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Implementing Data Definition Consistency for Emergency Department Operations Benchmarking and Research

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Abstract

Objectives: The objective was to obtain a commitment to adopt a common set of definitions for emergency department (ED) demographic, clinical process, and performance metrics among the ED Benchmarking Alliance (EDBA), ED Operations Study Group (EDOSG), and Academy of Academic Administrators of Emergency Medicine (AAAEM) by 2017.

Methods: A retrospective cross-sectional analysis of available data from three ED operations benchmarking organizations supported a negotiation to use a set of common metrics with identical definitions. During a 1.5-day meeting—structured according to social change theories of information exchange, self-interest, and interdependence—common definitions were identified and negotiated using the EDBA's published definitions as a start for discussion. Methods of process analysis theory were used in the 8 weeks following the meeting to achieve official consensus on definitions. These two lists were submitted to the organizations' leadership for implementation approval.

Results: A total of 374 unique measures were identified, of which 57 (15%) were shared by at least two organizations. Fourteen (4%) were common to all three organizations. In addition to agreement on definitions for the 14 measures used by all three organizations, agreement was reached on universal definitions for 17 of the 57 measures shared by at least two organizations. The negotiation outcome was a list of 31 measures with universal definitions to be adopted by each organization by 2017.

Conclusion: The use of negotiation, social change, and process analysis theories achieved the adoption of universal definitions among the EDBA, EDOSG, and AAAEM. This will impact performance benchmarking for nearly half of US EDs. It initiates a formal commitment to utilize standardized metrics, and it transitions consistency in reporting ED operations metrics from consensus to implementation. This work advances our ability to more accurately characterize variation in ED care delivery models, resource utilization, and performance. In addition, it permits future aggregation of these three data sets, thus facilitating the creation of more robust ED

operations research data sets unified by a universal language. Negotiation, social change, and process analysis principles can be used to advance the adoption of additional definitions.

Various sets of quality measures and definitions exist, and there are national efforts to develop health industry-wide standards for emergency medicine practice and performance metrics.¹ However, implementation is the next frontier. As the demand for emergency care grows and the practice of emergency medicine becomes more complex, there is an increased need to define, measure, and study the mechanics of the emergency department (ED) within the healthcare delivery system.² The widespread use of electronic medical record systems (EMRs) has made it possible to capture time stamps for patient care events, measure throughput within patient care pathways, and quantify the volume of patients utilizing services.³ In addition, there is increasing pressure to demonstrate responsible and efficient use of resources to policy-makers, payors, and consumers in the face of rising ED utilization and health care costs.^{1,4,5} Health reform pressures are inducing a shift from a fee-for-services provided approach toward incentivizing the creation of value for patients.⁶ This has accelerated the need for quality data to inform research, regulatory, operations management, and health policy decisions guiding effective clinical practice.⁷ Systems for quality improvement require the consistency of a common language developed through agreement on terminology and a commitment to rapid and uniform implementation.^{8,9} These steps advance the science that guides the function of emergency care delivery systems.

The ED Operations Study Group (EDOSG) is a nonprofit research consortium dedicated to promoting evidence-based clinical practice through the development of quality data and health systems delivery sciences to drive efficiency in achieving positive patient outcomes. In Fall 2014, The EDOSG hosted a data consistency conference where the three major ED benchmarking organizations were invited to negotiate a commitment to adopt universal definitions for common ED clinical performance metrics by 2017. These three groups included the ED Benchmarking Alliance (EDBA), the ED Operations Study Group (EDOSG), and the Academy of Academic Administrators of Emergency Medicine (AAAEM). The underlying hypothesis was that the application of social change theory and negotiations principles, such as process analysis, can achieve adoption of universal definitions for a 20 ED demographic descriptor, clinical process, and performance metrics. We refer to these here as measures. This paper presents the 1) methods used before, during, and after this meeting to negotiate the adoption of common definitions and 2) the analysis of all measures and list of adopted definitions as our results.

MEETING METHODS

Study Design

This was a retrospective cross-sectional analysis of available data from three ED operations benchmarking organizations which informed a negotiation for a universal set of ED operations measures and definitions. The premeeting preparation, meeting format, and post-meeting follow-up processes were structured according to principles of negotiation principles. We specifically applied social change and process analysis theory. We considered the use of universal definitions for a common set of measures as the targeted social change. Negotiation theory takes into account cost-benefit calculation sciences developed from

decision analysis, behavior decision-making, game theory, and negotiation analysis.¹⁰ Per social change theory, social change and the subsequent stability of the change is a process of negotiated exchanges between involved parties.¹¹ It is the “science of bartering” toward a new status quo and commitment to adjust internal practice to align. Agreement is formed through a series of cost–benefit analyses where individual gain is calculated in the context of alternatives.¹²

Participants

Since 1994, the EDBA has been a learning community empowering medical directors and hospital leaders with data to manage the operations of their EDs. The EDBA maintains a database of core operations measures that includes over 35% of the United States’ EDs, representing 32% of the nation’s ED volume.³ They also participate in the application and interpretation of the Centers for Disease Control and Prevention (CDC)’s National Health Ambulatory Medical Care Survey (NHAMCS),¹³ which includes the Nationwide Emergency Department Sample (NEDS)¹⁴ as an ED-specific subset.

The AAAEM originated as an academy within the Society for Academic Emergency Medicine (SAEM) in 2009. Per its name, it is a collaboration among administrative directors of academic EDs. AAAEM’s data survey provides details on the structure and resources of the clinical, education, and research pillars of approximately 90 academic EDs. Its purpose is to provide critical leadership information for the Academy of Academic Chairs of Emergency Medicine (AACEM), also an SAEM academy.

The EDOSG emerged in 2011 with the unique mission of advancing the development of operations research within the time- and process-dependent clinical practices of the ED. This group promotes consistent data reporting and research to avoid discrepancies among different groups studying common phenomenon within emergency medicine. Its data set includes similar clinical process, performance, and staffing measures, in addition to system-level clinical practice details for cardiovascular diseases.

These data sets are individually and collectively smaller than NHAMCS or NEDS. However, they provide more detail on the organization, function, systems performance of EDs.

Premeeting Analysis

Foundational work has been done by the EDBA, AAAEM, and EDOSG to facilitate the first step of a negotiation toward a common standard within emergency medicine: informational exchange. This has occurred from individual EDs providing data to these groups to see their local performance compared, or benchmarked, against the performance of peers. Each of the three organizations had previously developed a set of measures they felt were essential to managing and monitoring an ED’s care delivery. Conceding these internally developed metrics to an external consensus standard was the focus of this negotiation. For this meeting, the first step toward information exchange was for each organization to share the list of measures they regularly collect and report. The EDOSG research team then systematically reviewed the survey questions and measures used by each of the three organizations.

During the premeeting review the survey questions used by each organization were parceled into individual process measures or ED demographic descriptors that were either reported directly by EDs or calculated from reported data. A survey may ask for annual patient volume and the number of ED beds. The reports generated from the survey may then report back average number of patients seen per bed. This results in a count of three measures from two source questions. A question asking for the distribution of the patient population across categories, such as Ambulatory Payment Classification (APC) coding levels for billed charts, can yield several measures including the proportion of APC level 1 charts, proportion of charts billed for critical care, and the proportion of high-level charts billed (APC levels 4 and 5 and critical care).

Protocol and Key Outcomes

The EDOSG hosted a 1.5-day meeting at Vanderbilt University in Nashville, Tennessee. The meeting's opening session was structured according to the social change principles of self-interest and interdependence. These served as the perspectives upon which the organization representatives entered the negotiation. First, the opening presentation highlighted the evolution of the organizations' common purpose (i.e., performance benchmarking) from ED performance alone to including clinical performance. Second, the need for higher-quality and broadly representative data was presented. Finally, the desired social change—a universal set of definitions—was presented. Each organization had an opportunity to present their historical evolution and current niche: the EDBA's broadly inclusive core clinical operations measures, AAAEM's academic mission-oriented measures (of which clinical operations is a subset), and the EDOSG's focus on researching the effect of clinical operations on patient outcomes. Removal of anticipated threat was articulated when we clarified and agreed that there was no intent to unify the organizations into one, create competition among the groups, or overpower one niche with that of another. Rather, the meeting's purpose centered on the interdependence of the three organizations, emergency medicine, the healthcare industry, and health services research on consistent ED operations data reporting.

On day 2 the representatives reviewed each measure and descriptor, considering: 1) the purpose and definition for each measure within each organization's performance benchmarking niche and mission and 2) each measure's significance within emergency medicine and healthcare. The EDBA's published definitions were the starting point for each discussion. Consensus on definitions was achieved for measure common to all three organizations. The list of measures shared by at least two organizations was also reviewed. An additional list of 17 shared definitions were found to be important to the development of a common language. Process analysis,¹⁵ or the science of bartering, was used to gain consensus on the current use of shared terms and potential future use by the nonsharing organization. Process analysis is a method of framing the causal chain of responsible for the observed outcome. Rather than explaining whether an outcome was achieved, it explains how it was reached. It walks involved parties through a rational for a mutually agreeable outcome.¹⁶ When applicable, the EDBA definition⁷ was presented as the standard, and requests for objection were solicited. When there was disagreement between organizations, each was asked whether the difference reflected a perspective that was specific to their

mission. A discussion ensued about whether maintaining this difference was essential or redundant, and the discussion ended with the acceptance or rejection of a common definition by all three groups.

Approval for Adoption

In the 8 weeks following the meeting, the final list of common metrics was shared with the leadership of the three organizations for review. Process analysis theory also guided the manner in which we presented the meeting prework, structure, and outputs. In the discussion that ensued, the definitions were challenged. No measures were removed or added. This completed manuscript was shared with the leadership again for review to confirm the commitment to adopt by 2017.

RESULTS

The methods applied in this study produced two sets of results. First is a summary analysis of process performance and descriptive measures collectively used among the three organizations. This includes assessments for uniqueness and shared used with an assessment of differences in the associated definitions. Second are the results of the negotiation. This includes two specific products, a list of common ED measures and definitions and a second list of shared definitions for measures common to at least two organizations.

Premeeting Analysis Results

Despite overlap in the clinical processes described, over 40% of all organization measures were unique to a single organization. The EDDBA's data survey includes 21 questions resulting in 63 measures, the EDOSG's survey has 53 questions producing 137 measures, and the AAAEM survey uses 134 clinical questions resulting in 174 measures. This analysis is detailed in Table 1. Among the three organizations, there were a total of 374 process measures, performance metrics, and descriptors. Universal definitions were negotiated for 17 (8.3%). Fourteen (4%) of the total universe of measures were used by all organizations. Definitions for these 14 were the center of the negotiation session, together with 57 (15%) measures shared by at least two organizations. Of those shared by two organizations, 31 (17%) were adopted.

Measures related to ED staffing demonstrated the greatest area of overlap within the limited set of measures common to all. Radiology and laboratory utilization and turnaround times, performance improvement, and innovation and disease specific diagnostic testing were nearly exclusively unique to one organization, the EDOSG (see Table 2).

Negotiation Results

The final list of 14 ED measures common to all three organizations, and the negotiated definitions are listed in Table 3. The definitions for 17 measures shared by two organizations for universal adoption are listed in Table 4.

DISCUSSION

Healthcare payment reforms are emphasizing a shift from fee-for-service payments toward incentives for the delivery of healthcare value.¹⁷ This requires leaders to understand the mechanism of healthcare delivery, associated spending, and the impact of systems structure choices on patient outcomes. None of this is possible without the ability to make stable comparisons between care delivery environments.¹⁸ Reliable comparisons are dependent on the use of consistent definitions for ED demographics, care delivery processes, and clinical performance. Adopting universal definitions is a foundational endeavor. Prior work promoting consistent benchmarks has been achieved via consensus.

The process described in this paper advances benchmarking, quality measurement, and assessments of the relationship between performance and clinical outcomes by achieving a commitment to adopt a consistent language. The methods that were used (e.g., negotiation structure to achieve social changes, social change facilitated by demonstrating self-interest and interdependence, removal of anticipated threats, process analysis to achieve adoption, and communication of a negotiated outcome) can continue to advance quality in clinical process analysis, quality reporting, quality measures, and comparative systems-effectiveness research.

This meeting was a follow up to the EDBA's 2014 Third Performance Measures Summit,⁷ which included representatives from the Centers for Medicare & Medicaid Services (CMS), The Joint Commission (TJC), the American Hospital Association (AHA), and the American Medical Association. This group updated the EDBA's evolving set of measures and definitions initiated in 2006. These have become the recommended field standard with endorsements throughout healthcare. However, there was no commitment from the individual stakeholders to use these definitions or timeline for adoptions. More recently, three of the eight final recommendations from the EDOSG's March 2014 Consensus Conference on ED Operations and Its Impact on Patient Outcomes⁴ called for the development of universal process measures, creation of robust ED operations research registries, and the definition of functional components of ED care systems. This meeting was organized to address this practice gap. Moving forward with these three recommendations requires a universal language.

It has become more important than ever to demonstrate how care provided contributes value to patients.¹⁹ The implementation of the Patient Protection and Affordable Care Act requires EDs and their health systems to transform financial, information technology, and clinical practices to promote improved patient outcomes, lower costs, and efficiency.^{20,21} Two kinds of data are needed to study clinical processes involved in emergency health-care delivery and consequent patient outcomes.²² First are standardized operations measures²³ permitting us to compare and contrast EDs as care environments.^{24,25} Second are detailed clinical practice and care episode data,²⁶ which is dependent on standardized time-stamping and definitions for care events. Meaningfully comparing efficiency, resource utilization, and the value of services provided requires a common language. To date the work of the EDBA, EDOSG, and AAAEM involves ED level operations measures. Emerging cross-institutional comparison of visit level data is being built on these foundational efforts. This work has

been limited by definition inconsistencies. Even when there has been agreement on terms, universal adoption has not previously been mandated.

There is a marked degree of redundancy in the type of data available through these organizations. However, our analysis demonstrates that there is significant uniqueness (see Table 1) in data sets relating to each organizational mission. The EDBA collects 17% of the total measures available among these organizations, and 44% of its measures are unique to its data set. The EDBA primarily uses medians for aggregate process measures (EDLOS, door-to-doctor time, etc.). Their data set includes the fewest measures but includes the largest sample of EDs. It includes data from 1994 to the present. The EDOSG's data set includes 37% of all available metrics and descriptors, with 66% of its reported measures being unique. Given their focus on ED operations and clinical practice research, their data set includes more granular measures of ED processes, performance, and clinical practice patterns. The EDOSG's survey includes sections on clinical process innovation and clinical diagnostic practices reflecting their research of clinical process, process change, and its impact on patient care. The AAAEM had the largest data set including 47% of the total measures with 73% uniqueness. They include details on relative value units produced per physician clinical hour scheduled, faculty-time equivalent distributions, and total revenue collected, reflecting how AAAEM's data are primarily used to assist in constructing the staff and faculty composition of an academic ED.

LIMITATIONS

A common set of definitions for adoption was achieved via a structured negotiation facilitated by the application of social change and process analysis theories. This technique guided mutual understanding on the definitions currently used by the three participant organizations, the realm of overlap, and the need for consistency in reporting of shared metrics. There are likely important measures that have not been included as products of this meeting due to the inability of this process to move agreement beyond the 31 metrics included herein. Further work is needed to drive commitments to adopt a larger list of measures among these three organizations as well as individual EDs, their associated health systems, the CMS, the CDC, TJC, the AHA, and specialty societies within emergency medicine.

Detailing specific applications of these measures was beyond the scope of this study and the associated meeting. However, the commitment to adopt a common language enables more reliable research on ED operations and its impact on patient outcomes, the ability to create common data reports within commonly used EMRs, and the creation of quality measures reflecting the diversity of ED structure, process, and function.

CONCLUSIONS

In the 4 years preceding this meeting there was perceived competition among the ED Benchmarking Alliance, ED Operations Study Group, and Academy of Academic Administrators of Emergency Medicine resulting in limited collaboration. This contributed to the development of inconsistent definitions for ED care demographic characteristics,

clinical processes, and performance. The review supporting this negotiation enhanced 1) data transparency for those contributing to and interpreting the data sets and 2) an understanding of each organization's mission within emergency medicine. The application of social change theories facilitated the negotiation of a universal set of definitions for common ED operations measures among the three organizations and a formal commitment to adopt a standardized set of measures by 2017. It transitions consistency in reporting ED operations metrics from consensus to implementation, while improving the accuracy of cross-institutional comparisons of ED processes. These data include more granular ED clinical operations detail than is currently available in national data sets such as National Health Ambulatory Medical Care Survey and Nationwide Emergency Department Sample. This presents an opportunity to create a unique data set for the study of ED operations and clinical performance across ED phenotypes. The use of these 31 standard measures is an early, yet critical step. Implementation will affect benchmarking for nearly half of all U.S. EDs and enhance our ability to study emergency care delivery across ED care environments.

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Table 1

ED Operations Measures: Unique, Shared, Common to All

Organization	All	Unique	Shared by 2 Organizations	Common to All
EDBA	63 (17%)	28 (44%)	20 (32%)	14 (22%)
EDOSG	137 (37%)	90 (66%)	32 (23%)	14 (10%)
AAAEM	174 (47%)	127 (73%)	32 (18%)	14 (8%)
All	374 (100%)	245 (66%)	57 (15%)	14 (4%)

AAAEM = Academy of Academic Administrators of Emergency Medicine; EDBA = ED Benchmarking Alliance; EDOSG = ED Operations Study Group.

Table 2

ED Operations Measures: Data Categories*

Data Category	All	Common to All	Shared by 2 Organizations	Unique to 1
ED staffing	45	6	5	40
Patients, throughput, care spaces	113	3	22	91
Acuity, billing, coding, documentation	39	1	14	25
Radiology and laboratory utilization and turnaround times	22	0	2	20
Performance improvement and innovation	27	0	0	27
Triage and disposition	18	1	5	13
Disease-specific diagnostic testing	22	0	0	22
Hospital demographics	9	3	5	5
*Categories are not mutually exclusive		14	53	243

Table 3**Fourteen Core ED Measures and Definitions Common to All**

Measure or Descriptor	Definition
Adult ED	An ED primarily (but not exclusively) serving adult patients.
Pediatric ED	A defined pediatric care space within the ED or separate pediatric ED.
ED admission rate	The proportion of patients that have completed an ED visit who are subsequently held in-hospital for continued care. These include those admitted under “admission” and “observation” status.
ED discharge rate	The proportion of patients treated and released from the ED at the end of an ED visit.
ED observation unit	A unit managed by the ED to provide continued medical care via in-hospital “observation” status care (observation medicine) after the completion of the ED visit.
Scribe use	The use of scribes by physician staff as personal assistants during clinical shifts who facilitate patient care documentation, physician order entry, or test result notification.
Trauma-level designation	Level I, II, III, IV, or V or none as verified by the American College of Surgeons after state or community level designation.
ED bed	The patient care space within an ED. These include licensed, vertical (seated or chair care space), flex or overflow (intermittently used), and hallway beds.
Residency affiliation	EM residency core training site; EM residency satellite or non-EM resident rotation site; Non-residency-affiliated.
ED volume	The number of patients registered and treated in the ED.
Physician in triage	The inclusion of physician in the ED arrival triage process of an ED. A PIT is directly involved in the screening and evaluation of resource needs for arriving patients.
Attending physician staffing	The mean clinical hours of attending physician hours worked per 24-h period.
Resident physician staffing	The mean clinical hours of EM and non-EM resident physician hours worked per 24-h period.
Advanced practice practitioner (PA or NP)	The mean clinical hours of APP hours worked per 24-h period.

Table 4**Important Measures and Definitions Shared by Two Organizations**

Measure or Descriptor	Definition
Hospital beds	The number of licensed and staffed patient beds including ICU, step-down, inpatient floor, observation unit (ED and non-ED). Excludes labor and delivery and nursery beds.
Hospital admission	All hospital-wide admissions, including those from the ED and labor and delivery (excluding babies born in that hospital and subsequently placed in the nursery of that hospital).
ED proportion of hospital admissions	All hospital-wide admissions that originate in the ED (excluding babies born in that hospital and subsequently placed in the nursery of that hospital), divided by all hospital admissions.
ED/hospital fiscal designation	State; Private; Nonprofit.
ED/hospital academic status	Academic; Academic affiliate; Community.
Pediatric patient volume	All patients < 18 y of age or patients seen in a defined pediatric care space.
ED arrival time	The date and time that a patient first arrives at the institution for the purpose of requesting emergency care. This is the time of first physical contact, which may be different than the triage or registration time.
ED length of stay	The length of time from patient arrival to patient departure from the ED.
ED disposition	The date and time of physical departure of a patient from the ED treatment space. Categories include admit, discharge, observe, and transfer.
Departure	The date and time the patient exits their assigned ED bed.
EMS arrivals	The proportion of ED patients who arrive via EMS (ambulance).
EMS admissions	The proportion of EMS (ambulance) arrivals who are admitted to the hospital.
ED boarding	Time from decision to admit until ED departure.
ED walkouts	Left before treatment completed (LBTC); includes against medical advice (AMA), left without being seen (LWBS), eloped, left without completing treatment (LWCT), etc.
Ambulatory Payment Classification (APC) coding distribution	Measured by the billing level of care code (current procedural terminology [CPT]) assigned to the a patient visit (Levels 1, 2, 3, 4, and 5 and critical care).
Turnaround time	The time from physician order to first available result.
Laboratory utilization	The percentage of patients who have at least one serum laboratory test.

ICU = intensive care unit.