions have been successful? Can intervention activities aimed at a related clinical problem be leveraged and, if so, how? Can these activities be feasibly integrated into existing workflows?

Outputs

Definition: The work products created or achieved by performing the activities. Outputs typically include materials created and distributed, or they quantify things such as the number of services provided or the number of staff engaged. Outputs are often overlooked in models, but measuring program outputs helps establish the alignment between how a QI program is expected to work) vs. how it works in practice. As such, outputs are essential to understanding if the outcomes observed are the result of the QI program or something else. Concepts that are closely associated with program outputs are reach, fidelity, acceptability, and sustainability. Acceptability and sustainability are sometimes referred to as normalization, which is the extent to which program activities are integrated into usual processes and become automatic.

Guidance for Development: Measure developers should look carefully at the evidence base and identify the extent to which the implementation processes of the QI interventions they are citing have been evaluated. How can the value or quality of an intervention's implementation be determined? Is the QI program sustainable without ongoing investments? Outputs should be plausible and measurable, even if they are not directly measured by entities.

Outcomes

Definition: The desired changes or effects expected at different time periods. The developer may be able to distinguish short-, intermediate-, and long-term outcomes following from the outputs. One of these desired effects should be the measure focus, i.e., the structure, process, or outcome the measure describes. In any logic model, the outcomes are the indicators of the effectiveness of the intervention. In the case of a measure logic model, we expect that entities will work to achieve improvement in the measure focus, and developers should be able to identify a causal pathway that will drive that outcome, including the inputs, activities, and outputs needed to do so. Factors developers should consider when determining whether the measure focus is a short-, intermediate-, or long-term outcome include the expected time frame in which the measure focus is realized.

- Short term: immediate anticipated changes resulting from the activities.
- Intermediate term: anticipated effects observed as a QI program matures.
- Long term: anticipated changes resulting from widespread adoption of the measure.

Guidance for Development: Measure developers should consider the different outcomes that may result from a QI program and where in this chain of events the measure focus best fits. Is

the measure itself a short-, intermediate-, or long-term outcome of the program? What important outcomes might precede or come after the measure focus? Logic models may mask unintended or negative outcomes. Measure developers should employ an unbiased approach and engage TEPs to explore both intended and unintended consequences, and developers should consider representing potential unintended consequences in their logic model.

Impacts

Definition: The broad system- or community-level goals the measure focus is intended to catalyze and often focus on sustainable health improvements and enhanced quality of life on a large scale. Impacts may extend beyond the boundaries of the health care system or the populations receiving care to include broader societal benefits such as reduced economic burden on communities or increased productivity.

Guidance for Development: Consider the longer-term beneficial changes that are expected to follow from improvement in the measure focus and accompanying outcomes. What are the primary economic, social, and public health implications? How do the impacts improve equity and/or reflect patient priorities?

Feedback Mechanisms

Definition: A system or process designed to gather information about a QI program's progress and outcomes, allowing for adjustments and improvements to be made to the program's inputs and activities. Feedback mechanisms may utilize real-time data or periodic reports (e.g., monthly, quarterly) to support continuous quality improvement at the provider level. Other examples of feedback mechanisms include performance dashboards or a process for using program monitoring data to update training. Feedback mechanisms can also include efforts to collect feedback from the public and other interested parties, through public comment, surveys, or focus groups.

Guidance for Development: Measure developers should consider how entities and providers learn about their progress and opportunities for improvement. Note that some program activities may be part of this mechanism (for example, an activity that develops an infrastructure for communicating performance feedback). Is there an infrastructure to collect and communicate these learnings, including performance scores and other outcomes? How can these learnings be utilized to adjust inputs and activities? What other kinds of feedback about the measure should be collected and from whom?

Assumptions

Definition: The conditions that must hold for the logic model to be supported. Assumptions are not typically subjected to direct measurement or testing but are essential for the coherence and applicability of the model. Assumptions can include expectations regarding availability of key resources necessary for the implementation of a QI program or beliefs about human behavior. In addition, assumptions may address gaps in the evidence base, such as an assertion that evidence from one practice setting or population applies to a different setting or population for which there is no direct evidence.

Guidance for Development: Measure developers should consider plausible factors that can potentially affect the operation of the model but that cannot be observed directly or easily. What is asserted to be true but cannot feasibly be demonstrated? When identifying assumptions, consider carefully what distinguishes your assumption from another element, such as an external factor or an output. For example, when making the claim that *"effective training leads to improved adherence to medication administration protocols,"* improved adherence could be considered an output of an activity focused on clinician training. However, if the positive effect of training on adherence has not been demonstrated empirically, the expectation that training improves adherence might be more appropriate as an assumption.

External Factors

Definition: External factors are outside the control of the accountable entity but have a potential impact (positive or negative) on implementation of a QI program or its outcomes. External factors typically come from policy, economic, and social domains, and may serve as barriers, facilitators, or moderators of a QI program. Some external factors may also drive assumptions, particularly when their effects have not been evaluated.

Guidance for Development: Measure developers should consider what an environmental scan reveals about likely external factors that may complicate the operation or effectiveness of the QI program. What is the likelihood of each factor's effect and its anticipated impact on the measure? For an outcome measure, which factors are appropriate for risk adjustment or stratification? Consider including structural inequities that may influence performance as external factors in the model.

Logic Model Examples

The two logic model examples provided below come from measures submitted for the Spring 2024 E&M cycle. We used the logic model template to adapt the measure logic models that were included with the submission to serve as examples for how to use the template. We also identified opportunities for the measure developer to enhance their logic model using information they may already have at their disposal. The adapted logic models (Figures 4 and 5) and annotations are provided on the following pages. In the adapted examples: black text shows the indicators the developer included in the original logic model, but the indicators may not be placed in the same location; text in blue italics represents an indicator that was not presented in the original logic model but that was discussed in their submission; text highlighted in yellow indicates potential gaps the developer could consider addressing; gray text in brackets represents indicators the developer included showing existing resources or capabilities. Annotations following each example logic model describe how the submitted logic model was adapted for the template.

The first measure, CVD Risk Assessment Measure - Proportion of Pregnant/Postpartum Patients who Receive CVD Risk Assessment with a Standardized Tool (CBE ID 4360), is a process measure that uses patient medical records to calculate the proportion of patients attending a pregnant or postpartum clinic visit who are evaluated for cardiovascular disease (CVD) risk. The second measure, Percent of Hospitalized Pneumonia Patients with Chest Imaging Confirmation (CBE ID 4440e), is a process measure that uses data from the electronic

health record (i.e., it is an electronic clinical quality measure or eCQM) to identify the proportion of hospitalized adults who received chest imaging to confirm a diagnosis of pneumonia. These logic models were selected because each contained indicators for most of the logic model elements defined in this guidance, and the logic models effectively supported the accompanying measure submissions. The selection of these logic models to use as examples here had no effect on the committee's endorsement decisions.

Logic Model Example 1

Measure Title: (CBE ID 4360) CVD Risk Assessment Measure – Proportion of Pregnant/Postpartum Patients who Receive CVD Risk Assessment with a Standardized Tool

Measure Type: Process

Measure Description: This measure determines the percentage of pregnant or postpartum patients at a given clinic who were assessed for cardiovascular disease (CVD) risk with a standardized tool, such as the CVD risk assessment algorithm developed by the California Maternal Quality Care Collaborative (CMQCC). The aim is to perform CVD risk assessment using a standardized tool on all (100 %) eligible pregnant/postpartum patients. All patients should be assessed for CVD risk at least once during their pregnancy and, if needed, additional times when new symptoms present during the pregnancy and/or postpartum period. A threshold has still to be determined ("at least xxx % of patients who received risk assessment"). The measure can be calculated on a quarterly or annual basis.

Inputs*	Activities	Outputs	Outcomes	Impacts
CVD clinician training curriculum *Standardized CVD risk assessment tool* *Patient education materials* Applicable clinical guidelines, if any	Conducting clinician CVD training Implementation of screening protocols Delivery of patient education materials [Regular care]	Number of clinicians trained Screening protocols established Patient education materials developed or education sessions conducted	Short-term (i.e., intermediate health outcomes/modifiable actions): • **Measure Focus:** Increased number of pregnant/postpartum patients who receive CVD risk assessment with a standardized instrument • Increased clinician awareness of the role of cardiovascular health (CVH) during pregnancy and postpartum • Increased patient awareness of CVD risk during pregnancy and postpartum • Decrease in patient risk behavior (diet, physical activity) Intermediate-term (i.e., initial health care outcomes): • Improved guideline-adherent clinical care • Targeted follow-up of screen-positive patients (electrocardiogram [EKG], echocardiogram ("echo"), brain natriuretic peptide [BNP] level) • Higher yield of follow-up tests (higher % of abnormal EKG, echo, BNP) • Increased diagnosis of previously unknown CVD or CVD-related diagnosis Long-term (i.e., subsequent health care and pregnancy outcomes): • Reduced emergency department (ED) utilization, readmissions, urgent care visits, and length of inpatient stay • Decrease in CVD-related complications • Decreased preeclampsia at birth • Reduced hypertensive disorders at delivery • Improved infant health outcomes: birth weight, Apgar score, gestational age	Data derived from the measure may inform broader health care policies and planning Reduction in health care costs

Feedback Mechanisms
[Feedback mechanisms were not provided in the submitted logic model]
Assumptions
Systems have access to high-quality electronic health record data and computational resources to support the capture and analysis of CVD risk data *This population-wide risk assessment is likely to reduce CVD-related morbidity and mortality, particularly among African-American patients*
External Factors
Patient demographics and comorbidities Provider CVH awareness and experience

**Items in blue italics text were added to the logic model based on details from the submission.* Additional opportunities to enhance the logic model are noted in yellow. [Existing resources and capabilities are indicated by bracketed gray text.]

Figure 4. Adapted Logic Model: CBE ID 4360 CVD Risk Assessment Measure – Proportion of Pregnant/Postpartum Patients Who Receive CVD Risk Assessment with a Standardized Tool

Annotations: Adapted Logic Model, Example 1 (Figure 4):

Inputs

- The original logic model does not explicitly describe inputs. In the adapted logic model, the presumed inputs include a CVD training curriculum (needed for the activity on clinician training), a standardized CVD risk assessment tool (needed to meet measure criteria for an acceptable assessment tool), and patient education materials (that should be used in conjunction with the results of the risk assessment).
- A potential missed opportunity in this example would be relevant guidelines or policies, and similar inputs, if any.

Activities

- The original logic model includes activities divided into “intervention” and “comparator” groups. The adapted logic model focuses on the activities needed to improve performance on the measure focus, which are directly supported by inputs.
- The developer also listed “regular care”, an existing activity that would be supplemented by activities focused on improving CVD risk assessment.

Outputs

- Outputs are often underspecified in logic models, and the original logic model does not list any. However, the logic model does include a robust discussion of multi-dimensional outcomes, and the adapted logic model identifies several measurable outputs resulting from activities, which can drive these outcomes. Including outputs enables measure interested parties to follow and evaluate the causal path from activities through to outcomes.

Outcomes

- The original logic model describes outcomes in terms of intermediate health outcomes directly resulting from the intervention (e.g., increased patient and provider awareness), health care outcomes (e.g., reduced utilization), and pregnancy outcomes (e.g., decreased preeclampsia and improved infant health). In the example, the original outcomes listed have been aligned with short-, intermediate-, and long-term outcomes and impacts while retaining the approximate categorical distinctions the developer made.
- For instance, indicators focused on diagnosis and follow-up have been listed as intermediate-term outcomes, while pregnancy outcomes such as reduced complications and improved infant health have been listed alongside reduced utilization as long-term outcomes.

Impacts

- The developer did not include a section for impacts in their logic model. Instead, the original logic model listed pregnancy outcomes as the ultimate outcomes, which could be considered intermediate and long term (see above).
- Potential impacts the developer might consider include reductions in health care costs, and use of the data derived from the measure to inform broader health care policies and planning (e.g., new guidelines and recommendations for managing CVD risk among pregnant and postpartum patients).

Feedback Mechanisms

- The original logic model does not identify feedback mechanisms that enable continuous quality improvement at the provider or program level. It does identify "increased clinician awareness of the role of CVH during pregnancy and postpartum" as an intermediate health outcome. Measure developers should ask how that increased awareness will happen. What feedback mechanisms will inform individual providers and health systems of their performance, considering the use context of the measure? Examples include feedback sessions with providers, patient satisfaction surveys, and data analysis to identify and report trends and develop improvement plans.

Assumptions

- The original logic model did not identify assumptions, but reviewing the measure submission yielded two assumptions relevant to the theory of action described in the logic model: First, that systems have access to an EHR to aid in data collection and analysis and, second, that the risk assessment tool is likely to have a positive impact in reducing an equitable care gap.

External Factors

- The original logic model identifies moderating factors (e.g., "patient demographics and comorbidities") as external factors, i.e., factors outside direct control of accountable entities.

Logic Model Example 2

Measure Title: **(CBE ID 4440e)** Percent of hospitalized pneumonia patients with chest imaging confirmation

Measure Type: Process

Measure Description: The chest imaging-confirmed measure of pneumonia diagnosis is a process measure of inpatient hospitalizations that identifies the proportion of adult patients hospitalized patients with a discharge diagnosis of pneumonia and who received systemic or oral antimicrobials at any time during admission who received chest imaging that supported the diagnosis of pneumonia, as recommended by clinical practice guidelines. The measure applies to a target population of adult hospitalized patients.

Figure 5. Adapted Logic Model: CBE ID 4440e Percent of Hospitalized Pneumonia Patients With Chest Imaging Confirmation

Inputs*	Activities	Outputs	Outcomes	Impacts
Tools & Tech Investments: • EHR, data warehouse, computational resources, data-extraction tools Additional staffing Investments: • Data analyst; coding specialist [Usual staffing] Applicable clinical guidelines, if any	Data Processing: • Extract, analyze, and report data [Usual patient care activities] *Measure performance dashboard* *Clinical decision support tools*	Diagnostic performance score Target population for other pneumonia quality measures	Short-term: • ***Measure Focus:*** *Increased use of chest imaging to confirm pneumonia diagnosis.* • Patient (and Provider): Increased awareness and attention to diagnosis. • System: Ability to calculate and compare pneumonia incidence and outcomes and ability to track interventions to improve pneumonia care. Intermediate term: Provider: • Improved workup and documentation • *Unintended consequence of measure: overuse of CT and ultrasound.* Patient: • Reduce inappropriate antibiotic exposure • Improve workup for alternative diagnoses • Increase self-efficacy (to question a diagnosis). Long-term: System, professional societies, and quality organizations: • Standardized population for other pneumonia quality measures • Better evidence from population studies More accurate diagnoses Better health outcomes Improved transparency & trust	Reduced antibiotic resistance [in the community]
Feedback Mechanisms				
Feedback mechanisms were not provided in the submitted logic model.				

Assumptions
Systems have access to high-quality electronic health record data and computational resources to support the capture and analysis of evidence of pneumonia on chest imaging. Clinicians accept chest imaging as a standard confirmatory test for pneumonia. Feedback to accountable entities will reduce misdiagnosis of pneumonia and inappropriate antibiotic use.
External Factors
Changing technologies and standards for chest imaging and documentation (i.e., emergence of lung ultrasound) may make measurement more technically challenging but also more important. Policies [and provider attitudes] regarding measures will affect the short-, medium-, and long-term outcomes.

**Items in blue italics text were added to the logic model based on details from the submission.* Additional opportunities to enhance the logic model are noted in yellow. [Existing resources and capabilities are indicated by bracketed gray text.]

Annotations: Adapted Logic Model, Example 2 (Figure 5):

Inputs

- The inputs the developer listed are the tools and staffing required to report the measure as part of a QI program.
- A potential missed opportunity in this example would be relevant guidelines or policies, and similar inputs, if any.

Activities

- The original logic model identified activities required to report the measure as part of a QI program.
- The items added in blue italics were drawn from this submission's Use & Usability section. The full submission states that a dashboard that displays provider- and facility-level performance information was piloted with clinicians and it also describes the availability of sites to leverage clinical decision-support tools in their EHRs. The logic model would be more complete with these items included as activities, as they indicate how feedback can be used by clinicians for quality improvement.
- If the developer's evidence review identified other effective interventions that entities could implement related to this measure focus, these could also be listed in the activities box.

Outputs

- Outputs are often underspecified in logic models. In this case, the developer has indicated the performance score itself as an output and has also indicated that they anticipate that the inputs and activities listed will generate a resource that would be available for additional measures.

Outcomes

- As mentioned earlier, the logic model should clearly identify the *measure focus* as a short-term, medium-term, or long-term outcome, as appropriate. The submitted logic model was not explicit regarding the measure focus, so improvement in the measure focus was added in blue italics text as a short-term outcome.
- Most of the indicators listed as intermediate and long-term outcomes were listed as "medium-term" outcomes/impacts in the original logic model. In this case, it could be appropriate to differentiate between intermediate-term outcomes (e.g., changes in provider behavior and patient exposures) and long-term outcomes (e.g., better information for measuring improvement). These distinctions can be fluid and measure developers should consult with their interested parties.
- The developer listed the final four indicators (more accurate diagnoses through improved transparency and trust) as long-term outcomes.

Impacts

- The developer did not include a section for impacts in their logic model, but one of the long-term outcomes they identified, "reduced antibiotic resistance," is a community-level benefit that could be derived from this measure, so is it listed in blue italics as an impact.

Feedback Mechanisms

- The submitted logic model did not have a section for feedback mechanisms, but in their full submission the developer called attention to providing feedback to accountable entities in their assumptions; more information about that process could be detailed here.
- They are not listed here, but some of the activities that were added to this logic model related to measure performance dashboards and clinical decision-support tools could be considered as feedback mechanisms.

Assumptions

- The second indicator under assumptions is, *"clinicians accept chest imaging as a standard confirmatory test for pneumonia."* This item should be considered an assumption only if there is no widely accepted standard of care for using chest imaging to confirm pneumonia diagnosis. If a standard of care or guideline exists, this informational resource should be provided as an input in the logic model. If encouraging providers to adhere to guidelines is the focus of the inputs and activities, this may not be appropriate to list as an assumption.
- Whether an indicator should be considered as an assumption or another element of the logic model can depend on context, and interested parties should critically evaluate the proper role of each indicator.

External Factors

- The second external factor the developer listed (i.e., *policies* that affect a clinician's ability to implement the measure) is a good example of an external factor. However, provider attitudes are potentially modifiable through a QI program and may not be appropriate as a factor outside the program's control.

Best Practices for Logic Models

Developing logic models for health care quality measurement involves a systematic approach to planning, implementing, and evaluating interventions aimed at improving health outcomes. Below are some best practices to guide the development of effective logic models (Table 1).

Table 1. Best Practices for Logic Models

Engage Interested Parties Early and Often	
Aim: Involve a diverse group of interested parties, including health care providers, patients, administrators, policymakers, and community representatives, from the outset. This engagement ensures that the logic model reflects a comprehensive understanding of the health care environment and incorporates multiple perspectives.	**Benefit:** Enhances the relevance and acceptance of the model (i.e., face validity), ensuring that it addresses real-world needs and gains broad support.

Use Evidence-Based Information	
Aim: Base the theory of action on the best available evidence, including scientific research, clinical guidelines, and data from previous similar interventions. This approach ensures that the logic model is grounded in proven strategies and practices and improves confidence that any performance improvements observed result from the proposed theory of action.	**Benefit:** Increases the likelihood of a QI program's effectiveness and efficiency, minimizing the risk of implementing unproven or ineffective methods.
Revisit the Completed Logic Model Frequently	
Aim: The logic model should be a living document. Review and revise the logic model as the evidence base grows, the practice environment shifts, and insights evolve. At a minimum, the logic model should be critically reviewed with each maintenance endorsement.	**Benefit:** Ensures the model reflects current understanding of the theory of action and enhances communication with external audiences.
Evaluate Selected Indicators in Context	
Aim: Carefully consider the role of each indicator in the logic model and how this is affected by context. An indicator that might be a reasonable assumption in one model (e.g., clinicians will comply with clinical guidelines) may be the focus of an activity in another (e.g., training about guidelines).	**Benefit:** Understanding the appropriate roles of indicators ensures the model clearly communicates the theory of action and can also help teams identify which indicators require empirical support.
Balance Comprehensiveness with Parsimony	
Aim: Logic models should be tailored to the measure focus, population, and clinical context. Indicators that are universal or address events that are unlikely to materialize do not improve the explanatory value of the model and may dilute its value as a tool for evaluation and communication. Consider the relative value of each indicator given the specific clinical activity and practice setting.	**Benefit:** A strong, explanatory model that communicates the most pertinent and impactful aspects of a theory of action in the specific measure context.
Incorporate Feedback Mechanisms	
Aim: Design the logic model to include mechanisms for ongoing feedback and data collection, allowing for continuous monitoring of progress and outcomes.	**Benefit:** Enables timely adjustments to the program based on empirical data and interested party feedback, enhancing adaptability and effectiveness.

Expectations for Endorsement Consideration

For health care quality measure endorsement, logic models are expected to be comprehensive, clear, and based in evidence. Logic models also can identify where there are gaps in evidence that might be addressed in the future via a TEP or empirical studies. The model should clearly articulate the theory of action, demonstrating how specific inputs and activities will lead to desired outcomes. A successful logic model aligns closely with evidence-based practices and incorporates interventions and outcomes supported by current research and clinical guidelines. It should detail all relevant components—inputs, activities, outputs, and outcomes (both short-term and long-term), ensuring each is clearly defined and logically connected. Additionally, developers must consider external factors that could influence the measure's effectiveness, including potential barriers and facilitators. This is important, as the logic model plays a pivotal role in informing and guiding other critical aspects of the measure, such as validity testing and usability. By clearly outlining the relationships between inputs, activities, outputs, and outcomes, the logic model provides a structured framework that can be used to ensure that the measure is both valid and usable (i.e., the measure results can be used by accountable entities to drive improvements). For example, the logic model outlines the expected causal relationships and assumptions underlying the measure. This framework can be used to formulate hypotheses for validity testing, ensuring that the tests are directly aligned with the intended outcomes of the measure. The logic model also helps to identify patient-level factors that should be considered for risk adjustment because they are outside the control of accountable entity (e.g., social risk factors). With respect to usability, the logic model includes mechanisms for ongoing feedback and adjustment. These feedback loops are crucial for maintaining the usability of the measure, as they allow for continual refinement based on user experience and changing conditions.

Engaging a broad range of interested parties in the development process is essential to ensure the model addresses diverse needs and gains wide acceptance. Within their full submission, developers should be transparent about who those interested parties are and how consensus was reached on decisions that informed the model and/or that established face validity. Furthermore, the logic model should reflect feasibility and usability within the intended settings, considering resource availability and costs/burden to the system.

By adhering to these expectations, measure developers can create robust and effective logic models, helping position their measures well for endorsement and to drive significant improvements in health care quality.

Maintenance Endorsement

During maintenance endorsement, the logic model must demonstrate continued relevance and effectiveness by incorporating updated evidence and best practices. It is essential to reassess outcomes to ensure they remain accurate and relevant, reflecting the latest clinical guidelines and changes in health care delivery. Updated interested party feedback should be integrated to enhance the measure's usability and acceptance. Detailed documentation of all updates and the rationale behind them is crucial for transparency and accountability. The logic model should also illustrate a commitment to continuous improvement, showing how ongoing feedback and new information have been utilized to refine the measure. By fulfilling these expectations, the logic

model supports the maintenance endorsement process, ensuring the quality measure remains a robust tool for driving improvements in healthcare outcomes.

Conclusion

In the realm of health care quality measurement, logic models are essential tools provide actionable steps for entities to improve measure performance and outcomes. These models guide the design and planning of quality measures, clarify objectives, and enable a systematic approach to enhancing patient outcomes. By mapping causal relationships between inputs, activities, outputs, and outcomes, logic models ensure measures are evidence-based and accurately represent a plausible, testable theory of action. They also enhance communication among interested parties, fostering a clear understanding of the health care context and continual improvement through feedback and empirical data. Ultimately, logic models facilitate the development of effective and equitable interventions, promoting ongoing performance enhancement and system strengthening.

Appendix: Resources for Developers

Resource	Description
Endorsement and Maintenance Guidebook	This document contains comprehensive information pertaining to the Endorsement and Maintenance process, including conditions and non-negotiables for each domain, as well as a detailed measure evaluation rubric that outlines a successful submission for each domain.
PQM Measure Evaluation Rubric Worksheet	Reviewers use this document to guide their assessments of measures under review for initial endorsement or maintenance. It includes PQM evaluation criteria and key considerations for reviewers' assessment of measures.
The Logic Model: The Foundation to Implement, Study, and Refine Patient-Centered Medical Home Models	Example of a logic model designed for evaluation of health care demonstration models.

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