

Advancing Chief Complaint-Based Quality Measurement

FINAL REPORT

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NATIONAL
QUALITY FORUM

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EXECUTIVE SUMMARY

Emergency departments (EDs) play a central role in the delivery of acute, unscheduled care in the U.S. with nearly 145 million visits and more than one-quarter of all acute care visits.¹ EDs are also the healthcare setting on the front lines of detecting disease outbreaks and linking with public health entities who monitor threats to public health. The ED's unique role in the healthcare system enables healthcare delivery for all populations—spanning age groups, acuity, health, and socioeconomic status.

Chief complaint data have historically been collected to guide healthcare providers' diagnostic decision making and care planning in EDs and other settings like urgent care, primary care, and retail health settings. Chief complaints represent patient-reported symptoms collected at the start of a visit that describe what prompted the patient to seek care. Chief complaints—or other ways of representing them such as presenting problems, clinical syndromes, or reason for visit—are important because the chief complaint often guides diagnostic decision making and care. It is also a vital data element collected by regional and state public health systems to monitor for disease outbreaks.

Chief complaint data have various uses that facilitate patient-centered care, decision support, disease surveillance, and quality measurement. However, the lack of standardization of chief complaints creates challenges for use cases that require aggregation of similar patients for quality measures or detecting disease outbreaks. Efforts to resolve the challenges with standardization of chief complaints have been discussed for more than two decades. However, recent advancements in information technology (IT) and informatics may present solutions to several of the barriers—areas that have limited standardization. Researchers and informaticists have developed several approaches and tools that can standardize chief complaints including classification systems, nomenclatures, ontologies, and IT-based tools.

These approaches span the public and private sectors, vary in their capabilities, and are use-case-specific (e.g., syndromic surveillance, research, quality measurement). However, there is still no current guidance or consensus on how to navigate these approaches, understand their strengths and weaknesses, and select the best approaches and tools for a specific use case.

This project aimed to develop a strategic roadmap for advancing chief complaint data standardization and chief complaint-based quality measure development and implementation, as well as exploring other use cases for standardized chief complaints. This project also sought to describe opportunities for harmonizing approaches to collecting and aggregating chief complaint data across acute care and public health use cases. The roadmap was built on the findings of an environmental scan and key informant interviews, which were conducted to gain an understanding of the current landscape of chief complaint-based quality measurement and current approaches for standardizing chief complaint data. Based on these findings, the National Quality Forum (NQF) guided a multistakeholder Committee in the development of a measurement framework and recommendations to advance the implementation of chief complaint standardization, measure development, and implementation.

BACKGROUND

Emergency departments (EDs) play a central role in the delivery of acute, unscheduled care in the U.S. with nearly 145 million visits and more than one-quarter of all acute care visits.¹¹ EDs serve as a 24/7 resource for treating critical illnesses, such as acute myocardial infarction, stroke, severe trauma, and sepsis. In addition, EDs have several other functions including diagnosing acute conditions—specifically evaluating undifferentiated symptoms such as chest or abdominal pain and distinguishing benign versus serious diagnoses² that require immediate treatment. EDs often function as a safety net for patients facing barriers to healthcare access and when other services are not available or affordable. Nearly 60 percent of care provided in the ED is conducted outside of regular business hours (8 am to 5 pm).³ EDs are also a primary resource during disasters—both natural and manmade. It is the healthcare setting on the front lines of detecting disease outbreaks and linking with public health entities who monitor threats to public health. The ED's unique role in the healthcare system enables healthcare delivery for all populations—spanning age groups, acuity, health, and socioeconomic status.

Chief complaints represent patient-reported symptoms collected at the start of an ED visit that describe what prompted the patient to seek care. Chief complaints—also commonly referred to as presenting problems, clinical syndromes, or reasons for visit—are important because the chief complaint often guides diagnostic decision making and care. It is also a vital data element collected by regional and state public health systems to monitor for disease outbreaks. Providers typically record these data in a free text field in the electronic health record (EHR) or paper chart, usually in the patient's own words. In some cases, an EHR may feature a corresponding structured field in which a clinician can select one or more terms that align with the patient's chief complaints.

In addition to the lack of standardization upon entry of chief complaint data, there is no accepted standard nomenclature for classifying chief complaints for secondary uses like syndromic surveillance or quality measurement. Other uses for chief complaint data include ED operations and management (i.e., staffing, resource assessment), research, and education.

Chief complaint data have historically been collected as a primary data point to guide healthcare providers' diagnostic decision making and care plan. When patients arrive in the ED, the chief complaint and other initial findings such as the physical exam, vital signs, and other patient-specific risk factors (e.g., medical history, age, gender) are often used to formulate a work-up plan as the clinical team seeks to determine an appropriate course of treatment and eventual diagnosis. Therefore, chief complaint data are critical in understanding whether the approaches taken are efficient and appropriate when comparing across hospitals and other entities.

Chief complaint data have various uses that facilitate patient-centered care, disease surveillance, and quality measurement. However, the lack of standardization of these data has limited its utility and makes aggregation of chief complaints for specific use cases a complex undertaking. Discussions about efforts to resolve the challenges with standardization for quality measurement have gone on for more than two decades. However, advancements in information technology (IT) and informatics may present some solutions to several of the barriers that have limited broad use of chief complaint data. Specifically, the high prevalence of electronic health records in EDs and other acute healthcare settings presents an opportunity to facilitate measurement by the adoption of systematic electronic capture of standardized chief complaint data. Standardizing chief complaints also

presents a set of challenges with integrating new technology or programming new capabilities into existing systems, which can be expensive and complex. To address this need, researchers and informaticists have developed several approaches (i.e., classification systems, nomenclatures, ontologies, and IT solutions) that span the public and private sectors and vary in their utility based on the use case (e.g., syndromic surveillance, research, quality measurement). However, there is still no current guidance or consensus on how to navigate these approaches, understand their strengths and weaknesses, and select the best approaches for a specific use case.

Quality Measurement

Quality measurement in EDs and other acute care settings has a long history, with measures covering specific conditions (e.g., acute myocardial infarction, sepsis, and stroke) and care processes, ED crowding and flow, as well as resource utilization and outcomes.⁴ However, one limitation of ED quality measurement has been the challenge of capturing and categorizing ED visits based on the chief complaint, or the reason that the patient came to the ED for care.⁵ Chief complaint measures do exist; however, those measures are defined on the basis of a symptom-based diagnosis at the end of the episode after specific conditions are ruled out, not the initial chief complaint. For example, a patient may enter the ED with chest pain, receive diagnostic testing and care, and ultimately receive no specific diagnosis (e.g., diagnosed with chest pain not acute myocardial infarction). The diagnosis at the end of the visit (e.g., nonspecific chest pain) becomes the chief complaint for the subset of those complaints where nothing specific was identified during the course of ED care. Most chief complaint-based measures in use today do not incorporate an actual chief complaint because the data are not captured in a standardized manner. By contrast, diagnoses are captured and categorized systematically, using the International Classification of Diseases-Clinical Modification

(ICD-CM), which facilitates the specification of reliable quality measures. The lack of a similar approach to systematic standardization of chief complaint data has led to a persistent gap in ED performance measurement.

Measuring quality in the ED using a diagnosis determined after evaluation does not address the variability in practice required to establish the diagnosis from a chief complaint. Solely using diagnosis limits utility when the goal is to link similar patients to measure concepts such as resource utilization, shared decision making, and missed diagnoses. It is also clear that using final diagnosis is limited because of the poor correlation between final diagnosis and chief complaint and has been shown to be a poor marker for acuity.^{6,7} For example, a patient may present with abdominal pain and leave with a diagnosis of appendicitis—or just a diagnosis of abdominal pain. Seemingly benign chief complaints may result from a serious condition, and worrisome chief complaints may have a benign cause. This makes final diagnosis a poor way to classify undifferentiated ED visits. Also, only a minority of patients in the ED are diagnosed with serious conditions where specific measures related to care and treatment exist.⁸ Therefore, without chief complaint measures that accurately capture a population, a majority of the care delivered in the ED goes unmeasured.

Syndromic Surveillance

Another important use case for chief complaint data is syndromic surveillance, which national, state, and local health departments and agencies use for early identification of epidemics such as the yearly influenza season, diarrheal illness, or public health emergencies such as bioterrorism. Epidemiology experts have been using chief complaint data for over 20 years and were the early developers and adopters of tools to process and aggregate free text chief complaint data for syndromic surveillance. These tools have evolved with technology and employ natural language

processing and complex algorithms for parsing and grouping data by defined syndromes. Health departments in each state partner with hospitals who voluntarily share data on emergency visits to support these public health surveillance efforts.

The Centers for Disease Control and Prevention (CDC) offers a national web-based platform (i.e., Biosense) that enables the sharing of data between states. Currently, 46 states are submitting data to Biosense which encompasses approximately 65 percent of all ED visits in the U.S.⁹ With EHR presence in a majority of EDs and the implementation of meaningful use standards,

data can be transmitted from participating hospitals to state and national agencies on a real-time basis. While the data shared by hospitals vary significantly based on the capability of the hospital systems and internal practices, hospitals are sharing both structured and unstructured data related to chief complaint, patient demographics, discharge diagnosis, vital signs, and discharge disposition. Upon receipt of these data, health departments are able to examine the unstructured data as well as process the data with tools designed to parse and classify data into syndromes for reporting purposes.

PURPOSE

The purpose of this project is to develop a strategic roadmap for advancing chief complaint data standardization and chief complaint-based quality measure development, implementation, and for other use cases as applicable. This roadmap was built on the findings of an environmental scan, which was conducted to gain an understanding of the current landscape of chief complaint-based quality measurement and current approaches for standardizing chief complaint data.

The scan explored: (1) existing chief complaint-based measures; (2) existing chief complaint measure concepts; (3) existing chief complaint classification systems and nomenclatures; and (4) literature discussing barriers and existing approaches to standardizing chief complaint data and measuring chief complaint-based quality. Based on these findings, the National Quality Forum (NQF) guided a multistakeholder Committee in the development of a measurement framework for chief complaint-based measures. NQF also charged the Committee with identifying the current gaps in measurement and prioritizing measure concepts for future development. Finally, the Committee sought to provide guidance to the field on the selection and implementation of a standard nomenclature. These activities informed

recommendations to advance the implementation of chief complaint standardization, measure development, and implementation.

While this effort focused on chief complaint-based measurement for the ED, these findings and guidance can be applied to other settings that rely on chief complaints to guide patient-centered care, such as urgent care centers, retail clinics, telemedicine settings, and for acute care provided in outpatient clinics. Further, the findings and recommendations for standardizing chief complaint data are intended to support the use of these data in other applications, such as for syndromic surveillance in public health, where chief complaint classification has been used for some time. Finally, this Committee's discussions were focused solely on encouraging the development of quality measures to advance quality improvement and population health preparedness initiatives, and was not intended to support design of measures that could be used to guide health plan payment practices.⁷ The Committee does, however, recognize that once in widespread use, chief complaint-based measures could be used in accountability applications (e.g., merit-based incentive program) for hospitals and clinicians.

METHODOLOGY AND APPROACH

To guide this effort, NQF convened a multistakeholder Committee of 25 individuals selected for their expertise in emergency medicine, quality measurement, and clinical informatics, as well as representation from varied stakeholder groups, including consumers, purchasers, providers, patients, and health plans. Expertise not represented on the Committee was sought via key informant interviews.

Assessing the current landscape of measures, measure concepts, and gaps in the set of available chief complaint-based performance measures was a vital first step in establishing guidance to improve future emergency care quality measurement. NQF conducted a scan of existing measures by using keywords focused on specific conditions often reported as chief complaints ([Appendix C](#)). The measure search was initiated using a list of the top 10 most frequent chief complaints across all populations identified in the 2015 National Hospital Ambulatory Medical Care (NHAMCS) survey findings.³

The list was then revised based on other lists found in the literature.¹⁰⁻¹² This list of chief complaints was further expanded and iterated upon based on Committee inputs with attention to conditions or complaints that: (1) are associated with high acuity and with serious conditions that when missed can cause major harm to the patient; (2) require significant differentiation to determine a diagnosis (versus injuries with known mechanism like a motor vehicle crash); and (3) have existing clinical evidence to support measure development. This list of approximately 30 conditions and complaints was also used to identify measurement gaps and measure concepts to be prioritized for future development. Measures were identified by searching peer-reviewed literature and trusted measure sources such as NQF's measure inventory (Quality Positioning System – QPS), the Centers for Medicare and Medicaid Services

Measures Inventory Tool (CMIT), Health Indicators Warehouse, The Joint Commission, and previous NQF endorsement projects.

In addition, NQF searched for approaches to standardizing and classifying chief complaint data by reviewing peer-reviewed literature, grey literature, government publications, and various other key publications. Some approaches to chief complaint standardization were also identified through input from the Committee and key informant interviews. This portion of the scan focused on key questions and data elements including the name of the system, key features of the approach, and strengths and weaknesses. Other data elements captured during the scan for classification systems are listed in [Appendix D](#).

In order to gather additional information, NQF conducted 10 key informant interviews ([Appendix F](#)) with experts in quality measurement, chief complaint research, and emergency department informatics, electronic medical record vendors, and both national and international public health experts, including epidemiologist and surveillance experts. NQF led the one-hour interviews using a Key Informant Interview Guide ([Appendix G](#)) to promote consistency across the interviews. Each interview was also tailored to the interviewee based on individual expertise and background. Interviewees were identified and selected based on recommendations from the Committee, the funder, and through the literature review. The information obtained through these interviews was used in conjunction with other environmental scan findings as input to assist NQF in framing the Committee's discussion and to ensure the most comprehensive assessment of the current landscape of the use of chief complaint data for quality measurement and syndromic surveillance.

CHIEF COMPLAINT MEASUREMENT FRAMEWORK

The Chief Complaint Measurement Framework (**Figure 1**) was developed to provide a conceptual model for how chief complaint data can be used to measure quality in acute care settings like the ED. While it is not the focus of the framework, the use of these data for public health surveillance is also represented. In contrast to administrative claims-based measures, chief complaint-based measures use data derived from the patient's own

words recorded during the visit to group similar patients into a denominator. This framework relies on the implementation of a systematic approach for standardizing and aggregating chief complaint data. The definitions upon which this framework is built (**Table 1**) are key to understanding the relationships between the chief complaint, a standardized representation of the chief complaint (i.e., presenting problem), and a clinical syndrome.

TABLE 1. KEY TERMS AND DEFINITIONS

Term	Definition	Capture	Example
Chief Complaint	The patient's reason for seeking care or attention in the emergency department, captured by a clinician at initial presentation. ¹³	Entered as free text by triage or clinical personnel at the start of the encounter	"trouble breathing; can't catch his breath, chest pain"
Reason for Visit	The patient's motivation for seeking medical care and perspective on the problem or reason for visit. ¹⁴	May be entered in patient's own words or standardized field	"Patient is concerned he is having a heart attack"
Presenting Problem	A clinical interpretation of the patient's reported symptoms ¹⁵	Presenting problems are derived from the chief complaint and captured as standardized elements or terms; they may be captured in a standardized chief complaint field, generally in the provider's perspective	1. Shortness of breath 2. Chest pain
Clinical Syndrome	A constellation of symptoms, combined with risk factors and demographic characteristics of a patient (e.g., age and gender). ¹⁶ The combination of presenting problems with patient demographics, other risk factors, and other clinical data (e.g., vital signs)	Clinical syndrome is established using data elements from the visit along with presenting problems to determine a clinical pathway	55 years old + male + chest pain + shortness of breath + smoking history

This framework is intended for application in any acute care setting that collects and uses chief complaint data to guide the evaluation and diagnosis of a patient, including EDs, telemedicine, urgent care, and retail health settings. This framework is intended to guide measure developers and organizations who seek to measure, understand, and improve the effectiveness of care processes and outcomes related to chief complaints.

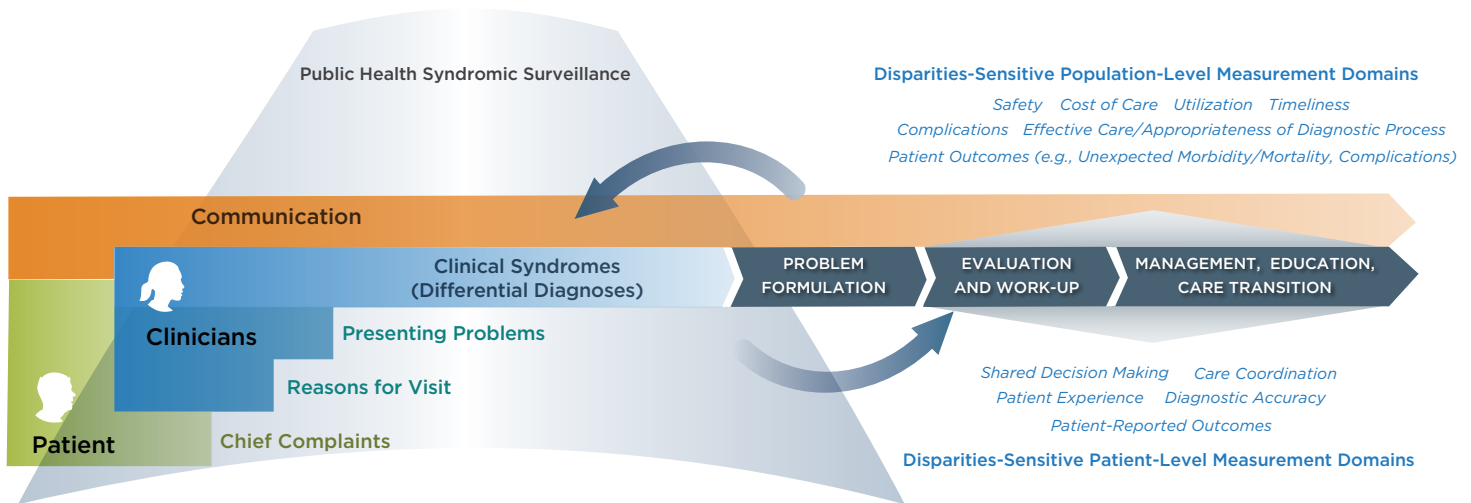
While this framework aims to drive measure development for the acute care delivery processes that are currently not well measured, the Committee acknowledged that for certain types of facilities and populations, like rural and/or critical access hospitals, other considerations may be taken into account. In particular, depending on how standardization of chief complaints is deployed, rural EDs are typically resource-constrained and may not have the capacity to implement the IT infrastructure and processes to facilitate standardized capture of chief complaint data, particularly if there are local implementation requirements.

This framework should be applied within specific contexts where using administrative claims, free text, or discharge diagnosis is ineffective at accurately identifying a target population for measurement or for another use case such as syndromic surveillance. With respect to quality measures, it is also important that chief complaint-based measures may not apply to every encounter given the heterogeneity of acute care. In addition, chief complaint measures should be considered complimentary to diagnosis-based measures. The Committee identified several conditions under which chief complaint-based measurement should be employed:

- To assess care processes and relevant outcomes for patients presenting with symptoms that account for significant volume and frequency of visits, and that account for common ED or urgent care visits
- Undifferentiated symptoms where the diagnosis requires significant clinical assessment, diagnostic testing, or hospitalization
- Known variation in clinical practice, gaps in care, or poor quality for assessing the condition or symptom
- Symptoms or syndromes for which diagnostic quality and safety are major concerns and that if missed or not addressed in a timely manner could cause major harm to the patient
- Symptoms or complaints where the work-up and evaluation processes or the episode of care is associated with high costs
- Symptoms, complaints, or syndromes for which there is demonstrated or suspected overuse or inappropriate use of resources and variation in clinical practice

The Committee agreed that visits for exacerbations of known chronic disease (e.g., diabetic hyperglycemia, sickle cell pain crisis) or conditions for which there is a narrow differential diagnosis (e.g., arm laceration) could also be assessed using chief complaint-based measures, but only for care processes or work-up, not outcomes, which may be more appropriately measured using a specific diagnosis. Additionally, patients who are discharged with a symptom-based diagnosis (e.g., nonspecific chest pain, dizziness) should also be considered for chief complaint-based measurement.

FIGURE 1. CHIEF COMPLAINT MEASUREMENT FRAMEWORK



The Committee designed this framework based several key considerations. The model is intended to reflect an ED (or acute/urgent care setting) episode of care starting with the patient arriving to the ED and undergoing assessment in triage where a chief complaint is often obtained. The model illustrates the relationship between chief complaint, reason for visit, presenting problem, and clinical syndrome in that they build on one another and are part of an iterative process of patient-provider communication and diagnostic work-up that evolves as the episode of care progresses. Opportunities for measuring quality during the episode of care primarily lie within the diagnostic process and management segments of the episode.

Public health surveillance efforts use chief complaint data in any of its forms including reason for visit, chief complaint free text, standardized presenting problem, as well as data captured throughout the visit and the final diagnosis. The measure population for chief complaint-based measures can be aggregated using coded reason for visit data (e.g., National Center for Health Statistics [NCHS Survey]), standardized presenting problem, or clinical syndrome. In most cases, the specificity of a measure population will depend on the inclusion of additional data (e.g., age, sex,

vital signs) in order to better define a homogenous cohort; however, a single presenting problem can be used to define a denominator population. The framework also recognizes that not all presenting problems can be categorized as a clinical syndrome.

The Committee emphasized the importance of ongoing patient-provider communication to clarify complaints and symptoms and periodically confirm that the patient's chief complaint is being addressed. This is a vital element of the episode of care and of quality care. To further illustrate the importance of the patient perspective in the episode of care, **Figure 1** illustrates the patient and provider experience as parallel tracks. As part of the clinical evaluation and work-up within the ED, the provider collects information via patient interviews, physical exams, laboratory results, imaging results, patient demographics, and history. The provider develops a mental model of the differential diagnoses, or a list of all of the potential diagnoses, to help guide a clinical evaluation that would help diagnose potentially harmful causes of the illness. This is also an iterative process that may also result in a set of possible clinical syndromes that fit the patient's clinical presentation; these clinical syndromes often drive the clinical pathway

for further evaluation and work-up. While not every chief complaint will lend itself to a clinical syndrome (e.g., request for a medication refill), communication and an iterative diagnostic process are important elements of the episode of care.

The Committee weighed the role of diagnostic accuracy and quality as a central tenet of the diagnostic process. The primary focus of chief complaint-based measurement is to assess the diagnostic process, with the goal of accurately identifying the underlying cause of a patient's illness, addressing the complaints or symptoms that led the patient to seek care, and preventing potentially harmful outcomes. In order to measure the rate at which the diagnostic process leads to the appropriate diagnosis, an assessment of the discharge or later diagnoses from subsequent visits, as well as other related outcomes—like return visit to ED—in relationship to the diagnostic process, is needed. The diagnostic accuracy domain is unique in that it requires chief complaint data in conjunction with diagnosis in order to assess quality through this lens.

The measurement period for chief complaint-based measures continues as the episode of care moves to the right of the conceptual framework. This period ends with patient and caregiver education, management or treatment of the illness, and a care transition. The care transition may include transfer to another facility (or next level of care for urgent care or retail health settings), discharge to home, return to a skilled nursing facility, or admission to the hospital. Visit outcomes are typically driven by a discharge diagnosis, and as such, the Committee specifically sought to exclude diagnosis from the framework as it is intended to reflect the episode of care prior to diagnosis that is most relevant to chief

complaint-based measurement. While diagnosis-based measures would fall outside of the scope of chief complaint-based measurement, they remain an important part of measuring quality in the ED; diagnosis-based measures should be used in tandem with chief complaint-based measures to provide a comprehensive quality signal for an episode of care.

Throughout the episode of care, there are several measurement domains that the Committee identified as applicable to chief complaint-based measures. These domains are defined in **Table 2** along with a sample concept to illustrate the domain in the context of chief complaint data. Where possible, previously established domain definitions were used or adapted for chief complaint measures. Measures within these domains represent both process and clinical measures. The Committee noted that while some outcome measures are feasible for chief complaint-based measurement, most outcome measurement related to the ED episode of care will be driven by the diagnosis. The Committee also emphasized the need to recognize measurement perspectives in the framework with attention to identifying patient-level, population health, and public health measurement domains and use cases. Disparities-sensitive measurement is an overarching domain that should be considered at the conceptual phase of measurement, in order to incorporate the appropriate data collection and implementation strategy. From a clinical perspective during the episode, the Committee highlighted the importance of considering health disparities in the evaluation and work-up phase of the episode as certain populations (e.g., women) may present differently than others for the same diagnosis (e.g., heart attack).

TABLE 2. CHIEF COMPLAINT MEASUREMENT DOMAINS

Domain	Description	Example
Patient-Reported Outcomes	<p>The concept of any report of the status of a patient's health condition that comes directly from the patient, without interpretation of the patient's response by a clinician or anyone else¹⁷</p> <p>May also include patient-important outcomes in which the outcome of interest is determined by the patient and is the focus of measuring whether that quality care has been achieved during the measurement period¹⁸</p>	<p>The proportion of patients with a chief complaint of headache who were headache-free at 24 hours after the ED visit</p> <p>The number of patients reporting their chief complaint was adequately addressed in the ED</p>
Effective Care/ Appropriateness of Diagnostic Process	Measures within this domain focus on the appropriateness and effectiveness of the care processes for working up a patient to determine a diagnosis and plan ¹⁹	The proportion of patients with a chief complaint of chest pain without acute myocardial infarction who had a HEART score documented in their chart to risk stratify for acute coronary syndrome
Cost of Care	Measures that count the dollars paid by the health plan and/or patient for the services received during the measurement period ²⁰	The total episode-based cost for patients presenting with abdominal pain.
Diagnostic (Accuracy) Quality and Safety	<p>Measures that assess whether a correct or incorrect diagnosis was assigned during a healthcare encounter²¹</p> <p>Measures may be designed as follows: patients diagnosed with target disease "x" (e.g., stroke) divided by patients with chief complaint or presenting problem associated with disease that was not diagnosed during episode of care (e.g., dizziness, headache)</p>	The proportion of patients with a chief complaint of dizziness who were discharged from the ED with a diagnosis of nonspecific dizziness who were diagnosed with stroke within 7 days.
Care Coordination	A multidimensional concept that encompasses—among many other facets of healthcare organization and delivery—the effective communication between patients and their families, caregivers, and healthcare providers; safe care transitions; a longitudinal view of care that considers the past, while monitoring delivery of care in the present and anticipating the needs of the future; and the facilitation of linkages between communities and the healthcare system to address medical, social, educational, and other support needs, in alignment with patient goals ²²	The proportion of patients with chest pain who were recommended to receive a stress test after discharge who were able to complete a stress test study
Shared Decision Making	A process of communication in which clinicians and patients work together to make informed healthcare decisions that align with what matters most to patients and their individual concerns, preferences, goals, and values ²³	The proportion of patients with a chief complaint of chest pain where shared decision making was performed for chest pain disposition decisions with a HEART score of 0-3

Domain	Description	Example
Safety	Patient freedom from accidental injury due to medical care or medical errors ²⁴	The proportion of patients with a chief complaint of dizziness that experienced a fall in the ED
Timeliness	Measures that assess whether a particular action was taken within a specific time period ²⁵	The proportion of patients over age 35 with chest pain who received an EKG within 10 minutes of ED arrival
Patient Experience	The measures that assess how patients perceived their healthcare encounter including communication with their providers and whether they felt their concerns were addressed ²⁶	The proportion of patients with abdominal pain whose patient experience of care was measured by ED-CAHPS scores or other instruments
Utilization	Measures that count the use of services or supplies, such as advanced imaging, laboratory testing, or hospital admission	The proportion of patients with chest pain who were admitted to the hospital after their ED visit
Patient Outcomes	Measures that capture the outcome of the patient as a result of care in the ED (or similar setting). May examine unplanned return visit to the ED (for symptom-based diagnosis), unexpected morbidity and mortality during the episode of care, or complications during the episode as a result of care delivered during the diagnostic process	The proportion of patients with a presenting problem of chest pain who died unexpectedly in the ED

CURRENT LANDSCAPE OF CHIEF COMPLAINT STANDARDIZATION

Overarching Challenges

The environmental scan of chief complaint standardization revealed several barriers that have long prevented broad adoption of a single methodology to standardize chief complaints. One of the most notable findings was the long history of efforts aimed at establishing a standardized chief complaint vocabulary for quality measurement and other secondary purposes like research and education. Dating back to 2008, Haas et al.¹³ describe the work and recommendations of an expert group of clinical informaticists convened to establish a path forward for widespread adoption of a standardized vocabulary. Since then, others have tried to respond to their recommendations (i.e., development of HaPPy and other ontologies),

but still there has been no broad adoption of a single approach. The scan also highlighted some of the long-standing barriers to implementing the necessary technology and infrastructure to advance standardization of these data.

Specifically, the lack of a mandate or incentive for widespread adoption of processes and technology infrastructure that enable the desired standardization significantly hinders broader implementation of chief complaint-based measures. Further challenging quality measurement is the growing demand for measures to meet value-based purchasing requirements, which has significantly dampened the appetite to expand data collection practices for measures that have not yet been mandated or widely used. On the front lines of patient care, expanding

data collection demands can increase provider burden. Widespread implementation of a new data standard would also take a sustained effort to address the wide variation in chief complaint data collection practices across EDs. Another fundamental challenge is the lack of consensus among engaged bodies on the selection, implementation, stewardship, and maintenance of a vocabulary that could be widely adopted. In an effort to drive the selection of a vocabulary that can be useful for multiple use cases and employed across disciplines, the balance between the size of the vocabulary and specificity for a variety of users poses a particular challenge. A vocabulary must be granular enough to provide the specificity needed for clinical care (e.g., left eye lid swelling), but also be able to roll up in to broader categories for research purposes (e.g., eye symptoms).

Chief Complaint Data Collection

The chief complaint field itself remains free text for many systems, while a corresponding defined list of complaints may be labeled “reason for visit,” “presenting problem,” or with other terms. Chief complaint data are usually entered as free text into the EHR by the triage nurse or other nonmedical triage personnel. As free text is entered, there are often misspellings, abbreviations (e.g., CP for chest pain), and other unique descriptions included to describe the patient’s report of symptoms. To address this issue, several tools have been employed to facilitate standardization. For example, tools like natural language processing (NLP) are designed to capture the wide variations in free text and translate the medical concepts into specific terms. Autocomplete enables automated correction of misspellings and standardization. However, while useful, these tools are not readily available in all EHRs for the purposes of chief complaint data collection.

Standardization of these data through the EHR can occur at several points in the collection process: (1) at the point of entry into the EHR (i.e., correcting misspellings, abbreviations), (2) when matching the terms from the free text to a standardized chief complaint vocabulary within

an ontology or nomenclature, (3) when selecting a standardized term/complaint from a dropdown menu, or (4) when mapping terms in the vocabulary to a standardized coding terminology (e.g., Systematized Nomenclature of Medicine [SNOMED], ICD). With the exception of selecting complaints from a dropdown menu, systems with these capabilities employ these steps without additional clicks or keystrokes by the clinician.

Even with technology like natural language processing and autocomplete, the data that result from this process would need to align with one or more terms in a chief complaint nomenclature or ontology which specifies the universe of complaints from which measures can be developed. Chief complaint nomenclatures or ontologies structure and organize the terms with definitions and relationships to other terms, using hierarchies and synonyms. For example, the terms “dyspnea,” “trouble breathing,” “SOB,” and “out of breath” could be translated by NLP technology into a single term: “shortness of breath.”

Chief Complaint Standardization Tools, Nomenclatures, and Classification Systems

The scan for classification systems and nomenclatures yielded a variety of existing systems and approaches for capturing and standardizing chief complaint data. Of the 27 approaches identified, most (17) were created and are currently in use within various public health and syndromic surveillance programs (e.g., Electronic Surveillance System for the Early Notification of Community-Based Epidemics [ESSENCE]) for monitoring disease outbreaks and incidence of threats to public health. More recently developed IT-based ontologies characterize the patient’s chief complaint in terms of standardized presenting problems (e.g., Hierarchical Presenting Problem Ontology [HaPPy]). HaPPy was developed in response to the recommendations outlined by Haas et al. in order to fulfill the need for a hierarchical chief complaint terminology that linked to a coding terminology (e.g., SNOMED). Many of these systems include a technology

component that enables NLP and contextual autocomplete to standardize the data for mapping to ICD and SNOMED codes.²⁷⁻²⁹ While most of these systems are open source and accessible at no cost to a user, proprietary and commercial systems are also in wide use and offer a suite of IT solutions to institutions looking to manage coding and data (e.g., Intelligent Medical Objects), including chief complaint data.

The key informant interviews also revealed a potentially new chief complaint add-on to ICD-11 that is anticipated to be released by the World Health Organization in the future. This add-on will be similar to the Start-up Mortality Lists (SmoL) that have been implemented in the past. While this chief complaint module is being developed based on needs for a chief complaint nomenclature in the developing world, it is anticipated that the vocabulary will be applicable for use in developed countries as well. Testing of the module will evaluate this application. While the development of this module is still in its early stages, it is anticipated that once released this module would be accessible by any user of ICD free of charge.

In an effort to provide an inventory of the existing publicly available vocabularies, five vocabularies ranging from 54 to 980 terms are listed in [Appendix D](#). These lists were developed empirically by analyzing the frequency and accuracy of capturing chief complaints in a target population. For example, Aronsky et al.¹⁰ set out to identify a minimum set of complaints that would capture most presenting symptoms and that could be usable for triage staff, settling on a list of 54 terms. Some argue that this approach lacks the specificity needed to enable accurate assignment of a standard complaint. At the other end of the spectrum, the Centers for Disease Control and Prevention (CDC) annual NHAMC survey provides utilization statistics based on a sample of U.S. hospitals. Chief complaint data are collected and manually coded using the Reason for Visit Classification (RVC) System, which is a series of more than 1,000 separate codes created to classify patients' reasons for seeking care. While these data are important and useful for research and for

purposes of national estimates of ED visits, the RVC system lacks the feasibility for widespread adoption, as a trained coder must manually assign the codes. Interviews with key informants also revealed that most EHRs include a chief complaint list generated by the vendor; however, the host institution can customize this list based on its patient population and specific needs. While this allows for chief complaint measurement locally, it does not facilitate reliable quality metrics that can be implemented across platforms. Due to the highly customizable nature of these EHR lists, it was not feasible to capture these lists as part of this effort.

In the public health arena, chief complaint data are processed for syndromic surveillance using classification systems designed to parse free text chief complaint data into defined syndromes. In conjunction with other clinical data and demographic data (e.g., diagnosis, vital signs, gender, age), these classification systems²⁸ use complex algorithms and natural language processing to group patients into defined clinical syndromes. Unlike the quality measurement use case, the preference for chief complaint data for the surveillance use case is free text. Receiving free text data enables the greatest flexibility for analysis and access to the details about the patient's complaint that is sometimes lost in standardized fields.

As previously mentioned, multiple classification systems are in use across the U.S. with varying technological capabilities, which capture varying numbers of syndromes. In an effort to meet the diverse needs of local and state health departments, many classification systems have been home-grown, while others have implemented more widely used systems like ESSENCE. At a national level, the CDC provides various resources to support state-level surveillance including a national platform for states to share surveillance data across states via the Biosense system. In an effort to drive standardization and consistency across surveillance efforts, the International Society for Disease Surveillance (ISDS)³⁰ established a repository of dozens of syndrome definitions, which have been widely

adopted within the surveillance community and implemented in ESSENCE. These definitions cross seven categories including injury, infectious disease, environmental exposure, emergency preparedness, behavioral health, occupational health, and chronic disease. The library is web-based and enables the addition of syndrome definitions through crowd sourcing.

Implementation Challenges

Implementing a standard chief complaint list for front line providers to incorporate into their documentation and care delivery may be equally challenging. Selection of vocabulary must consider the feasibility of managing the list and the usability for the end user (e.g., the triage nurse). A list that is too long, specific, and unmanageable may result in a data field that is underused. Conversely, a list of complaints that is less detailed could lack the specificity need to adequately group patients, but could facilitate easy recall and access for completing documentation in a timely manner. The implementation of any new data field that requires systematic collection must consider the burden on the front-end clinician in order to promote success of its use. Ideally, implementation of electronic algorithms or tools to standardize these data would be automated and require little additional effort for the clinician. Chief complaint and reason for visit data are typically used as a communication tool between providers during the acute care episode, and there is wide variation in the use of these fields across providers and EDs. For example, for a patient who has a long list of complaints, the triage nurse may use the term “TNTC”—“Too numerous to count”—for the chief complaint field which may signify to other providers a long list of nonspecific complaints. Some nurses may document chief complaints based on known physician preference and practice or describe and organize complaints based on their interpretation of acuity.

As the evaluation and work-up evolve over the course of the visit, the patient’s symptoms are typically differentiated into a diagnosis which is the data element most frequently used for

measurement and administrative purposes. Selection from a predefined list of complaints requires a clinician’s interpretation of the patient’s reported chief complaint(s). For this reason, avoiding anchoring bias, which would drive clinicians to select terms from the list that are most accessible and easily found, is an important consideration for implementation. When standardizing patient-reported data for measurement purposes, there is a risk of losing the patient’s voice and sentiment as a result of interpretation; therefore, maintaining practices to capture free text of the patient’s own words is imperative. The free text field not only holds value in the clinical setting but for secondary uses like syndromic surveillance where the context of complaints is often lost. For example, a standardized translation of a heroin overdose, could be standardized to just “overdose,” which is missing the additional context needed to properly classify the overdose based on the causing agent for surveillance purposes. In clinical settings, the free text chief complaint can be used as a check point to engage the patients in their care and ensure that the course of evaluation and treatment is consistent with why they initially sought care. Finally, while the chief complaint field is often regarded as a reflection of the patient’s voice, it is not the only place in the health record that attempts to capture patient perspective. Assessments such as the review of systems can also be used to communicate patient symptoms based on the patient’s report.

Yet another challenge in the practice of collecting chief complaints from patients is the barrier that language and culture may create in effectively communicating symptoms and the reasons for seeking care. Clinicians who interview patients must be culturally competent and cognizant of communication strategies that can be used to accurately collect and document a patient’s symptoms. Any break down in this initial communication during triage can lead to documentation in the record that is misaligned with the patient’s purpose and potentially misguide the evaluation and treatment of the patient.

ADDRESSING MEASUREMENT GAPS IN FUTURE DEVELOPMENT

An environmental scan for existing chief complaint measures did not identify any existing chief complaint-based measures in the public domain. However, a total of 50 measures and 11 measure concepts based on symptom-based discharge diagnoses across 16 chief complaints or conditions were identified. Details of this scan and its results can be found in [Appendix E](#). While many claims-based measures and concepts were found, significant gaps remain across many common complaints with no measures. Existing measures and measure concepts do exist for common complaints like chest pain, but may require updating given new data and treatment approaches. These gaps may be due to the limitations of identifying specific patient populations using claims data, which do not have sufficient granularity to differentiate risk factors or findings that may include or exclude a patient from a particular decision rule. For example, while the Canadian C-Spine Rule and National Emergency X-ray Utilization Study (NEXUS) criteria are both sensitive and specific rules that are validated to safely identify low-risk patients where neck radiography can be deferred, measures do not exist for the use of these decision rules because populations who would require or not require neck radiography cannot be differentiated solely by using a diagnosis. In this case, it would be important to both identify patients with a chief complaint of acute neck injury and also to use clinical and demographic data from the EHR to identify high- and low-risk patients. This example also supports the rationale for all future chief complaint-based measures to be specified as electronic clinical quality measures (eCQMs) where clinical data can be combined with other patient-level information to establish an appropriate denominator. There is also some literature to support potential development of concepts

related to pediatric febrile seizure, dizziness, and diagnostic error.³¹⁻³³

Another major gap in measurement is the low number of measures for the areas of care coordination, patient-reported outcomes, shared decision making, and diagnostic accuracy. These are four burgeoning areas where there has been considerable focus on improvement in recent years. However, for some domains like care coordination, this gap reflects the overall measure development landscape for the topic. Care coordination measurement using chief complaints presents an opportunity to fill these gaps. Many complaints represent high-risk populations that require close follow-up by longitudinal healthcare providers after the ED visit. Measures for resource utilization—such as hospital admission and cost measures—were also scarce. Given the recent shift in focus to value-based payment,³⁴ resource utilization measures would be a fruitful area for measure development; they can be paired with measures focused on a particular intervention—such as shared decision making or an evidence-based practice (e.g., whether advanced imaging or admission was used).

Finally, there was a significant gap in patient-reported outcomes, which increasingly are becoming an area of focus to measure and reflect the patient's experience in healthcare delivery. Given that chief complaint-based measures originate from the patient's report of symptoms, this is a logical domain to explore gaps and whether patient-reported outcome measures could reflect the patient's report of their disposition for the episode based on why they initially sought care. Measure concepts for this domain may relate to patients' experience of having their complaints addressed during a visit or resolution of symptoms within a specified time period.

In addition, many measurement gaps could be addressed using existing guidelines and clinical policies. The American College of Emergency Physicians (ACEP) has 20 active clinical policies published on their website, eight of which focus on general populations of patients which could be categorized with chief complaints (i.e., acute blunt abdominal trauma, seizure, and others). For example, in acute blunt abdominal trauma, ACEP has a Grade B recommendation that patients who are hemodynamically unstable should receive a bedside ultrasound (focused assessment with sonography in trauma [FAST] examination), but no measure or measure concept for this exists to date.³⁵

Prioritization of Measure Concepts for Development

As the literature review and environmental scan primarily yielded measure gaps, NQF charged the Committee to identify and prioritize new measure concepts that would use chief complaints as a data source. Committee members submitted measure concepts through an online survey tool, specifying the chief complaint, the target population, a description of the concept, and any literature or published evidence supporting the concept. Committee members also identified measurement domains for the concepts submitted, choosing from the list of domains that was developed from the environmental scan. All together, 44 concepts were submitted. The concepts submitted by the Committee and the concepts identified in the environmental scan were compiled and shared with the Committee as the basis for an activity to prioritize the measure concepts for development as eQMs.

The prioritization exercise had two goals: (1) identify and prioritize concepts suitable for immediate development that are both important and feasible, and (2) identify and prioritize important concepts which may not currently be feasible based on the current limitations in data or other technical issues (such as the inability to reliably collect a key component of the data source). The Committee distinguished important concepts based on the following criteria:

- Addresses a quality problem (e.g., serious condition, high cost/high volume, suspected overuse concern, known poor quality care)
- Conditions with evidence (i.e., guidelines, clinical data) to support a quality measure, and for which chief complaints are the correct characterization
- Least susceptible to manipulation of the measure results
- Applicable to and valuable for multiple patient populations and care settings
- Useful applications to payers and in public policy

Feasibility of concepts recommended for development in the current state was determined by eQIM standards requiring that each data element be systematically collected from a structured data field in the EHR. This exercise yielded a list of 13 measure concepts feasible for development now (**Table 3**) and eight measure concepts feasible for future development (**Table 4**).

TABLE 3. IMPORTANT AND FEASIBLE FOR DEVELOPMENT NOW

Domain	Concept Description
Effective Care/Appropriateness of Diagnostic Process	<ul style="list-style-type: none"> • Prescription of opioids to patients with a presenting problem of back pain • Prescription of over-the-counter or prescription cough medicine for young children with a presenting problem of cough • Patients with a presenting problem of dizziness, weakness, or fall injury who receive a falls assessment • Effective care and diagnostic process for infants with a presenting problem of fever • Use of pelvic ultrasound for patients in early pregnancy with a presenting problem of abdominal pain • Use of head CT in patients without focal neurological symptoms with a presenting problem of syncope • Prescription of naloxone for patients with a presenting problem of opioid overdose • The proportion of children with a CT scan ordered for a presenting problem of febrile seizure • Pediatric patients with a presenting problem of cough and sore throat receiving antibiotics
Utilization	<ul style="list-style-type: none"> • Use of imaging (CT/MRI) for patients with a presenting problem of nontraumatic back pain
Diagnostic Quality and Safety (Accuracy)	<ul style="list-style-type: none"> • Rate of missed stroke diagnosis for patients with a presenting problem of dizziness/vertigo with or without headache • Rate of missed sepsis diagnosis among patients with presenting problems of fever or upper respiratory tract infection, sore throat, or generalized weakness/fatigue • Rate of missed myocardial infarction among patients with presenting problems of chest pain or shortness of breath

TABLE 4. IMPORTANT AND FEASIBLE FOR FUTURE DEVELOPMENT

Domain	Concept Description
Effective Care/Appropriateness of Diagnostic Process	<ul style="list-style-type: none"> • Patients with a behavioral health presenting problem (e.g., depression, attempted suicide) that are discharged with a structured suicide risk assessment and suicide safety plan
Shared Decision Making	<ul style="list-style-type: none"> • Use of shared decision making to guide evaluation in patients with presenting problem of low-risk chest pain (e.g., identified as low to moderate risk using a tool such as the HEART score) • Shared decision making on the use of imaging for patients with a presenting problem of head injury
Utilization	<ul style="list-style-type: none"> • Proportion of nonelderly patients with presenting problem of syncope without focal neurological problem that did NOT receive a head CT • Use of imaging (CT/MRI) for patients with presenting problem of nontraumatic back pain
Cost	<ul style="list-style-type: none"> • Episode-based cost for patients with a presenting problem of low-risk chest pain • Episode-based cost for patients with a presenting problem of low-risk abdominal pain
Diagnostic Quality and Safety (Accuracy)	<ul style="list-style-type: none"> • Rate of missed spinal abscess diagnoses in patients with a presenting problem of back or neck pain

In advancing these measure concepts, the Committee offers illustrative examples of high-priority concepts for measure developers looking to use chief complaints (or presenting problems) as data elements in measure calculation. The list is not exhaustive; there are many other conditions and quality problems that could feasibly benefit by the introduction of new quality measures leveraging chief complaints as data elements. The Committee discussed the unintended consequences of implementing process-based measures which can drive under- or over-utilization in order to attain optimal performance. For example, advancing new quality measures in the domains of utilization, cost, and appropriateness could lead to unintentional incentivization of providers to reduce the volume of care services delivered, which may in turn increase the rate of missed diagnoses or otherwise compromise quality outcomes. Consequently, the Committee recommended pairing measures of care utilization with measures of missed diagnosis when selecting measure sets for implementation

to counter this potential unintended consequence.

The Committee also recognized that there should be consideration given to concepts with available evidence and high frequency conditions. This could reduce the proliferation of chest pain measures where there is already an abundance of measurement. Although the Committee is eager to see new measures introduced in the field, an important consideration that emerged from the discussion is the need for those developing quality programs and choosing measure sets to use caution not to over-burden providers. Indeed, the opportunity presented by chief complaint-based measures to be developed as eQMs and the feasibility constraints emerging from the inconsistent interoperability between EHR systems suggest that special consideration is warranted for these measures. Finally, the Committee noted the importance of advancing measures applicable to special populations, particularly pediatrics where care for children raises particular concerns related to treatment overuse and diagnostic accuracy.

CHIEF COMPLAINT-BASED eQMS

The development of chief complaint-based electronic clinical quality measures should follow established guidelines and standards for specifying the data elements, numerator, and denominators for any eQm. However, due to the variability in documenting chief complaints, several intermediate steps should be taken to ensure reliable specifications. First, consider implementing an established chief complaint vocabulary that is linked to a standard code set like SNOMED (e.g., HaPPy). A vocabulary provides a finite universe of presenting problems to choose from and supports the reliability of the specifications in that the problems are identified from a standard list. Specifying eQMs requires the identification of the appropriate Quality Data Model (QDM) category and/or data type, and selection of an appropriate

value set or direct reference code. The value set may be an existing one, or else a new one must be created and approved through Value Set Authority Center (VSAC). Several QDM categories should be considered for chief complaint-based measures including symptom, diagnostic study, procedure, and intervention.

In addition to selecting important and feasible concepts for development, the Committee emphasized the need to ensure measures are usable and scientifically sound to foster adoption and implementation. NQF's Consensus Development Process (CDP) applies **standard measure evaluation criteria** for evaluating measures across four criteria. These criteria examine the need for measurement, the evidence

base supporting the measure concept, the reliability and validity of the tested measure specifications, the feasibility of implementing the measure, and whether measures and their performance results are usable and responsive to feedback by those being measured. In an effort to provide developers guidance around key challenges specific to chief complaint-based measure development, the NQF criteria were used as a framework for identifying potential challenges and providing recommendations to address them.

In anticipation of submitting chief complaint-based measures to NQF for endorsement, the Committee expressed concern that NQF's condition-specific standing committees may not deem the ED or urgent care-based measures important. Committees reviewing these measures would need to be educated on this specific measurement approach and the challenges with the data source prior to evaluating them. In an effort to ensure measures are being considered by those who will be using and are impacted by the measures, NQF would consider whether establishing an emergency medicine technical expert panel is warranted. Further, given some of the challenges that will arise with developing chief complaint-based measures, NQF recommends that developers submitting measures into the endorsement process seek NQF technical assistance prior to submission.

Importance to Measure and Report

The Committee reviewed the Importance to Measure and Report criterion, which focuses on the extent to which the specific measure focus is evidence-based and important to making significant gains in healthcare quality where there is variation in or overall less-than-optimal performance. For this criterion, measure submitters must demonstrate an opportunity for improvement, performance gap, disparities in care, and evidence to support the measure concept.

The Committee highlighted the particular challenge for developing a robust evidence

base for supporting the endorsement of measures based on chief complaints. However, the Committee indicated that a substantial performance gap would not be difficult to demonstrate for many of the measure concepts proposed. Moreover, in many cases pushing the performance gap a step further to investigate disparities would yield additional evidence substantiating a clinical performance gap to be remedied by performance measurement. The Committee indicated that invoking the evidence exception pathway in the CDP evaluation is likely the appropriate pathway for process measures within the effective care (or appropriateness of diagnostic process) domain where there may be insufficient published evidence or guidelines, but clear standards of care. It was also suggested that a systematic demonstration of face validity be considered as evidence to support the measure concept when empirical evidence is lacking. The Committee agreed that chief complaint-based measures should also be required to demonstrate a conceptual or evidence-based linkage to desired clinical outcomes.

Scientific Acceptability

The Scientific Acceptability criteria address the extent to which a measure produces consistent (reliable) and credible (valid) results about the quality of care when implemented. The Committee highlighted particular challenges around the reliability of the chief complaint data element when specifying a performance measure. Specifically, given the variability in the collection of chief complaint data, inter-rater reliability (e.g., across nurses entering data) comes into question as well as whether data can reliably be pulled from the field containing the standardized data (i.e., presenting problem). For example, data element validity testing should demonstrate that patients with a presenting problem of “abdominal pain” actually reported a complaint of abdominal pain. Further, data element reliability should indicate that abdominal pain patients are being consistently and appropriately identified across hospitals.

In contrast to diagnosis codes, no infrastructure or process currently exists to ensure compliance with the accuracy of these data. The Committee acknowledged that inter-rater reliability would demonstrate data element reliability; however, this approach is resource intensive, cost prohibitive, and not feasible. As an alternative, the Committee recommended that developers establish a data set based on diagnosis codes that would align with the chief complaint in order to make correlations between the two sets.

For example, for patients with the chief complaint of abdominal pain, one would examine the diagnoses for which abdominal pain is a likely symptom (e.g., appendicitis, cholecystitis, symptom-based diagnoses of abdominal pain) to determine the correlation of those populations. The expectation is that patients with these diagnoses would also have a chief complaint of abdominal pain. If this can be demonstrated with a large enough sample, this data element validity can be demonstrated with some statistical confidence. Additionally, the incidence of the complaint can be compared to established literature showing that the rates of a particular condition in the testing population align with rates in the broader population. Alternatively, comparing what is typed as free text in the chief complaint field to what is captured in the presenting problem or standardized complaint field could also be a way of validating the data elements. These analyses can also be largely conducted electronically.

The Committee pointed out that the chief complaint, when documented using the patient's words, is intrinsically valid as it reflects the patient's utterances, which are the data source. The Committee also suggested that measure developers consider specifying measures with broad lookback periods in order to mitigate reliability issues in small samples sizes.

When specifying the measure, the Committee recommended the use of SNOMED-CT codes to define the complaints in order to take

advantage of the specificity and hierarchical design offered by the terminology and its wide use in EHRs. SNOMED is a comprehensive clinical terminology that includes over 340,000 codes and is the international standard for consistently representing clinical information in EHRs.³⁶ SNOMED concepts are also linked by robust relationships, which give flexibility in how cohorts are aggregated. These relationships go beyond simple parent-child relationships and allow different measurement use cases to have varying levels of granularity. These robust relationships are not found in other terminologies such as ICD-CM.

Feasibility

Feasibility, or the extent to which data are readily available, retrievable, and implementable, is a criterion NQF uses to evaluate measures for endorsement. This criterion is not “must-pass” since the review or endorsement of innovative measures without standardized data elements drives healthcare quality improvement. The feasibility of eMeasures is evaluated through the Feasibility Scorecard across four domains:

1. data availability including heterogeneity across different EHR systems and mapping requirements;
2. data accuracy and completeness;
3. data standards (access to structured and coded data); and
4. impact on workflow.

In the Scorecard, developers score data elements against the four domains and submit this alongside evidence for approval for trial use. The Committee identified several challenges with developing chief complaint measures that would meet these criteria. First, the development of patient-reported outcome measures that use the EHR would pose a challenge as these data (i.e., surveys) may not be collected as a routine process of care. While electronic capture of patient surveys that are linked to the EHR are emerging in primary care and specialty care settings, this

is not common in the ED or urgent care settings. Further, while some facilities may have established practice guidance around standard vocabulary or capturing standardized chief complaint data, this may not be the case for many, in which case the feasibility of implementing these measures would be low. The Committee acknowledged the challenges in meeting the current requirements that eQMs be tested in at least two different sites and with more than one vendor, but ultimately agreed this standard should also be applied to chief complaint-based measures.

Usability

The Committee also reviewed the Usability and Use criterion in the context of chief complaint measures. The criterion measures the extent to which potential audiences (e.g., consumers, purchasers, providers, policymakers) are using or could use performance results for both accountability and performance improvement

to achieve the goal of high-quality, efficient healthcare for individuals or populations. This criterion includes an assessment of whether the measure is currently in use, by whom, and for what purposes. It also assesses the actionability of the measure results as well as unintended consequences. The Committee anticipated that the demand for new measures based on chief complaints was sufficiently high and that these measures were likely to be adopted for use. The Committee noted that a possible unintended consequence of measures based on chief complaints was an incentive to “over-test,” increasing utilization rates in order to bring down missed diagnoses. Counter measures should be implemented to balance these potential consequences. Overall, the Committee agreed that current NQF usability criteria apply to chief complaint-based measures and should be equally considered during development and endorsement.

RECOMMENDATIONS

The Committee sought to identify strategies for promoting the implementation of the recommendations to enable widespread, standardized, and systematic collection of chief complaint data in the current emergency department and electronic health record landscape. Recommendations centered on four key areas: (1) Establishing a standard chief complaint vocabulary, (2) aggregating chief complaint data in the absence of a standard vocabulary, (3) Engaging important stakeholders to advance chief complaint-based measurement, and (4) data quality and implementing chief complaint-based measures.

Establishing a Standard Chief Complaint Vocabulary

There are two important declarations that must be made in order to advance chief complaint-based measurement. The first is the identification of a steward organization and sponsoring organization(s) who would shepherd future chief complaint standardization efforts. The steward would ultimately be responsible for selecting and establishing the initial standard vocabulary, testing, curating, and updating the vocabulary over time, as well as engaging ontology experts and data authors (a person or group of individuals). The sponsoring organization would work in tandem with the steward organization to ensure that the curation of the vocabulary aligns with stakeholder interests and needs and help to identify experts to support stewardship activities. The second foundational declaration is the selection of a standard vocabulary. While there have been efforts to select or establish a standard vocabulary, there has been a lack of engagement from authoritative bodies to drive the necessary actions and resources toward these efforts.

Stewardship of the Chief Complaint Vocabulary

Recommendation 1: The Committee suggested that the ideal steward for the chief complaint vocabulary would be the National Library of Medicine, with American College of Emergency Physicians (ACEP) and other interested organizations as sponsors. The NLM currently acts as a steward for other similar efforts like the Clinical Observations and Encoding (CORE) Problem List Subset and oversees the Value Set Authority Center (VSAC). As a part of the National Institute of Health (NIH), and given their ongoing oversight of related efforts, the NLM is equipped and experienced to take on stewardship of the chief complaint vocabulary. However, at this time, they do not have a federal mandate to assume this role.

Recommendation 2: The Department of Health and Human Services, including the Centers for Medicare and Medicaid Services (CMS), should encourage the Office of the National Coordinator to include use of a standard chief complaint vocabulary and designate the NLM as the chief complaint vocabulary steward and make tools available via the Value Set Authority to maintain the vocabulary. This designation would also require funding to support authoring and stewardship activities.

Selection of a Chief Complaint Vocabulary

Recommendation 3: Ontology experts working in this space have envisioned that the chief complaint vocabulary would be a subset of SNOMED-CT codes. The HaPPy ontology was developed with this approach in mind and would be a logical starting point for establishing the first standard vocabulary list.

Recommendation 4: Once a steward has been designated, the steward's initial efforts should focus on convening the necessary organizations

and ontology experts to establish the vocabulary. This convening should include ontologists, EHR vendors, IT standards organizations, specialty societies, professional organizations, clinicians, governmental agencies, hospital/ED administrators, clinical informaticists, research organizations, measurement and measure developer organizations, patient-centered organizations focused on reducing harm and improving diagnosis, and pediatric and adult clinical registry representatives.

Aggregating Chief Complaint Data in the Absence of an Accepted Standard Vocabulary

Recommendation 5: In the interim, until a standard is adopted and implemented broadly in EHRs, EDs or other settings interested in pursuing chief complaint-based measurement should explore current capabilities of the EHR with their vendor to determine the capabilities of their system and potential for systematically capturing standardized chief complaint data. Consider locally implementing an established chief complaint vocabulary (e.g., HaPPy) in partnership with the EHR vendor to facilitate this work. Local collaboration across systems implementing this measurement strategy and standardization practices is encouraged to facilitate sharing of successes and implementation strategies.

Recommendation 6: For hospitals who are actively submitting data to local or national syndromic surveillance programs, there is an opportunity to use established public health syndrome definitions and data to define measure populations that can be accessed through the ESSENCE System. EDs are encouraged to collaborate with local public health agencies in submitting voluntary data to support syndromic surveillance. Hospitals collaborating with public health agencies in this way further supports the linkage of public health and acute care settings and takes advantage of existing processes, tools, and standards to process and classify data. While it does require

that ED quality personnel seek out access to their data in ESSENCE through their local health department, it provides a pathway for accessing the necessary data without having to re-engineer EHR infrastructure and data entry practices. The Committee agreed this could be a potential avenue for getting aggregated chief complaint data, but there was concern that the syndrome definitions established for public health use would be inadequate in scope for the needs of most emergency departments and for meaningful quality measurement.

Recommendation 7: Free text chief complaint data should continue to be collected as this remains a rich data source upon which multiple users of the data rely on for specific use cases.

Engaging Important Stakeholders to Advance Chief Complaint-Based Measurement

Recommendation 8: Once a steward and vocabulary have been established, it will be important to engage the necessary regulatory and standard setting bodies to adopt the selected vocabulary to facilitate widespread adoption. This would include collaboration with the Office of the National Coordinator (ONC) to include a standard chief complaint vocabulary and standardized data capture in the Trusted Exchange Framework, and exploration of standards such as QDM, Fast Health Interoperability Resources (FHIR), VSAC, and the Common Clinical Data Elements (CCDE) to determine how each can support chief complaint-based measurement and/or value sets.

Recommendation 9: CMS should provide measure developers with guidance on developing and testing chief complaint-based measures that are integrated into the [CMS Measures Management System Blueprint](#). The Blueprint was established by CMS as a resource to support organizations who are interested in developing measures and the process to develop measures. The document discusses various types of measure constructs

(i.e., patient-reported outcomes, cost and resource use measures) and provides guidance on best-practices for measure development processes.

Recommendation 10: The American College of Emergency Physicians (ACEP) Clinical Emergency Data Registry (CEDR) and other similar registries offer significant opportunity for promoting the collection of chief complaint data to support quality measurement. The Committee recommended that ACEP and other registries implement at least two relevant chief complaint-based measures in its registry to demonstrate feasibility of measuring quality using these data. In doing so, the registries should incorporate chief complaint data (free text and standardized elements) as a standard required data element for participating hospitals and physician groups.

Recommendation 11: Research organizations collecting ED-related data should capture chief complaint (CC) as a discrete data element. Ideally both a discrete, encoded data element and the free text string should be reportable elements included in the relevant data model. The ED CC field should utilize SNOMED-CT® for the value set.

Data Quality and Implementing Chief Complaint-Based Measures

Recommendation 12: As chief complaint-based research and measurement is in its infancy, the observed variation in care is compelling for quality measurement; however, the Committee recommended that caution be exercised when using chief complaint-based measures for purposes other than internal quality improvement. In particular, the lack of a standardized nomenclature or ontology means that chief complaint measures should not be used for payment purposes without a more consistent evidence base and experience implementing the measures in practice.

Recommendation 13: Given the challenges of collecting chief complaint data from patients (e.g., cultural and language barriers, variations in nursing practices), institutions that seek to implement chief complaint measures should focus efforts on identifying its ED-specific challenges to data quality and implement standard practices as necessary for collecting these data both in free text and standardized fields prior to implementation of selected measures.

NEXT STEPS

Future efforts to advance this work should focus on implementing the strategies and recommendations put forth by this Committee and examination of emerging issues and technologies in ED care (e.g., evolution of triage practices and patient-facing electronic triage tools). The Committee recognized that ongoing progress may occur slowly, and implementation of these recommendations may continue to be challenging as many of the prior barriers remain today. In an

effort to spur action and renew efforts to engage stakeholders on this issue, dissemination of this work will focus on fostering communication, raising awareness, and distribution of this report to key stakeholders. Communication targets will include the key informants, who may potentially take on a collaborative role in promoting this work through stewardship of a chief complaint vocabulary, funding measure development, or testing chief complaint-based eCQMs within their EDs.

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APPENDIX A:

Committee Members and NQF Staff

COMMITTEE MEMBERS

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APPENDIX B:

Definitions

Chief complaint: The patient's reason for seeking care or attention in the emergency department, captured by a clinician at initial presentation.¹³

Classification system: An organized arrangement of entries based on some hierarchical structure.

Clinical syndrome: A constellation of symptoms, combined with risk factors and demographic characteristics of a patient (e.g., age and gender).¹⁶ The combination of presenting problems with patient demographics, other risk factors, and other clinical data (e.g., vital signs).

Measure: A healthcare performance measure is a way to calculate whether and how often the healthcare system does what it should. Measures are based on scientific evidence about processes, outcomes, perceptions, or systems that relate to high-quality care. NQF-endorsed measures are tools that show whether the standards for prevention, screening, and managing health conditions are being met.

Measure, quality (also quality performance measure): Numeric quantification of healthcare quality for a designated healthcare provider, such as hospital, health plan, nursing home, clinician, etc.

Measurement framework: A conceptual model organizing ideas about how chief complaints should be used in measurement and how chief complaint measures can be used to examine quality of healthcare delivery in acute care settings, such as EDs.

Ontology: A set of concepts and categories in a subject area or domain that shows their properties and relationships.

Presenting problem: A provider's clinical interpretation of the patient's reported symptoms.¹⁵

Quality: Quality is how good something is and, for healthcare, is often expressed in a range, (e.g., percentage of patients). When a person receives high-quality healthcare, he or she has received the right services, at the right time, and in the right way to achieve the best possible health.

Reason for visit: The patient's motivation for seeking medical care and his perspective on the problem or reason for visit.¹⁴

APPENDIX C:

Scan of Measures and Measure Concepts

1. Chief Complaint Search Terms
2. Data Elements Captured in Environmental Scan

Chief Complaint Terms Used During Measure Scan

- Altered mental status
- Ataxia/difficulty walking
- Back pain/spasms (upper/mid/lower, including flank pain)
- Chest pain and related symptoms (palpitations)
- Cold/flu symptoms
- Cough
- Dizziness/vertigo
- Extremity pain
- Fever
- Focal weakness/numbness
- Generalized weakness/malaise/fatigue
- Head trauma
- Headache/eye pain/ear pain
- Loss of consciousness
- Nausea/vomiting/diarrhea
- Neck pain
- Pregnancy symptoms
- Seizure
- Shortness of breath
- Stomach and abdominal pain, cramps, and spasms
- Substance use/abuse/overdose
- Suicidal ideation
- Syncope
- Throat symptoms/sore throat
- Trauma
- Urinary symptoms
- Vaginal bleeding
- Vision loss/double vision

APPENDIX D:

Classification System Scan

TABLE D1. CHIEF COMPLAINT VOCABULARIES

Vocabulary	Number of Conditions Included
Hierarchical Presenting Problem Ontology (HaPPy) ¹⁵	690 presenting problem concepts
Canadian Emergency Department Information System (CEDIS)	183 chief complaints
Presenting Complaint List (2.0) ^{12,37}	
Dominik Aronsky, et al. ¹⁰	54 chief complaints
Coded Chief Complaints for Emergency Department Systems (CCC EDS) ¹¹	243 chief complaints
Reason for Visit Classification System (RVC) ¹⁴	980 conditions (symptom module)

APPENDIX E:

Details of Environmental Scan Findings

A total of eight diagnosis-based measures were also found that were specified for other settings but could potentially be modified for use in the ED; these were mostly related to behavioral health conditions. There were approximately 13 conditions where no measures or concepts were identified. The highest number of chief complaint-based measures and concepts was identified for back pain (14 measures) and chest pain (10 measure concepts), respectively. These are followed by five measures in head injury and three measures for abdominal pain. While detailed specifications were not found for all measures,

the majority of them were specified using ICD codes. There were also several important and common chief complaints where no measures or measure concepts exist. For example, vomiting/nausea/diarrhea has no measures or concepts although it makes up 1.8 percent of ED visits, nor does fever although it makes up 4.4 percent of ED visits.³ Five complaints for which no measures or concepts were found (vomiting, fever, unspecified pain, throat symptoms, and cough) also represent conditions identified by the 2015 National Hospital Ambulatory Medical Care Survey (NHAMCS) among the 10 most common complaints in the ED.

TABLE E1. MEASURES AND CONCEPTS BY CHIEF COMPLAINT

Chief Complaint	Number of Measures	Number of Concepts
Back Pain	14	1
Chest Pain	10	10
Head injury	5	0
Abdominal Pain	3	0
Altered Mental Status	3	0
Chest Pain/Shortness of Breath	2	0
Syncope	2	0
Vaginal Bleeding	2	0
Substance Use	2	0
Neck Pain	1	0
Low Back Pain	1	0
Sore Throat	1	0
Head Trauma	1	0
Seizure	1	0
Suicidal Ideation	1	0
Dizziness	1	0

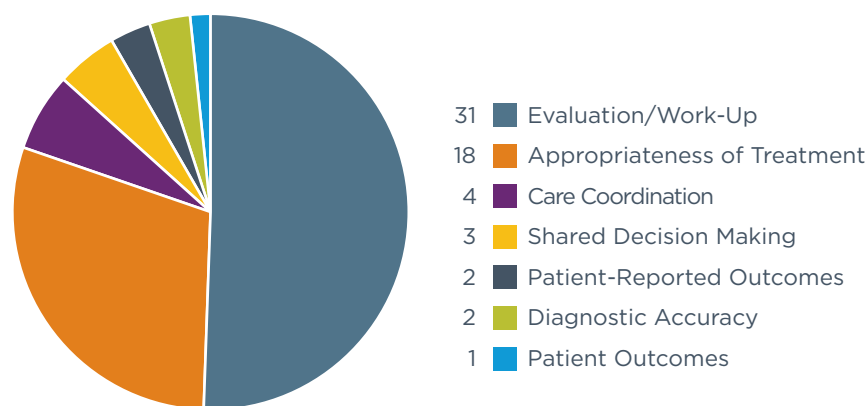
Chief complaint conditions with no existing measures or concepts found in the scan included the following:

- Cold/flu/upper respiratory symptoms
- Cough
- Vomiting/nausea/diarrhea
- Ataxia/difficulty walking
- Eye problems (including double vision/vision loss)
- Ear pain
- Fever
- Vertigo
- Pregnancy symptoms
- Generalized weakness/malaise/fatigue

- Focal weakness/numbness
- Extremity pain
- Urinary symptoms

To better understand the types of measures identified, each measure was tagged with an appropriate domain; the seven measurement domains represented in the measures found included care coordination, evaluation/work-up, patient-reported outcomes, diagnostic accuracy, patient outcomes, shared decision making, and appropriateness of treatment (**Figure E1**). The domain for measures focused on evaluation/work-up was the largest with 31 measures and concepts. This domain includes measures focused on the appropriateness of the work-up based on the chief complaint, including imaging and testing (e.g., electrocardiogram [EKG]).

FIGURE E1. (CLAIMS-BASED) CHIEF COMPLAINT-BASED MEASURES AND CONCEPTS BY DOMAIN



APPENDIX F:

Key Informant Interviewees

Name	Title	Organization
Jay Schuur	Physician-in-chief for emergency medicine; Chair of Department of Emergency Medicine	Lifespan; Brown University
Debbie Travers	Associate Professor of Health Care Systems and Emergency Medicine	University of North Carolina - Chapel Hill
Teri Reynolds	Scientist, Emergency and Trauma Care Program Lead	World Health Organization
Richard Wild, Michael Handrigan	Chief Medical Officer, Atlanta Region; Chief Medical Officer, Program Integrity	Centers for Medicare and Medicaid Services
Kari Baldonado, Angie Glotstein, Jana Malinowski	Senior Director and Solution Executive, Quality Measurement; Director, Population Health Strategy; Lead Solution Strategist, Quality Reporting Development	Cerner
Caroline Schwartz, Russ Bayuk	Software Developer, Team Lead; Product Lead, Software Development	Epic
Kristin Rising	Associate Professor, Director of Acute Care Transitions, Emergency Medicine	Thomas Jefferson University
Rachel Abbey	Program Officer, Public Health Analyst	Department of Health and Human Services
Erin Austin	Enhanced Surveillance Coordinator	Division of Surveillance and Investigation Virginia Department of Health
Paula Yoon, Jason Thomas, Lesliann Helmus, Michael Coletta, Bessie Valle	Division of Health Informatics and Surveillance, Center for Surveillance, Epidemiology, and Laboratory Services	Centers for Disease Control and Prevention

APPENDIX G:

Sample Key Informant Interview Guide

#	Topic	Questions/Discussion Guidance	Timeframe
1	Introductions/ Welcome	<ul style="list-style-type: none"> • NQF staff introductions • Interviewee introductions 	2 minutes
2	Purpose and overview of interview	<ul style="list-style-type: none"> • Interview Overview/Purpose of Interview • Brief Project Description • What we hope to learn 	5 minutes
3	Interviewee Role and Organization	<ul style="list-style-type: none"> • Can you give us a brief description of your role and responsibilities in your current position(s)? <ul style="list-style-type: none"> – Organization, department/division description – Organization type/stakeholder category – Region – Population served – Service lines – Key responsibilities 	3 minutes
4	Experience with Chief Complaint measurement	<ul style="list-style-type: none"> • In what ways are you currently using chief complaint measures? <ul style="list-style-type: none"> – What specific measures are most helpful and why? – How have you used measurement results for improvement? • Do you have any experience with implementing chief complaint-based measures in the ED? <ul style="list-style-type: none"> – Describe the work flow and data collection strategy associated with those measures (e.g., EHR use, documentation used, staff members involved, distribution of results). • Do you have experience developing chief complaint-based measures? <ul style="list-style-type: none"> – Describe your approach, conditions/complaints of interest, and challenges you encountered. 	10 minutes
5	Organization's approach/ strategies for addressing chief complaint measurement strategies and managing resource utilization for diagnosis in the ED	<ul style="list-style-type: none"> • How might your organization operationalize chief complaint measures? • How does the process for quality reporting in emergency medicine work in your organization? • What are some ways that you can work to facilitate quality reporting, and how would this work for chief complaint measures? • What do you see as key facilitators to developing and implementing chief complaint measures in emergency department from your perspective? 	15 minutes

#	Topic	Questions/Discussion Guidance	Timeframe
6	Challenges & Strategies	<ul style="list-style-type: none"> • Chief complaint-based measurement has been studied and discussed for many years. What do you see as the major barriers that have prevented more widespread development and implementation of these measures? - What strategies and/or resources are needed to overcome these barriers? 	10 minutes
7	Gaps in knowledge, evidence, organizational needs	<ul style="list-style-type: none"> • What gaps do you see in chief complaint measures? What types of evidence are needed to support and enhance chief complaint measurement? • What sorts of IT approaches are needed to effectively implement chief complaint measures and how might your organization facilitate those approaches? • What sorts of chief complaint measures do you think would be valuable to develop/use in your organization or best support your practice that don't currently exist? • What is the key barrier to your organization devoting resources to developing/prioritizing chief complaint measures? 	13 minutes
8	Wrap-up	<ul style="list-style-type: none"> • Recapping any follow-up items • Next steps • Thank-you/ Close 	2 minutes

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