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Developing Strategic Health Care Key Performance Indicators: A Case Study on a Tertiary Care Hospital

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Abstract

OBJECTIVE: The main objective is to describe in details the complete process of developing a group of strategic key performance indicators (KPIs) to monitor and improve the performance of a tertiary care hospital, including different services. This project aimed at centralizing and standardizing KPIs to provide higher management with information and support evidence based strategic decision making. METHODS: The researchers used qualitative survey methods through conducting semi-structured interviews with higher management officers as well as hospital department heads and performance professionals. Suggested KPIs were validated against published research then categorized and sorted into ten groups of indicators and finally were approved by the higher management. RESULTS: Fifty eight KPIs could be identified then sorted into ten categories; Patient Access Indicators, Inpatient Utilization, Outpatient Utilization, OR Utilization, ER Utilization, Generic Utilization, Patient Safety, Infection Control, Documentation Compliance, and Patient Satisfaction Indicators. DISCUSSION: Each of these KPIs, and each of the ten categories, has specific value(s); some reflects the effectiveness or efficiency of healthcare provision, such as re-admission rate and average length of stay, some reflects timeliness, such as waiting time for admission, for an outpatient appointment or in the emergency room, and some reflects safety and patient centeredness, such as infection rates and mortality rates. CONCLUSION AND RECOMMENDATIONS: Before considering these KPIs reliable and comprehensive, they have to be validated against other sources of data, alarming triggers should be set up and future expansions should be planned, to include more related indicators or provide the users with ability to drill down to a lower level of details.

Keywords: Strategic Key Performance Indicators, Evidence Based Healthcare, Scorecards, Hospitals.

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1. Background and Significance

Data and facts are not simply, easily or passively picked up and collected. They can only be understood and measured through an underlying conceptual framework, which defines relevant facts, and distinguishes them from background noise. Many healthcare organizations have been developing key performance indicators (KPIs) for monitoring, measuring, and managing the performance of their healthcare systems to ensure effectiveness, efficiency, equity and quality. Healthcare systems are expected to achieve and manage results in line with their established objectives and quality standards[1]. Healthcare managers are aware of the effect of using measures on monitoring and improving performance, yet they rarely use measurement as an essential part of their strategies and tactics. 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 short term indicators they have used for years. It is very essential to develop strategic key performance indicators that reflect the actual performance of healthcare organizations[2].

Key performance indicators (KPIs) are used by hospitals to monitor and evaluate performing against benchmark values or standards. KPIs show trends and explain how improvements are being made over time. KPIs also help to compare results with approved standards or against other similar comparable organizations; this helps hospitals and healthcare organizations to improve the services they provide by identifying whether the performance is at the desired level or not and also to identify where improvements are required[3]. Examples of KPIs used in hospitals are the waiting time of patients in the emergency room, number of patients in the ER waiting area and number of ER patients waiting to be admitted to an inpatient department[4].

According to the three levels of performance management we can classify key performance indicators and their dashboards and scorecards into operational, tactical and strategic indicators. Each category has its own objectives, methods of measurement and expected outcomes[5]. According to Donabedian conceptual model, which provides a framework for evaluating healthcare services and quality of care, key performance indicators can be classified differently by being related to the three components of the healthcare system; structures, processes and outcomes. Structure describes the context in which healthcare is delivered, including hospital buildings, staff, financing, and equipment, while processes include all transactions between patients and providers throughout the delivery of healthcare, and outcomes refer to the effects of healthcare on the health status of patients and populations[6]. And finally, according to studies in the science of healthcare performance measurement and improvement, and according to the Institute of Medicine definition of goals for high quality healthcare delivery systems that we mentioned above, performance indicators can also be classified according to the different dimensions of measurement into the main six elements defined; safety, effectiveness, efficiency, timeliness, patient centeredness and equity[7, 8].

Safety indicators should measure the degree of how much any healthcare intervention or procedure is safe or harmful to the patient and/or staff including sentinel events and infection control[9]. Effectiveness indicators should measure the healthcare service capability of producing the desired results and achieve the intended goals and objectives while efficiency indicators should measure the extent to which healthcare resources such as time, effort or money are well utilized for the intended tasks or purposes[10].

Timeliness indicators should measure the degree to which healthcare is provided to the individual at the most beneficial or necessary time or in accordance with patient perception of promptness. Patient centeredness indicators should measure the satisfaction with the healthcare services and the degree to which systems succeed or fail in meeting patient needs, including patient respect, providing accurate information, relief from unnecessary pain and discomfort and emotional support[11]. Equity indicators should ensure reducing disparities among patient subgroups and ensure that the healthcare system treats all individuals fairly and deliver high-quality care regardless of personal characteristics, such as age, gender, race, ethnicity, education, disability, sexual orientation, income, or location of residence[12]. A model of performance indicators classification into levels, dimensions and system components is suggested by the researchers and illustrated in figure 1.
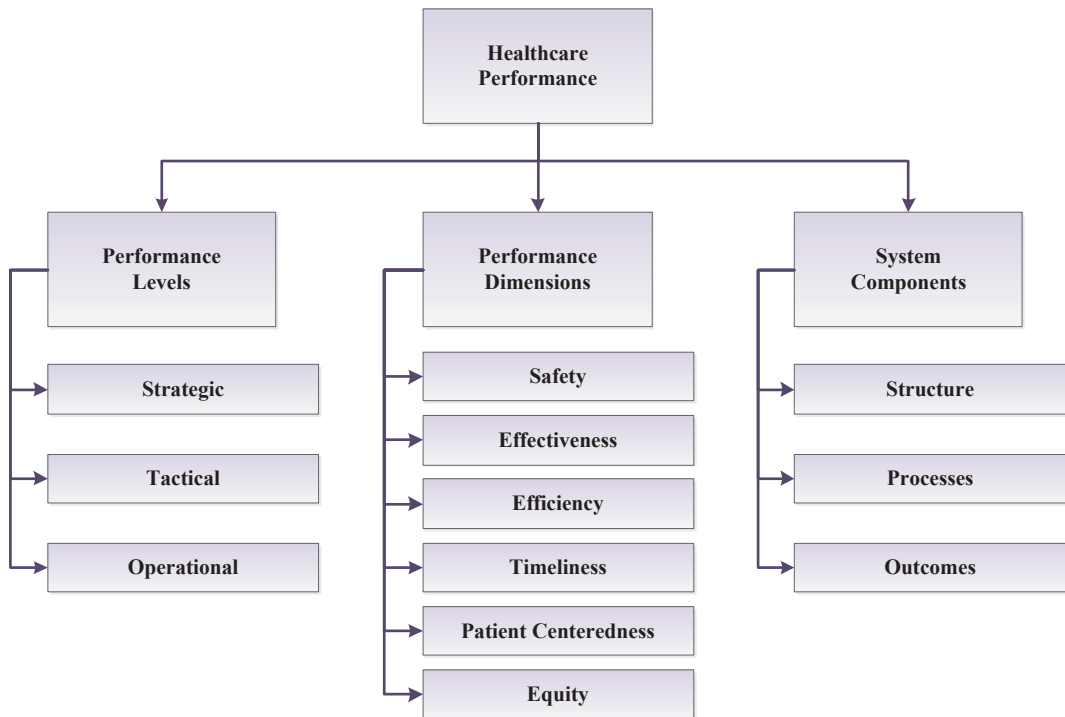
Fig 1. Healthcare Key Performance Indicators: What Can They Measure?
(Suggested by the Researchers)

2. Study Objectives

At King Faisal Specialist Hospital and Research Center, Saudi Arabia, the Medical and Clinical Affairs (MCA) decided to develop and utilize a group of strategic KPIs to monitor, measure and improve the performance of the hospital including different departments and services. The main objective of this project was to centralize and standardize KPIs and to make regular measurement data and information available for hospital higher management as well as departmental and services middle managers so that strategic, tactical as well as operational decisions could be made based on available evidence in order to highlight performance gaps and improve deficiencies. The challenge was to survey all the available KPIs from different departments and services then standardize them into a hospital wide level by developing definitions and documenting methods of calculation and reporting.

3. Methods

The researchers used qualitative survey methods through conducting semi-structured interviews with higher management officers, such as chief executive officer, director of medical and clinical affair and director of quality management, as well as hospital department heads and performance designees, which are specialist healthcare professionals assigned by each department and service to communicate and conduct the department performance vision and objectives to higher management. The sample included all professionals who belong to this group of executive and leading function. About forty interview meetings, each for sixty to ninety minutes, were conducted over the last six months of 2014, three for each of the twelve main departments and services in the hospital and some were conducted with higher management executives. The first meeting with each department was dedicated to orient the staff about the importance of KPIs and performance monitoring and improvement. The second meeting was conducted with the department head to discuss and approve their suggested KPIs and departmental priorities.

The third meeting was conducted with the performance designee member to verify and confirm the final list of suggested indicators. Interviews with participants focused on three main domains; verifying old KPIs already used by departments, suggesting new KPIs by staff and departments and providing justification and definition of each KPI. The study used qualitative descriptive approach and thematic analyses of participants' feedback. All collected KPIs were then standardized, in terms of indicator name, definitions and calculation formulae, and validated against published research and internationally recognized benchmarks, such as the healthcare quality indicators of the agency for healthcare research and quality (AHRQ) and the organization for economic cooperation and development (OECD) health care quality indicators project, then categorized and sorted into ten groups of indicators and finally were approved by the higher management of the hospital as the core set of strategic KPIs.

4. Results

Fifty eight KPIs could be identified, standardized and validated against published research and through comparisons with internationally recognized hospitals. These indicators were sorted into ten categories, as shown in table 1. Each category reflects specific performance objectives and helps in improving certain aspects of the performance of hospital departments and services. Detailed KPIs are shown in table 2.

Table 1. The Ten Categories of Suggested Key Performance Indicators.

S/N	KPIs Categories	Value
A	Patient Access Indicators	Reflect healthcare services accessibility
B	Inpatient Utilization Indicators	Reflect inpatient performance
C	Outpatient Utilization Indicators	Reflect outpatient performance
D	OR Utilization Indicators	Reflect operating room utilization and performance
E	ER Utilization Indicators	Reflect emergency department performance
F	Generic Utilization Indicators	Reflect the performance of some major services
G	Patient Safety Indicators	Reflect the safety of diagnosis, treatment and procedures
H	Infection Control Indicators	Reflects quality of care
I	Documentation Compliance Indicators	Reflects compliance with documentation policies
J	Patient Satisfaction Indicators	Reflects patient centeredness

Table 2. Detailed Selected KPIs Sorted into the Ten Categories.

S/N	Indicator	S/N	Indicator (Reported on Monthly Basis)
A	Patient Access Indicators	1	Number of Patients Referred
		2	Number of Patients Accepted
		3	Percentage of Patients Accepted
		4	Number of Patients on Waiting List for Admission
B	Inpatient Utilization Indicators	1	Number of Beds
		2	Number of Admissions
		3	Number of Discharges
		4	Average Daily Census
		5	Total Inpatient Days
		6	Average Length of Stay
		7	Average Bed Occupancy Rate
		8	Bed Turnover Rate
		9	Number of Patients with LOS > 30 Days
		10	Number of Patients with LOS > 60 Days
		11	Number of Patients with LOS > 90 Days
		12	Number of ICU Beds

		13	Average ICU Bed Occupancy Rate
		14	Average ICU Length of Stay
		15	Number of Patients Transferred to HHC (Home Health Care)
		16	Number of Deaths
		17	Mortality Rate
C	Outpatient Utilization Indicators	1	Total Number of Outpatient Clinic Visits
		2	Average First Available Slots > 30 Days for New Patients
		3	Patient Seen - New Patients
		4	Patient Seen - Follow Up
		5	Patient Seen - New Follow Up
		6	Number of No Show Patients
		7	Percentage of No Show Patients
D	OR Utilization Indicators	1	Number of OR Cases Booked
		2	Number of OR Cases Performed
		3	Number of OR Cases Cancelled
		4	Percentage of OR Cancellation Rate
		5	Number of OR Cases Done in Day Procedure Unit & Endoscopy
		6	Percentage of OR Cases Done in DPU & Endoscopy
		7	OR Utilization Rate
		8	Number of Cardiac Surgeries
		9	Number of Renal Transplants
		10	Number of BMT Cases - Adults
		11	Number of BMT Cases - Pediatrics
E	ER Utilization Indicators	1	Total Number of ER Visits
		2	ER Waiting Time (Door to Doctor)
		3	ER Treatment Time (Doctor to Disposition)
		4	ER Admission Waiting Time (Boarding Time)
		5	Percentage of Patients LWBS
F	Generic Utilization Indicators	1	Total Radiological Procedures
		2	Total Prescriptions
		3	Total Lab Investigations
G	Patient Safety Indicators	1	Unplanned Readmission within 30 Days of Discharge
		2	Unplanned Transfer to Any Critical Unit/OR
		3	Cardiac or Respiratory Arrest.
		4	Bleeding Requiring Transfusion/Exploration.
H	Infection Control Indicators	1	Blood Stream Infection
		2	Catheter Related Infection
		3	Wound Infection within 30 Days of Surgery
I	Documentation Compliance Indicators	1	Number of Deficient Records (less than 30 days)
		2	Number of Delinquent Records (more than 30 days)
J	Patient Satisfaction Indicators	1	Inpatient Satisfaction Rate
		2	Outpatient Satisfaction Rate

5. Discussion

As a tertiary care hospital, patients' accessibility to services is a very important indicator of performance. The number of patients referred to the hospital from other secondary and primary healthcare systems reflects the

increasing workload. The number of patients accepted reflects performance capacity and the percentage of patients accepted reflects the capability of the hospital to adapt with the increasing number of referred patients. The number of patients on waiting list for admission reflects the timeliness of healthcare provision[13]. Inpatient utilization indicators reflect work effectiveness and efficiency inside the hospital. Many of these indicators are interrelated and mutually influential. Number of hospital beds, number of admissions and discharges, average daily census and total inpatient days, average length of stay and bed occupancy rates in addition to bed turnover rate are all interrelated and affect each other[14].

Hospital bed occupancy rates have been proposed as a measure that reflects the ability of a hospital to properly care for patients. This measure is useful in guiding the planning and operational management of hospital beds in a way that improves how well patients are treated. Many studies discuss the effects of bed occupancy rates and average length of stay on patient outcomes[15]. It is very important to monitor the number of chronic patients, especially in a tertiary care hospital, such as number of patients with a length of stay exceeding 30 days, 60 days or 90 days. Chronic patients might need to be transferred to another long-term care facility or to a home healthcare program[16]. The number of ICU beds reflects the capability of a hospital to care for severely ill patients, while the average ICU bed occupancy rate and the average ICU length of stay might reflect complications such as nosocomial infections which are more prevalent in ICU especially ventilator-associated pneumonia[17]. It is very important to monitor the number of deaths in the hospital as well as the mortality rates, which directly reflect effectiveness of early diseases detection, proper diagnosis and appropriate treatment[18].

Most outpatient utilization indicators, such as total number of patients seen, actually reflect the efficiency of work in the outpatient department. Some indicator, such as average waiting time for new patients to be seen, reflects the accessibility of care in addition to the efficiency of care provision[19]. Many studies correlate no show behavior of patients for their outpatient appointments with a few factors such as patient's age and race, psychosocial problems and the percent of non-cancelled appointments that were kept by mistake. Some studies discuss the effect of patient satisfaction and patient-physician relationship on appointment keeping[20].

Operating room (OR) utilization indicators reflects the efficiency and effectiveness of care. It might vary largely according to the level of care provided, whether this is a secondary care or a tertiary care facility. Number of OR cases booked, number of OR procedures performed and number of procedures cancelled all reflects the capacity of work, where both cancellation rates and reasons should be investigated. Generally accepted OR cancelation rates range from 15 to 20%, while cancellation reasons are mainly due to unavailability of theater due to over-run of a previous surgery, no postoperative bed, cancelled by patient and change in patient clinical status. Some procedural reasons are also documented, such as patient not ready, no surgeon, administrative cause, and communication failure. Studies confirm that 60% of cancellations of elective procedures are potentially avoidable[21, 22]. Operative productivity indicators are also important, such as OR utilization rate, number of cardiac surgeries, organ transplants and bone marrow transplants.

Emergency room (ER) crowding has become a major barrier to receiving timely emergency care all over the world. Patients who present to EDs often face long waiting times to be treated and, for those who require admission, even longer waits for an inpatient hospital bed. It is very important to monitor the number of ER visits, ER waiting time (Door to Doctor), ER treatment time (Doctor to Disposition), ER admission waiting time (Boarding Time) as well as percentage of patients left without being sees[23]. Because ER crowding is a reflection of larger supply and demand mismatches in the health care system, the problem cannot be solved by examination of the ER in isolation. To find solutions, we must examine ER crowding in the context of the entire delivery system by using reliable methods to understand, measure, and monitor system capacity. Many studies investigated the association between increased hospital occupancy rates and the increased ER crowding and prolonged ER length of stay[24, 25].

Patient safety indicators and infection control rates are very important parameters that reflect quality of care and patient centeredness. Safety indicators include unplanned readmission within 30 days of discharge, which directly reflects treatment effectiveness, unplanned transfer to critical care units or to the operating room, number of cardiac

or respiratory arrest and incidents of bleeding requiring transfusion or exploration. Infection control indicators include blood stream infections, catheter related infections and wound infection within 30 days of surgery[26]. Some generic utilization indicators might reflect overall investigations capacity, such as total imaging procedures, total prescriptions dispensed, both inpatient and outpatient and total lab investigations[27].

Among generic performance indicators, documentation compliance is a very crucial indicator, such as number of deficient medical records (incomplete records for patients discharged less than 30 days ago) and number of delinquent medical records (for patients discharged more than 30 days ago). The first reflects compliance but is highly influenced by the number of discharged patients, when you discharge more you get more deficient records, while the second reflects the real status of healthcare professionals' documentation commitment, where proper documentation improves patient safety and reduce medical errors and liability risks[28]. Finally patient satisfaction rate, for both inpatient and outpatient services, which has gained widespread recognition as a measure of quality in healthcare, despite it still needs better definition and more objective methods for measurement[29, 30].

6. Conclusions and Recommendations

Many of these KPIs are already in use individually by hospitals and healthcare organizations. The main contribution of this work is to provide healthcare professionals with a more focused perspective towards classifying KPIs into functional categories and specific measurement groups; the more important is "why" we measure rather than just "how". Building this framework for strategic KPIs is very essential not only to report performance, highlight deficiencies and suggest improvements, but also to provoke more new ideas and suggestions on monitoring both tactical and operational performances as well.

Most of the discussed indicators are already automated, generated electronically from the hospital information system and reported through the hospital data warehouse system retrospectively. Before considering these KPIs reliable we have to validate the reported figures against manual records, nurses' books and departmental information, such as number of operations done or patients seen. In addition to the stage of validation, we have another important stage of setting triggers before these KPIs are fully comprehensive. Triggers are alarming values that KPIs should not exceed, whether these are lower limit triggers, such as number of patients seen in clinics which we don't want to decrease, or upper limit triggers, such as infection rates, which we don't want to increase, or both an upper and a lower limit, such as occupancy rates which we need to keep within a certain range[31, 32].

The researchers suggested two methods of setting up triggers; the first is by using international benchmarks and published evidence based figures of similar hospitals and healthcare institutions, some of these could also be standards that the hospital has to meet for accreditation or compliance with international programs, such as JCI (Joint Commission International) standards or other specialized accreditation programs. The second method is to utilize the available data on previous performance; for example using last year performance values of the hospital, and statistically setting an upper control limit, a lower control limit and an average for each indicator, then a suggested trigger, based on hospital or departmental objectives, could be estimated for each indicator.

Since these suggested strategic KPIs are mostly automated, the researchers suggest two types of further expansions; the first is to expand these KPIs horizontally to include more related indicators or more departmental specific indicators, such as specialty specific rates, e.g. fetal death rates, IVF success rate (In Vitro Fertilization) and caesarian section rates for a department like obstetrics and gynecology. The second is to expand these KPIs vertically to include multiple levels of details, e.g. providing scorecards users with the ability to drill down to a lower level of details to check for certain indicators in certain departments, units or services. For example, users should be able to compare average length of stay among different departments or nursing units.

It is very crucial to provide system developers with valid and accurate definition for each indicator and to delegate ownership of each indicator to specific departments, services or users. These indicator definitions should include mainly two components; the first is the importance and value of the indicator; why do we need this

indicator and how are we going to use it in setting future objectives and achieving performance improvement and the second is how should this indicator be calculated, including formulae, inclusion and exclusion criteria, such as the difference between total licensed beds and operational or functional (accessible) beds.

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