Developing Emergency Room Key Performance Indicators: What to Measure and Why Should We Measure It?

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Abstract. Emergency Room (ER) performance has been a timely topic for both healthcare practitioners and researchers. King Faisal Specialist Hospital and Research Center, Saudi Arabia worked on developing a comprehensive set of KPIs to monitor, evaluate and improve the performance of the ER. A combined approach using quantitative and qualitative methods was used to collect and analyze the data. 34 KPIs were developed and sorted into the three components of the ER patient flow model; input, throughput and output. Input indicators included number and acuity of ER patients, patients leaving without being seen and revisit rates. Throughput indicators included number of active ER beds, ratio of ER patients to ER staff and the length of stay including waiting time and treatment time. The turnaround time of supportive services, such as lab, radiology and medications, were also included. Output indicators include boarding time and available hospital beds, ICU beds and patients waiting for admission.

Keywords. Emergency Room, Performance Indicators, Improvement, Hospitals.

Introduction

Emergency room (ER) crowding and inefficient performance has become a major barrier to receiving timely emergency care. Patients who visit ER often face long waiting times to be treated and might wait longer to be admitted [1]. One conceptual model partitions ER crowding into three interdependent components: input, throughput, and output [2]. Input factors reflect sources of patient inflow, throughput factors reflect bottlenecks and slow processes within the ER and output factors reflect bottlenecks in other parts of the health care system, such as availability of hospital inpatient beds for admission [3].A thorough understanding of quality improvement principles and benchmarking is now necessary for providing patient centered care, improving customer satisfaction, and evaluating services performance. Emergency professionals now are asked to provide safe, timely, efficient, and cost-effective care. There is still a gap in developing and utilizing indicators to measure and control ER performance [4]. Some healthcare managers have the experience and skills of introducing new strategies and innovating new operating processes to achieve breakthrough performance, but they continue to use the same old or nonspecific indicators they have been used for years [5]. It is very essential to ask what to measure exactly and why should we measure it; so as to develop indicators that reflect the actual performance of healthcare organizations [6].

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Key performance indicators (KPIs) are developed and utilized by hospitals to monitor, evaluate and improve performing against benchmark values or standards. KPIs show trends and explain how improvements should be planned and achieved [7]. According to the three levels of performance management we can classify KPIs into operational, tactical and strategic indicators. Each category has its own objectives, methods of measurement and expected outcomes [8]. According to Donabedian conceptual model, which provides a framework for evaluating healthcare services and quality of care, KPIs can be classified by being related to one of the three components of the healthcare system; structures, processes and outcomes [9]. According to Asplin's conceptual model of ER patient flow, KPIs can measure input, throughput and output factors. And finally, according to the science of healthcare performance and according to the Institute of Medicine definition of goals for high quality healthcare systems, KPIs can be classified with different dimensions of measurement into the main six elements; safety, effectiveness, efficiency, timeliness, patient centeredness and equity [10].

1. Methodology

At King Faisal Specialist Hospital and Research Center, Jeddah, Saudi Arabia, the Medical and Clinical Affairs in cooperation with the Emergency Medical Services worked on developing a comprehensive set of KPIs to monitor, evaluate and improve the performance of the ER. The main objective of the study was to answer two main questions; what exactly do we need to measure and why should we measure it; so as to develop suitable KPIs that reflect the actual performance and support the improvement of healthcare organizations. A three steps combined approach using both quantitative as well as qualitative methods was used to collect and analyze the data. A careful review of literature was conducted first to identify the main ER indicators monitored worldwide. A qualitative survey method was used next; conducting semi structured interviews with different ER and healthcare leaders, over six months' duration; July to December 2015, to collect opinions, experiences and suggestions. Finally a comprehensive full spectrum data on all ER encounters over two years; January 2014 to December 2015, was retrieved, from the hospital data warehouse system, and analyzed for all possibly measurable and significantly meaningful variables.

2. Results

The first step of literature review included 68 published studies, articles and book chapters discussing over 60 KPIs of variable importance; among which only 38 were identified as frequently utilized and important. The qualitative survey included interviewing 22 ER physicians and 5 hospital managers and generated, in a nearly complete consensus, over 20 suggested ER KPIs, while the last step of quantitative data analysis generated over 30 measurable KPIs that are basically feasible and developed by the author. The results of the three phases were combined, validated against each other, nomenclature standardized, prioritized according frequency and redundancies removed to generate one consolidated list of KPIs that cover all the areas and functions discussed in the literature, suggested by survey participants and measurable through quantitative data. 34KPIs were developed and sorted into the three components of ER patient flow model; input, throughput and output. Table 1 shows the developed KPIs.

Table 1: Developed ER KPIS sorted into; input, throughput and output indications.

Categories	S/N	KPI Title
A – Input Indicators	1	Total Number of ER Visits
	2	Average Daily ER Visits
	3	Percentage of Leaving Before Screening
	4	Percentage of Leaving Without Being Seen
	5	Percentage of Revisits to ER within 3 days
	6	Percentage of Revisits to ER within 7 days
	7	Average ER Patients Acuity Level
	8	Differential Percentages of ER Patients Acuity Levels
B – Throughput Indicators	1	Length of Stay – All ER Patients
	2	Length of Stay – Patients Discharged Home
	3	Length of Stay – Patients Admitted to Hospital
	4	Percentage of ER Patients with LOS More than 6 hours
	5	Average Number of ER Patients Waiting for Treatment
	6	Average Registration Time
	7	Average Arrival to Triage Time
	8	Average Triage to Bed Time
	9	Average Bed to Doctor Time
	10	Average Door to Doctor Time (Waiting Time)
	11	Average Doctor Examination to Decision Made (Treatment Time)
	12	Percentage of Patients Leaving Before Complete Treatment
	13	Average ER Lab Requests Turnaround Time
	14	Average ER Radiology Requests Turnaround Time
	15	Average ER Medications Requests Turnaround Time
	16	Average Number of Active ER Beds
	17	Average Number of ER Staff
	18	Ratio of Daily ER Patients to ER Beds
	19	Ratio of Daily ER Patients to ER Staff
C – Output Indicators	1	Doctor Decision to Patient Discharge (ER Bed Turnaround Time)
	2	Doctor Decision to Patient Admission (Inpatient Boarding Time)
	3	Percentage of ER Patients Admitted to Hospital
	4	Percentage of ER Patients Discharged Home
	5	Average Number of ER Patients Waiting for Admission
	6	Average Available Inpatient Beds
	7	Average Available ICU Beds

3. Discussion

ER Input factors are variable. Frequent, non-urgent visits and seasons of some infectious diseases might increase ER crowding [11]. It is essential to monitor the total number of ER visits and the average daily visits, both reflect the input and magnitude of demand on services. The average of ER patients' acuity level and the differential percentages of ER patients' acuity levels could identify less acute patients. Recently discharged inpatients might not represent a huge percentage but when they come to ER they have longer lengths of stay and more hospital admissions [12]. The percentage of revisits to ER within 3 or 7 days can reflect other sources of increased input, in addition to the percentage of patients leaving without being seen; reflecting service inaccessibility. Some throughput are related the number of active ER beds, adequate staffing levels and ratio of ER patients to ER staff; which could all reflect significantly on the length of stay of patients inside ER and on different related time intervals, such

as waiting time and treatment time [13]. ER crowding has been associated with patients leaving before complete treatment. The use and/or delays of services, such as lab, radiology and medications, usually prolong ER length of stay [14]. Output factors are relatively less. Long patients' boarding time and unavailability of hospital beds are common factors that might cause ER crowding. It is very essential to monitor ER bed turnaround time; making an ER bed ready for the next patient, percentage of patients admitted from the ER to the hospital as well as the number of available inpatient beds, ICU beds and number of ER patients waiting for admission [15].

4. Conclusion

It is crucial to develop KPIs that are measurable and in the same time beneficial to performance management and improvement. These have to be comprehensive; covering all phases and components of ER; from arrival till discharge or admission, including other supportive services. Hospitals and ER departments might be able to measure many indicators but they might not be able to realize their strategic and/or operational value or even to utilize them to the maximum. It is recommended that further research and studies investigate how such KPIs can control and reflect the improvement of performance along different dimensions, such as safety, effectiveness, efficiency, patient centeredness, timeliness, and equity, which are the six main domains of healthcare and performance quality identified by the institute of medicine.

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