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ORIGINAL RESEARCH CONTRIBUTION

Emergency Department Performance Measures Updates: Proceedings of the 2014 Emergency Department Benchmarking Alliance Consensus Summit

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Abstract

Objectives: The objective was to review and update key definitions and metrics for emergency department (ED) performance and operations.

Methods: Forty-five emergency medicine leaders convened for the Third Performance Measures and Benchmarking Summit held in Las Vegas, February 21–22, 2014. Prior to arrival, attendees were assigned to workgroups to review, revise, and update the definitions and vocabulary being used to communicate about ED performance and operations. They were provided with the prior definitions of those consensus summits that were published in 2006 and 2010. Other published definitions from key stakeholders in emergency medicine and health care were also reviewed and circulated. At the summit, key terminology and metrics were discussed and debated. Workgroups communicated online, via teleconference, and finally in a face-to-face meeting to reach consensus regarding their recommendations. Recommendations were then posted and open to a 30-day comment period. Participants then reanalyzed the recommendations, and modifications were made based on consensus.

Results: A comprehensive dictionary of ED terminology related to ED performance and operation was developed. This article includes definitions of operating characteristics and internal and external factors relevant to the stratification and categorization of EDs. Time stamps, time intervals, and measures of utilization were defined. Definitions of processes and staffing measures are also presented. Definitions were harmonized with performance measures put forth by the Centers for Medicare and Medicaid Services (CMS) for consistency.

Conclusions: Standardized definitions are necessary to improve the comparability of EDs nationally for operations research and practice. More importantly, clear precise definitions describing ED operations are needed for incentive-based pay-for-performance models like those developed by CMS. This document provides a common language for front-line practitioners, managers, health policymakers, and researchers.

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The landscape of health care delivery systems is changing. With the passage and implementation of the Patient Protection and Affordable Care Act, the national conversation about health care delivery has shifted to focus on incentivizing quality of care and enhancing value to the customer.[1] "Value-based purchasing" programs have matured quickly over the past few years as a means to slow the growth of previously rapidly escalating national health care costs.[2–4] As such, there is increased scrutiny by policymakers, payers, and

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consumers for health care delivery systems to publish performance data.[5] There are other compelling reasons to pursue standardization of performance data: regulatory necessity, emergency department (ED) operational management, ability to meaningfully respond to health policy critiques of services, and research. Therefore, it is important to have a common language for industry-wide use to evaluate performance of ED services across various practice settings.

In February 2006, the first "Performance Measures and Benchmarking Summit" convened key stakeholders in emergency medicine (EM) to develop standard terminology for basic ED operations. In 2010 a second conference was convened to build on the work of the first. The resulting documents developed by stakeholders from within the specialty have become the criterion standard for the industry to describe ED operations and are used widely to compare ED performance rates.[6–14] These definitions have also been necessary for descriptions of policies created by regulatory bodies, including the Centers for Medicare and Medicaid Services (CMS) and The Joint Commission (TJC), and some of the metrics have been endorsed as quality measures by the National Quality Forum. On January 1, 2014, TJC developed and implemented hospital-wide flow program LD.04.02.11 EP 6. This requires hospitals to measure and set goals for mitigating and managing the boarding of patients who come through the ED.[15] In 2014, CMS initiated a pay-for-reporting program for hospitals that included ED time intervals of patient length of stay, ED boarding, and left-without-being-seen rates.[16]

EDs now care for over 140 million patients annually and have been identified as a high-cost target for potentially avoidable health care costs.[17,18] Since the last conference, there has been increasing pressure from payers and consumers for cost transparency and a focus on resource stewardship.[19,20] Defining the value of emergency care services and creating a means to compare EDs across the country are important first steps in understanding the national emergency medical care landscape, as well as potential opportunities to improve care delivery. Given the rapidly changing landscape of health care delivery, the Emergency Department Benchmarking Alliance (EDBA) organized a third summit in February 2014 to review and update this critical terminology, once again convening national leaders in ED operations, research, and health policy. The summit had two distinct goals: 1) to review and update the 2010 EDBA sponsored measures and definitions and 2) to assess if measures were appropriately defined and would help in comparing ED structure and performance across different practice settings. The summit participants were tasked with reviewing and revising the definitions for core elements of ED operations while striving to maintain consistency with previous work already done in this area. The vision was to set standards for industry-wide application. The results recommended are presented here.

METHODS

The EDBA is a not-for-profit organization established in 1994. It operates as a collaborative of quality and performance-driven EDs. It is a membership organization that requires annual dues. EDBA convenes a learning community through data and operational strategy sharing to identify industry best practices. The EDBA also developed and maintains a database of ED performance and operational benchmarking data from participants in the collaborative, which currently includes over 1,700 EDs and over 45 million ED visits annually. Innovations and best practices identified by the collaborative are disseminated through conferences and publications.[21–28]

Participants

Invitations for participation in the Third Performance Measures and Benchmarking Consensus Summit were solicited by e-mail. The summit attendees included 45 participants representing senior leadership of federal regulatory agencies, commercial payers, large group practice organizations, consumer groups, ED staffing organizations, professional societies, academic medical centers, and community hospitals (Data Supplement S1, available as supporting information in the online version of this paper). Participants were invited based on demonstrated professional and/or leadership in the area of ED operations, performance, and metrics as validated by any of the following: 1) research and publications in the field; 2) books, articles, and lectureships in the field; 3) participation on committees, task forces, and technical expert panels related to the field; and 4) participation in the previous two successful summits. Individuals with professional ties to a list of important stakeholder groups identified in advance by the EDBA Planning Committee (as assigned by the EDBA Board of Directors) were also invited. The summit also included participants with professional affiliations to a large number of regulatory and professional organizations (Data Supplement S2, available as supporting information in the online version of this paper). Hotel accommodations were paid for by the EDBA for participants. No stipends or consulting fees were offered to participate. Participants reported no conflicts or proprietary interests.

Summit Consensus Model

The Summit Consensus methodology was similar to previous EDBA summit conferences, except that the consensus methodology was refined and a 30-day public comment period was added in order to gain widespread input from conference nonparticipants.[6–8] The work of the summit was organized into four workgroups with one or two leads (Data Supplement S1). Workgroup leaders were chosen by conference organizers based on their expertise. Workgroup participants were chosen to reflect multiple stakeholders. Workgroups were assembled to be balanced with representative experts in ED operations, quality measurement, information systems, pediatric EM, emergency nursing, and representatives from key stakeholder organizations that steward competing definitions of ED performance metrics. Each workgroup was asked to consider the list of 2010 definitions and terminology organized into one of the following areas: 1) operating characteristics and endogenous/exogenous factors that affect ED performance, 2) ED time stamps and time intervals that measure performance, 3) process definitions that describe

ED workflows and proportion measures, or 4) utilization measures that describe emergency service delivery. The workgroups were tasked with either endorsing or updating the 2010 recommendations. Background information including material pertaining to the utilization of the previous consensus conference measures in the public or health policy domain, controversies, and pertinent associate work done by other stakeholder organizations was given. In addition, participants were directed to consider this when reconsidering the assigned definitions and terminology. Oversight for the workgroups was provided by the EDBA Board of Directors, with each board member having served as a participant in the first two summits.

A modified Delphi expert panel technique was used to develop consensus.[29–31] Workgroups collaborated through threaded e-mail discussions and conference calls prior to attending the summit in person. Preliminary definitions developed by the work groups were then presented to all summit participants. Summit participants offered structured feedback, which was then followed by workgroup breakout sessions to discuss the conference participant feedback. Revised workgroup definitions were then again represented to all summit participants with another series of modifications made. This process continued via conference calls and workgroup e-mails until workgroup consensus was achieved (defined as no further recommended modifications by the workgroup).

A novel 30-day public comment period was then posted on April 1, 2014, to a public website (http://www.edbenchmarking.org/ed-benchmarking-summit) with a draft of the summit recommendations. Specific feedback was solicited from the stakeholder groups during the comment period (Data Supplement S3, available as supporting information in the online version of this paper) as a way to increase feedback.

Members of the EDBA board collated the public comments received and distributed them to the appropriate workgroup chair(s). Comments were then reviewed by the workgroups. Each comment submitted was considered by the appropriate workgroup, and workgroup leaders led the group in its consideration of changes. The draft manuscript was circulated for additional review by the summit steering committee. Areas of contention were specifically reviewed via threaded e-mail discussions and conference calls. The consensus paper was then reviewed and approved by the workgroup leaders and EDBA Board of Directors.

RESULTS

Factors Affecting ED Performance (Operating Characteristics and External Factors)

Since the previous summit, two studies have linked the characteristics of a hospital and community with ED performance capability on commonly used metrics.[9,32] This makes comparing ED performance a complex task, requiring careful consideration of factors internal to an ED and hospital (i.e., ED-specific factors or operating characteristics as they have been called in the previous papers) and external factors (i.e., community, delivery system, and financing factors that are outside of the control of any specific ED).[6–8] To accurately and meaningfully compare ED performance, it is important to consider both internal factors and external factors. Further, appropriate comparison may require the creation of measure-specific risk adjustment methodologies.

Internal Factors. Factors that are internal to an ED and hospital include factors related to the patient population (i.e., to the volume and severity of illness) and both ED and hospital resources that are available (e.g., access to specialty care services). These can be measured through institution-specific surveys. ED operating characteristics and hospital operating characteristics are shown in Tables 1 and 2.

External Factors. These are factors affecting ED performance and are related to three components: the health and demographics of the community, the structure of its health care delivery system and staff, and its underlying financial resources (such as insurance status and their structure).

HEALTH AND DEMOGRAPHICS OF THE COMMUNITY

The health and demographics of the community include indirect measures associated with health care demand, such as poverty and education. In addition, there are more measures of health status, including subjective assessments of health, age mix, and access to care (e.g., insurance mix), and measures of environmental factors (e.g., violence and pollution). The group did not decide on a comprehensive list of these metrics. However, data from the Area Health Resource File (AHRF) were considered as a potential source of this information at the county level and through data sources such as local health departments, the United States Census Bureau, or other local databases.[33]

DELIVERY SYSTEM FACTORS

Emergency care demand and performance are also affected by the resources available outside the ED, including available hospital beds, emergency medical services (EMS) capabilities, urgent care centers, retail clinics, outpatient clinics, and skilled nursing facilities, along with the number of providers divided by physician type (e.g., primary care physicians, specialists) and nonphysician providers (physician assistants, advanced practice nurses, nurses, pharmacists, physical therapists). These data may also be available through the AHRF or other data sources.

HEALTH CARE FINANCING FACTORS

Financing factors also influence acute care demand and performance. These factors may include payment policies, the local insurance market, or the local regulatory environment. While there was consensus that these had great effect on ED performance and would likely accelerate as new payment reform policies are implemented, reliably defining and measuring these concepts was seen as an area for future work.

Table 1
ED Operating Characteristics

- ED census: Number of patients arriving to the ED, most commonly "annual" ED census.
- ED acuity: % of patients arriving to the ED, divided by triage acuity (i.e., Emergency Severity Index or Canadian Emergency Department Triage and Acuity Scale).
- ED treatment spaces: Treatment spaces should be divided into the following exclusive categories—ED rooms (i.e., four walls, door, and bed), ED nonroom bed-spaces, ED nonroom chair spaces, ED observation unit treatment spaces.
- ED specialized units: Dedicated pediatric ED, geriatric ED, psychiatric ED, or other dedicated spaces designed for subsets of patients.
- ED staffing: Staff should be divided in the following categories—physician full-time equivalents (FTEs), physician assistants FTEs, advance practice nurse FTEs, nurse FTEs, technician FTEs, pharmacist FTEs, social work FTEs, case manager FTEs, other administrative staff FTEs.
- ED admission rate: Divided into—intensive care unit admission rate, hospital floor admission rate (this may include admissions that are placed on "observation" status), and ED observation unit admission rate.
- ED transfer rate: Divided into ED transfers out and in and described as a rate.
- ED age mix: % of visitors by the following categories:
  - Infant, ages 0–2 yr
  - Pediatric, ages 3–18 yr
  - Adult, ages 19–64 yr
  - Geriatric, ages 65–80 yr
  - Elder geriatric, ages > 80 yr
- ED case mix by diagnosis: % of the top ten ICD-9 (or ICD-10) codes for ED patients; remainder should be "other."
- ED case mix by chief complaint: % of the top 10 chief complaints for ED patients; remainder should be "other."
- ED insurance mix: % Medicare, % Medicaid, % private, % self-pay, % other insurance.
- Other characteristics: Teaching hospital (i.e., regular resident trainees), ED residency training program (i.e., residency review committee-approved), trauma certification level (I–III or nontrauma), stroke certification (primary, comprehensive), transplant services.
- ED technology: ED electronic health record (i.e., enterprise vs. nonenterprise); diagnostic testing should be categorized based on availability to ED 24/7 vs. <24/7—lab testing, point-of-care testing, MRI, CT, ultrasound, telemedicine (i.e., to interact with other EDs).

Table 2
Hospital Operating Characteristics

- Hospital beds: Designated as ICU (including step-down) beds, inpatient floor beds, observation unit beds (ED and non-ED).
- Hospital specialists available to ED: should be divided by 24/7 vs. <24.7—allergy/immunology, anesthesia, dentistry, cardiology, family medicine, internal medicine, gastroenterology, general surgery, geriatrics, nephrology, neurology, neurosurgery, obstetrics/gynecology, ophthalmology, orthopedics, otolaryngology, palliative care/hospice, pediatrics, podiatry, psychiatry, rheumatology, trauma surgery, urology.
- Hospital technology: Hospital electronic health record (specific vendor), electronic patient tracking system (specific vendor).
- Hospital specialty units: Cardiac catheterization laboratory, interventional radiology, burn unit, pediatric unit, psychiatric unit.
- Hospital fiscal designation: i.e., nonprofit, profit, federal, other.
- Inpatient staffing

Time Stamps and Time Interval Metrics

The workgroup identified a set of key time stamps and time intervals for ED operations, starting from the 2010 definitions. Additionally, subcycle time intervals for critical ED processes such as laboratory, imaging, and bed management have also been defined or clarified. When possible, the participants attempted to harmonize with work done by other stakeholder groups, in particular the 2009 effort by ENA, the ED technical expert panel advising CMS (convened by the Oklahoma Foundation for Medical Quality [OFMQ], a CMS quality improvement organization) and those measures endorsed by the NQF.[34,35] Figures 1A and 1B are the schematic representation of these time stamps and time intervals. Time stamps are defined in Table 3 and time intervals and subcycle intervals are defined in Table 4.

Process Definitions and Proportion Metrics

Process Definitions. An ED visit consists of the sum total of a series of processes that take place, all dedicated to the safe and efficient care and disposition of the patient. They may occur in series or in parallel and frequently involve interfaces with other departments or services. Process definitions (Table 5) help to refine and standardize what is being described by each process term.

Proportion Metrics. Some ED operational metrics are more meaningful when placed in context of the overall sample size. These ratios have been termed "proportions." The summit attendees attempted to maintain the same terms and definitions to maintain historical context. However, consensus recommendations found that more precision was required and thus recommend

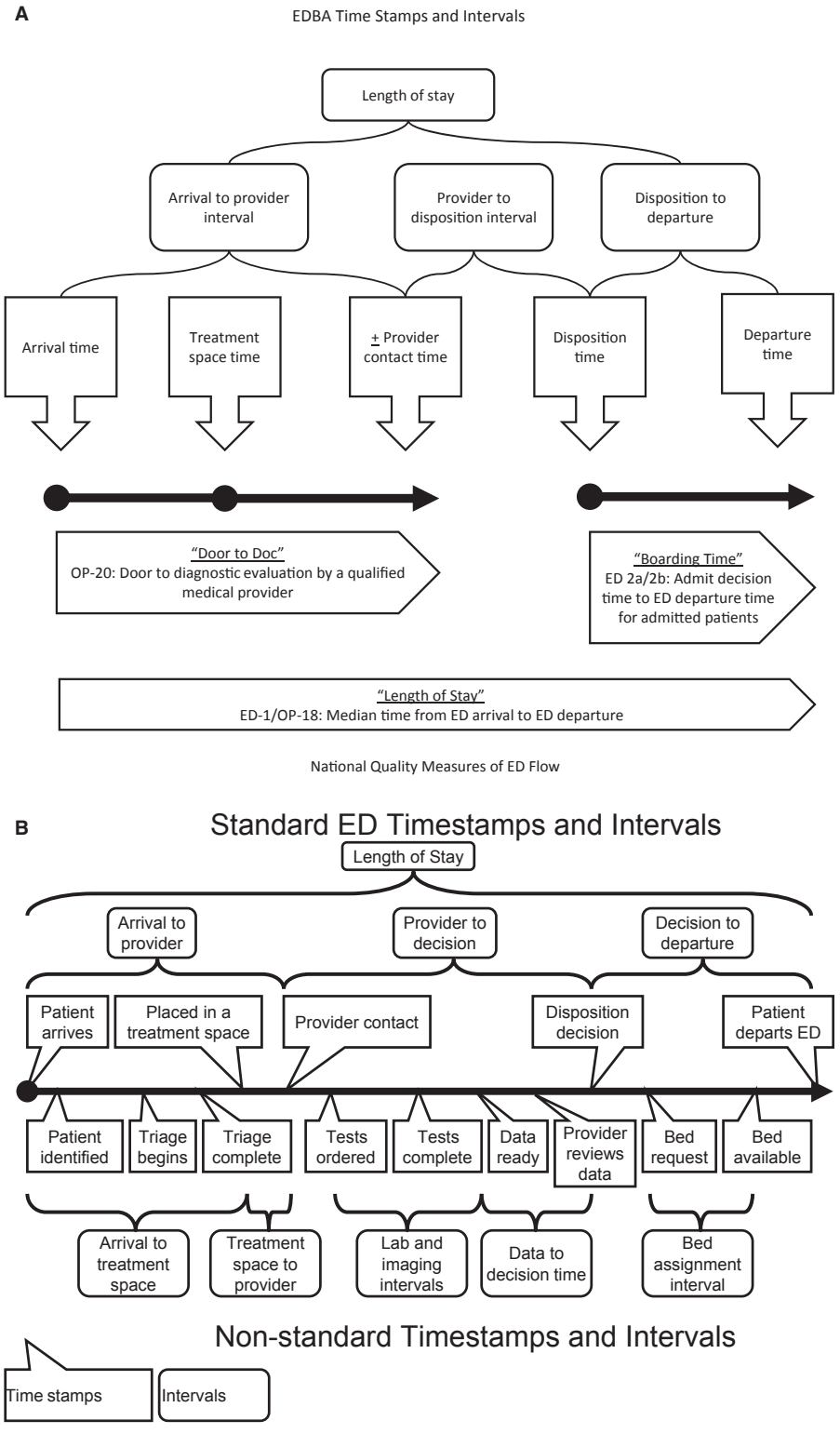

Figure 1. (**A**) Emergency Department Benchmarking Alliance (EDBA) time stamps and intervals. ±Provider contact time may precede placement in a definitive treatment space depending on ED flow (e.g., assessment in triage by physician). (**B**) Emergency Department Benchmarking Alliance time intervals and subcycles.

some additional new terms. Table 6 defines these recommended proportion metrics including the readmission measures discussed below. Figure 2 is a schematic of the proportion metrics that specifically relate to patients who leave the ED before their encounters are complete.

Readmission Measures. Changes in health care payment reform have placed increasing pressure on hospitals to prevent readmissions within 30 days of discharge. Therefore, the summit attendees proposed the establishment of metrics related to hospital readmission to quantify the ED-related burden (Table 6).

Table 3
Time Stamps

- Arrival time: First documented date and time the patient arrived in the ED. Specifications: this is the first recorded contact in the ED record and not necessarily registration time, triage time, or prearrival notification.
- EMS ED arrival time: Date and time that EMS documents arrival at the ED. Specifications: this time is recorded by the EMS staff in the EMS record. It may or may not be the same as the "arrival time."
- EMS offload time: Date and time that the patient is transferred from the EMS stretcher and placed in an ED treatment space. Specifications: this is recorded in the EMS run report. This represents the same conceptual time as "treatment space time" for patients who arrive by EMS. Because this time is recorded in the EMS record (and not the ED record) there may be discrepancies.
- Nurse contact time: Documented date and time of first contact with a nurse (RN/LPN) in the ED. This definition is not met by contact with a triage nurse.
- Treatment space time: Documented date and time of placement in an ED treatment space. Specification: "treatment space" is any space the hospital or facility designates as a space to render emergency care and is facility specific.
- Provider contact time: Documented date and time of first contact with a physician/APRN/PA in the ED. Specification: any physician/APRN/PA who contacts the patient is eligible. It is not determined by the institution's definition of which providers are credentialed to perform a medical screening examination.
- Admit time: First documented date and time of the disposition to admit the patient from the ED. Specification: as admission processes vary at different hospitals, this can use the first documented time of any of the following: 1) admission order (this may be an operational order rather than the hospital admission to inpatient status order), 2) disposition order (must explicitly state to admit), 3) documented bed request, or 4) documented acceptance from admitting physician. This is not the "bed assignment time" or "report called time."
- Disposition time: Documented date and time of the patient disposition order (transfer, observe, admit, discharge, die).
- Departure time: Documented date and time of the patient's physical departure from the ED.

Table 4
Time Intervals and Subcycle Intervals

Time Intervals and Subcycles

- Arrival to provider (a.k.a., "door to doc"): Arrival time to provider contact time.
- ED length of stay*:* Arrival time to departure time. This is tracked for the following subsets of patients:
  - Admitted patients
  - Discharged patients
  - Observation patients
  - Behavioral health patients
- Arrival to treatment space: Arrival time to treatment space time.
- Treatment space to provider: Treatment space time to provider contact time.
- Provider contact to disposition: Provider contact time to disposition time.
- Disposition to departure: Disposition time to departure time.
- Admit to departure: Admit time to departure time.

Subcycle Intervals

- Triage interval: Time interval from when the triage or intake is initiated by an institutionally credentialed provider to the time when triage is completed.
- Laboratory interval: Time from the placement of an order for laboratory testing until the results are available.
- Imaging interval: Time from the placement of an order for an imaging test until the results are available to the ED provider. Institutions are recommended to track for each modality: plain radiography, CT scanning, ultrasound, MRI.
- ED bed cleaning interval: Time from when a bed is vacated until it is cleaned and ready for the next patient.
- ED consultation interval: Time from the placement of an order for an ED consult until the initial consultant recommendation is communicated to the ED provider.
- Bed assignment interval: Time from the placement of a request for an inpatient bed to the time a bed is assigned (empty clean and staffed) and the ED receives notification.

ED Utilization and Emergency Staffing Units

Higher ED utilization has been correlated to longer length of stay and higher acuity.[36,37] Previous work has also demonstrated that ED utilization may be correlated to patient outcomes, including patient satisfaction/engagement, length of stay, and costs.[38,39] Defined as emergency service units and tracked to understand utilization of resources, the following are recommended as service units (Table 7). It is well known that the cost of providing care for patients in the ED depends in part upon staffing resources; as such, for the first time the Summit participants recommend standardized definitions (Table 8).

DISCUSSION

Since 2008, the Triple Aim has been a fundamental framework from which to describe the value of health care by improving the experience of care, improving the health of populations, and reducing health care per-capita costs. To meet these reform goals, initiatives such as optimizing resource use, eliminating waste, reducing

Table 5
Process Definitions

- Intake: Process of receiving and sorting persons presenting to the ED for acute medical care. Intake involves patient identification, triage, and registration. Intake starts at the arrival time stamp. The intake steps may be performed in any order.
- Identification: Process of collecting the information needed to establish a unique patient encounter. The currently accepted method is to ask the patient for two unique identifiers. Examples include name, birth date, and social security number.
- Triage: Process of assessing patients who present for care to prioritize access according to the urgency of the patient's acuity and available resources that their care may require. Traditional triage is typically performed by a registered nurse. One of the most important features of triage is the assignment of a standardized and validated triage level. The most common triage scale is the five-level Emergency Services Index.
- Registration: Process of collecting and recording all information required to generate a patient-specific record. Information recorded may include financial guarantor, insurance information, and sociodemographic statistics. Registration's main function is to generate an ED record for eventual inclusion with the permanent patient record. Registration also allows the ED to obtain the necessary data to facilitate billing for the encounter.
- Medical screening examination: This exam must meet federal regulations (i.e., EMTALA) and be performed by "qualified medical personnel." The medical screening examination includes stabilization (to the extent possible based on the hospital's capabilities) of any identified emergency medical condition(s).
- Discharge: Process where ED care is completed and the patient leaves the ED, ending the encounter. It is a multistep process—1) The decision is made that the ED encounter is complete and the discharge order is written. 2) The patient receives discharge material and acknowledges understanding. 3) The patient departs from the ED treatment area.
- Departure: Process where the patient physically leaves the ED after the encounter has been completed. Potential destinations after departure include home, an outpatient care facility (discharged patients), another inpatient facility (transferred patients), an inpatient unit at the same facility (admitted patients), or a physician's office providing specialized care. Departure involves a transition of care.
- Boarding: Process of holding an admitted patient in the ED while waiting for an inpatient bed. This boarding time interval is measured as the time between the admit decision and departure time stamps.
- Observation: Process where the patient has an extended "outpatient" stay within the hospital after the ED encounter. Observation may occur anywhere in the hospital. It is usually defined by a time interval and is most often completed in 23 hours or less.
- Admission: Process of transferring the patient and his/her care to inpatient status, for treatment that is needed after the ED encounter. The admission process involves a transition of care from the ED to another location. It is a multistep process and includes the following—1) an admission order by the provider, 2) an appropriate hand-off to inpatient providers, 3) actual departure.
- Ambulance diversion: Process whereby EMS patients are temporarily diverted to an alternate facility. Diversion is usually caused by a partial or complete limitation of institutional capability to provide acute care services, usually a limit on some type of inpatient beds or specialty resource (e.g., OR). It is measured as the time interval that the hospital diverts ambulances away.

overall costs, and coordinating the delivery of quality care (while improving patient outcomes) have become a priority for policymakers and payers.[40–42] The ability to compare consumer goods is well established in the marketplace, but is a relatively new and surging demand of health care delivery systems. As value-based purchasing reimbursement models expand, there has also been increased scrutiny by policymakers, payers, and consumers for health care delivery systems to publish performance data.[5] Timeliness and effective care are core attributes of emergency care delivery and have been used to describe ED performance.[43,44] They have also been critical measures used to facilitate notable changes in ED operations and quality improvement research.[45–49] Time metrics (the time it takes for certain processes and subcycles of care to be performed) and proportion metrics (percent defects) have become de facto markers for quality in the literature. As such, the need for standardized operations terminology key metrics relevant to the practice of EM has never been more pressing.

Important time stamps and intervals, processes, proportions, and utilization rates are necessary to create a framework with which to standardize the language around ED care and to create opportunities for comparative analysis of ED performance both internally and externally across various practice settings. This will become even more important as payers look to incent cost reduction and desired patient outcomes.

Previous work published by the EDBA Consensus Summits demonstrated the value of standardized measures.[6–8] In particular, the published time stamps and time intervals of ED flow have been helpful to policy makers.[15,16] To be operationally useful, time stamps must be clearly defined and easy to capture, and must be meaningful descriptors of clinical workflow. As EDs increasingly incorporate information technology into work processes, electronic tracking systems will capture routine time stamps as part of patient care. The most reliable time stamps may be those that also serve patient flow functions. The best systems will have time measures with real-time descriptive and predictive flow modeling within the electronic dashboard interface. This will allow for easier benchmarking and comparisons.

Updates and Controversies

The previous two summits looked at department-specific factors or characteristics with an emphasis on ED volume and census and acuity. Although it has become apparent that fair comparisons of ED performance must take into account the differences that exist between EDs based on annual volumes, acuities, and efficiency measures, the 2014 Summit participants felt that the specialty must move beyond the consideration of these specific ED-based factors to provide a meaningful comparison based on ED performance. This is because ED

Table 6
Proportion Metrics and Readmission Measures

Proportion Metrics

- Left before treatment completion (LBTC): Total number of patients who leave before treatment was completed, divided by the total number of patients who presented to the same ED during a defined time period. It is an attempt to quantify the patients who walk away from the ED.
- Left before being seen (LBBS): Total number of patients who leave the ED before examination by a physician/APRN/PA, divided by the total number of patients who presented to the same ED during a defined time period. Which provider completes the patient's initial assessment is governed by law and hospital bylaws. It will vary by site. LBBS includes patients who complete the triage process. LBBS patients may or may not have received initial treatment and/or diagnostics. This group can be further broken down:
- Left before being seen–no intervention (LBBS-NI): Total number of patients who leave the ED before examination by a physician/APRN/PA and receive no intervention, divided by the total number of patients who presented to the same ED during a defined time period. This subgroup of LBBS patients has received no intervention after arrival. They may have completed the triage process.
- Left before being seen–with intervention (LBBS-WI): Total number of patients who leave the ED before examination by a physician/APRN/PA but after an intervention, divided by the total number of patients who presented to the same ED during a defined time period. Such interventions may include protocol driven diagnostic testing or treatment. It may also include anything appropriate for the triage nurse's practice.
- Left subsequent to being seen (LSBS): Total number of patients who leave after being seen by a physician/APRN/PA, but before completion of the ED encounter, divided by the total number of patients who presented to the same ED during a defined time period. In the past these patients have been designated by other names, elopements or against medical advice.
- Left against medical advice (LAMA): A legal term, the total number of patients who choose to leave the ED against the advice of the physician/APRN/PA and after informed refusal is communicated, divided by the total number of patients who presented to the same ED during a defined time period. This decision to act against medical advice requires that the patient/legal designee have the capacity to consent and chooses to terminate the ED visit.

Readmission Measures

- ED visits after hospital discharge: Number of patients who are treated in the ED within 30 days following discharge from the hospital per 100 hospital discharges.
- ED visits after hospital discharge that result in readmission (inpatient): Number of patients who are treated in the ED within 30 days following discharge from the hospital and are readmitted as an inpatient per 100 hospital discharges
- ED visits after hospital discharge that result in readmission (observation): Number of patients who are treated in the ED within 30 days following discharge from the hospital who are readmitted as an outpatient with observation services per 100 hospital discharges.

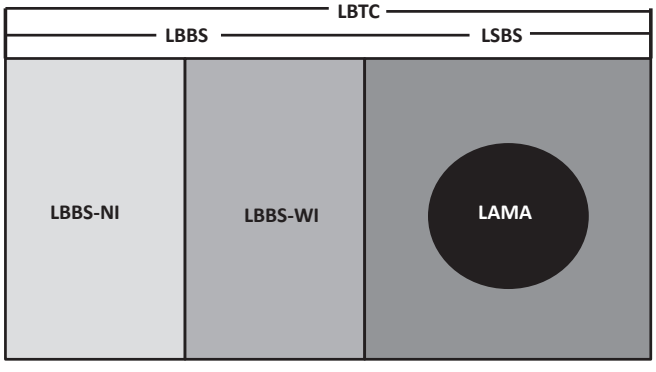

Figure 2. Temporal description of patients who leave ED before treatment is complete (see Table 6 for definitions). LBTC = left before treatment completion; LBSS = left before being seen; LBBS-NI = left before being seen–no intervention; LBBS-WI = left before being seen–with intervention; LSBS = left subsequent to being seen; LAMA = left against medical advice.

performance can be influenced not only by factors that are under the control of an ED, but rather, ED performance and its ability to deliver value and effective care is influenced by the local community and health care system in which it sits. Summit participants deliberated about how to describe the inherent community resources, in addition to exogenous and endogenous factors, which should be considered when making comparisons of performance measures. Although not fully codified, proposed here are the rudiments for such a comparison scheme.

In previous summits, attendees were concerned that EDs with paper-based charting would have difficulty capturing the recommended data. However, as information technology continues to enable the capture of meaningful time data, the 2014 Summit attendees were more confident about the capabilities of various EDs to measure and track these data. It reaffirmed the importance of most of the previously endorsed ED time stamps and time intervals. The Summit participants added more specificity to the "arrival time," "provider time," and EMS-related time stamps to increase clarity.

The time stamp that generated the most debate was the "admit decision time." Summit participants noted that "decision to admit time" is an unfortunate choice of words, as the inclusion of the word "to" connotes a time interval, rather than a point in time or a time stamp. Although summit participants attempted to harmonize and align this definition with other current stakeholder definitions, including those endorsed by the ENA and CMS, participants felt that these definitions were too vague, and reliably operationalizing them was challenging.[34,35] Specifically, both organizations crafted definitions that differentiated between an admit *decision* time and an admit *order* time. However the "decision to admit" (a cognitive thought rather than an action) is not clearly actionable or reliably recorded in the way that placing an "admission order" is.

Table 7
Emergency Service Units

- Electrocardiograms (ECGs): Number of ECGs performed per 100 ED visits.
- Plain radiography studies: Number of plain film studies (not images) per 100 ED visits.
- CT studies: Number of contrasted and noncontrasted CT studies (not images) per 100 ED visits. Includes CT-guided procedures.
- MRI studies: Number of MRI studies (not images) per 100 ED visits.
- Ultrasound studies: Number of formal ultrasound studies (not images) performed by the radiology department and reported to the ED per 100 ED patients.
- Bedside ultrasound studies: Number of ultrasound studies (not images) performed at the bedside by the emergency care provider per 100 ED visits. These studies would be defined as having a billable limited study code and retained image(s) in the medical record.
- Laboratory studies: Number of patients per 100 ED visits who have any specimen ordered and sent to the laboratory for processing or for recording as a billable laboratory test (this would include any point of care test in which docking resulted in the capture of the order and result and therefore would be eligible for a billable test).
- Medication dosages: Number of medication doses administered by any route (intravenous, oral, intranasal, or intramuscular) per 100 ED visits. Total doses may be captured from an electronic dispensing system or from charges recorded by the pharmacy department.
- Intravenous medication dosages: Number of intravenous medication doses administered per 100 ED visits. This would be a subset of total medication dosages and may offer some comparison of patient acuity.
- Behavioral health consultations: Number of behavioral health consultations per 100 ED visits. This would be a marker of the mental health burden on the ED
- Telemedicine behavioral consultations: Number of behavioral health consultations performed via telemedicine route per 100 ED visits. This would be a subset of the total behavioral health consultations listed above.
- Social services/case management consultations: Number of social worker services and case management consultations arranged through the ED per 100 ED visits.
- Case management consultations: Number of case management consultations per 100 ED visits, as a marker for discharge and admission decision burden on the ED.
- Palliative care consultations: Number of palliative care consultations arranged through the ED per 100 ED visits.
- Specialty service consultations: Number of medical or surgical specialty consultations arranged through the ED per 100 ED visits.

Table 8
Emergency Staffing Units

- Clinical nursing hours worked: Number of scheduled clinical nursing hours divided by the number of clinical nursing hours worked per 100 ED visits.
- Nonnursing caregiver hours: Number of scheduled nonnursing caregiver hours divided by the number of worked nonnursing caregiver hours.
- Ratio of worked hours to patient hours: Total number of provider and staff direct care (i.e., contact hours) worked hours divided by the total number of patient hours for a given time period (monthly/annual).
- Ratio of worked provider hours to patient hours: Total number of direct worked provider hours divided by the total number of patient hours for a given time period (monthly/annual).
- Number of nursing hours: Total number of direct care clinical nursing hours per 100 ED visits.
- Number of nonnursing caregiver hours: Total number of direct care nonnursing caregivers hours per 100 ED visits.
- Staff hours per ED visit: Total number of staff hours as defined as nurses and nonnursing caregivers doing clinical work per ED visit.
- Number of physician hours per ED visit: Total number of physician hours per 100 ED visits.
- Number of advanced practice provider hours: Total number of advanced practice provider hours per 100 ED visits.
- Number of case management hours: Total number of nonutilization case management hours per 100 ED visits.

As a result of an advocacy effort by the EM community and a multistakeholder consensus development project convened by the NQF, CMS contracted the development of ED throughput measures for hospital outpatient quality measurement. These measures have been operationalized for use by the OFMQ, and data have been collected from over 4,000 EDs across the United States over the past 2 years. Despite the creation of a detailed specification manual, this particular time stamp and its related metric, "admit decision to departure time," received more calls to the OFMQ than any other metric after being implemented by CMS. It also received the most attention from respondents during the public comment period following the summit. The difficulty arises from the wide variation in the processing of admitted patients around the country. Summit attendees experienced as many interpretations of this time stamp as there were participants. Given the lack of any semblance of agreement, the 2014 Summit attendees opted to rename the time stamp "admit time," allowing for four options for capturing the time when the decision is made to admit the patient to the hospital. The summit attendees believe that the goal of this time stamp is to measure ED boarding as a means to ultimately ease the burden it places on the ED.

The 2014 participants also clarified many processes and proportion metrics that are widely reported in the literature as measures of ED operations and performance. New definitions related to patient readmission were added as readmission measures and are

currently part of CMS's value-based purchasing reimbursement program and are tracked and reported on www.hospitalcompare.com. Measures of patients who left prior to visit completion were a particular area of focus during this summit. Attendees chose to endorse new definitions that sought to better clarify the realities of the ED process when patients leave before they are supposed to (i.e., left before being seen, left before being seen–no intervention, left before being seen–with intervention, or left subsequent to being seen). The subcycles of patients leaving before seeing a provider, leaving after interventions have been initiated (e.g., by a triage nurse), or leaving after seeing providers were deemed as important to describing ED patient flow. Much discussion surrounded the inaccuracy of the "left against medical advice" (LAMA) term. Summit participants noted that this seeks to describe patients who were counseled about the risks of leaving before their care plan was completed.

Utilization measures were largely endorsed from the previous summit. However, a new focus on staffing resources as an important aspect of EM care delivery was developed and endorsed. Utilization measures that were retired included quantification of respiratory therapy treatments, specific medications, and performance of certain procedures. Attendees noted that respiratory therapy treatments had been a recommended measure in the past, but did not yield a gross comparative benefit. Specific medications that may signify the complexity of patients treated in the ED were considered, but eventually rejected. The attendees do however recommend utilization measures of parenteral doses as a subset of total doses of medications given. The reason is that attendees felt that parenteral doses of medications require the initiation of an intravenous catheter, which signifies more intense nursing care and time, which is a surrogate marker for acuity. While the group was intrigued with the inclusion of various procedures (e.g., central line placement, intubation), the ability to produce reliable data was deemed to be universally unfeasible at this time, given the wide variation in documentation capture systems.

One of the topics that generated the most controversy was that of unscheduled return visits to the ED. Unscheduled return visits have been used as a surrogate marker for quality and reported as an outcome in EM research. Different time intervals have been used to describe this interval, including unscheduled returns at 24-, 48-, and 72-hour and 1-week intervals.[50,51] The attendees noted several complexities to this metric beyond the current lack of standardized time interval for tracking returns, including the fact that the unscheduled return visit rate is directly influenced by exogenous factors outside of the ED's control (e.g., community-based resources including availability of primary care services). Distinguishing between unscheduled returns and scheduled, or appropriate follow-up visits, was deemed problematic. In addition, unscheduled return visits that are admitted to the hospital on a repeat visit may not be related to inadequate care or poor quality during the first visit and are rarely are associated with poorer outcomes.[52]

Therefore, 2014 participants agreed with the conclusions of the 2010 participants that a poorly constructed measure could create an incentive to providers or organizations to discourage patients to return to the ED if outpatient management is failing. Participants also noted that future work should consider ED performance on cost of care measures, ED-specific patient experience measures, and patient safety measures including adverse event measures and outcome measures.

LIMITATIONS

The most notable limitation is development of definitions by consensus. The methodology employed was based on a modified Delphi method, which has been used before in this type of work.[30] However, this modified Delphi model requires the development of a final recommendation. This method has been used successfully by the EDBA in the past for developing consensus around particular issues in EM, but the conference attendees were a nonrandom sample whose creation was open to selection bias. The addition of a 30-day public comment period was added to address this potential bias and strengthen the consensus methodology.

CONCLUSIONS

Standardized definitions of key terms, time stamps, and metrics in ED operations makes it possible to measure, trend, and analyze ED performance in a meaningful way. This improves comparative analysis of ED operations for health policymakers, researchers, and administrators because it allows for identification of best practices. Clear, precise definitions are also needed to inform new pay-for-performance reimbursement models that seek to compare ED performance. Improving ED operations will improve patient care, which is at the heart the most compelling imperative in improvement work. This work provides all stakeholders in emergency medicine with the language to begin the important work that lies ahead.

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Supporting Information

The following supporting information is available in the online version of this paper:

Data Supplement S1. Participants in the Third Performance Measures and Benchmarking Consensus Summit.

Data Supplement S2. Stakeholder organization affiliations.

Data Supplement S3. Organizations solicited during public commentary period.

Data Supplement S4. Comparison of Emergency Department Benchmarking Alliance 2010 versus 2014 endorsed definitions.