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Abstract

Purpose: This paper develops a theoretical framework of holistic hospital management based on performance indicators which well fit healthcare context in Japan.

Design/methodology/approach: Selection of a key indicator set and its validity tests were performed primarily by the use of two data sources as well as expert statements obtained by interviews: systematic review of literature and questionnaire survey to healthcare experts. The systematic survey searched PubMed and PubMed Central, and 24 papers (761 indicators included) were elicited as relevant. The expert questionnaire asked respondents to rate the degree of "usefulness" for each of 66 indicators on a three-point scale (19 responses collected).

Findings: Applying the framework, we selected a minimum set of key performance indicators for holistic hospital management in the Japanese context. This indicator set comprised 35 indicators and items collected through patient and employee surveys. The indicators were confirmed by expert judgment from viewpoints of face, content and construct validity as well as their usefulness.

Originality/value: This paper established the theoretical framework of performance measurement for holistic hospital management from primary healthcare stakeholders' perspectives. Performance indicators were largely divided to healthcare outcomes and performance shaping factors. Indicators in the former type may be applied to detection of operational problems or weaknesses in a hospital/department, while latent causes of each problem can be more easily addressed by the latter type in terms of process, structure and culture/climate within the organization.

Keywords: Hospital management; Holistic management; Performance measurement; Performance indicators; Systematic review.

1. Introduction

There have been various kinds of issues raised in the healthcare sector. Adverse events in healthcare have been one of the most crucial social problems in recent years (e.g., Kohn et al., 1999). In addition to patient safety issues, for instance, healthcare officers and authorities receive strong pressures for cost containment due to increase of expenditure that are attributed to aging population, nature of contemporary diseases and the extensive use of costly biomedical technology (Aletras et al., 2007). Similarly, hospital leaders and department managers are strongly required to demonstrate higher efficiency and effectiveness in providing services to their clients (Weir et al., 2009). Consequently, it is indispensable for healthcare providers to work long hours (Rogers et al., 2004), which causes excessive workload and fatigue, and in turn leads to lower staff motivation and satisfaction with work (Holden et al., 2011). Each of these managerial issues is typically tackled independently by a specific section, although they are inter-related. For instance, a patient safety issue is treated in the risk management section while efficiency or productivity of clinical activities is typically addressed as operations management in healthcare. However, these issues are closely inter-related and their contributing factors may often be the same. For instance, it was suggested that continuous long-hour work may, on the one hand, temporarily yield positive effects on efficiency such as higher utilization and reduced personnel expenditure, but on the other it must derive higher risk of medical errors. As another important issue, no or only a few organizations, particularly small-sized hospitals and clinics, have a specific section that formally covers managerial issues at a higher level in the healthcare sector. Therefore, it is of critical importance to address various management issues from *holistic* points of view, from daily operations management and patient safety activities to strategic planning and decisions for the hospital's future goals.

Another requirement for hospital management may be an evidence-based approach. As evidence or rationale for how well organizational objectives or goals are achieved, *performance measurement* has been also emerged in recent decades in healthcare, using performance indicators (e.g., Campbell et al., 2000; van der Geer et al., 2009). In this regard, it was suggested that hospitals in Japan hold fewer data related to performance indicators than those in Europe, e.g., Denmark, although hospital managers or department leaders may implicitly retain approximate values of important indicators in their memory for management purposes in the former country (Traberg et al., 2010). Therefore, healthcare organizations and their management must particularly take an evidence-based approach to hospital management in Japan.

Thus, performance measurement provides not only an organization but also a country's government or healthcare authorities with fundamental information for various issues related to healthcare management from operational to strategic level. On the one hand, a typical example of its application at the operational level is operations management, which includes measuring and assessment of operations and processes within a hospital. The government can demonstrate its accountability for

operations and financial performance of health systems in the country or community by benchmarking specific performance indicators with other countries or local areas. Measurement of performance indicators, on the other, allows hospital management to make strategic decisions on hospital goals, and the government to establish future initiatives required for sound and sustainable national health systems.

There have been a number of national projects specifically conducted in Western countries, e.g., USA (Institute of Medicine, 2001), UK (Department of Health, 2001), Denmark (Mainz et al., 2004) and Australia (National Health Performance Committee, 2001), as well as several international projects, for instance, initiated by WHO (Veillard et al., 2005) and OECD (Arah et al., 2006). One of the most well-known international projects, the PATH (performance assessment tool of quality improvement in hospitals) project was launched in 2003, coordinated by the WHO Regional Office for Europe. In this project, a conceptual model was built to measure hospital performance in terms of the following six dimensions (including 51 indicators): clinical effectiveness, safety, patient centeredness, responsive governance, staff orientation and efficiency (Veillard et al., 2005). In PAF (performance assessment framework) project conducted by the National Health Service (NHS), UK, a total of 48 performance indicators were classified into six dimensions which were different from the PATH framework: health improvement, fair access, effective delivery of appropriate health care, efficiency, patient/care experience of the NHS, and health outcomes of NHS health care (Chang et al., 2002). As Groene et al. (2008) summarized ten national and international projects, each of them has different purposes and therefore used a different assessment model which comprised a different set of dimensions, including a number of different performance indicators, i.e., 36-308 indicators. From these reasons, it was suggested that there has been still no framework unanimously accepted as a tool for measuring quality and performance of healthcare services (Ondategui-Parra et al., 2004) although many different frameworks have been proposed.

In addition to the projects at national and international level, there have been a number of performance indicator studies at the organizational level for the purposes of measurement and assessment of quality or performance. One of the pioneering studies in healthcare, Donabedian (1966; 1988) proposed to assess care quality in terms of its outcome, structure and process. Several studies adopted the Donabedian approach to measurement of healthcare quality (e.g., Chiu et al., 2007; Mainz et al., 2004; van Eygen et al., 2007). Another major approach to assessment of healthcare services is application of balanced scorecard (Kaplan and Norton, 1992; 1996), in which organizational performance is measured based on the following four aspects: financial performance, customer satisfaction, internal processes, and learning and growth. There have been studies that applied these aspects to selection of indicators for measuring quality performance in healthcare (e.g., Chang et al., 2002; Chen et al., 2006; Curtright et al., 2000; Radford et al., 2007). As will be mentioned in the Systematic Review section, indicator sets used in organizational-level studies were diversified and typically comprised a number of indicators.

Although performance indicators potentially have great advantages like ones mentioned above, e.g., evidence-based management and holistic management at operational to strategic level, several difficulties and disadvantages have been pointed out for their applications to hospital management. As mentioned previously, most performance measurement frameworks or tools included a large number of indicators. Therefore, great efforts were required to obtain voluminous data for indicators (Mainz, 2003). In addition, hospital managers and decision makers constantly suffered a problem for selecting proper ones among a vast, diversified set of indicators (Gordon et al., 1998). These efforts must have led to administration fatigue and information overload (Bovier and Peneger, 2003). Such administration burden had no contribution to higher operations performance, but provided only greater administrative work (Traberg and Jacobsen, 2012a). For these reasons, performance measurement systems have been almost universally acknowledged to work poorly and viewed negatively by both hospital managers and employees (Furnham, 2004). These negative views – and actual poor performance – of performance measurement were primarily derived from a number of indicators that are never used but must be collected. Therefore, it is of critical importance to determine a *limited number* of essential indictors which meet management purposes.

In addition, most frameworks and indicators for healthcare performance assessment have been developed in Western counties, and relatively few in Japan (but see: Chen et al., 2006). Several studies have shown that differences in national culture make it questionable to transfer results across cultural borders (e.g., Helmreich, 2000; Tayeb, 2001). It is therefore indispensable to create a conceptual framework of performance measurement and its indicators which well fit healthcare situations in Japan, where healthcare systems, rules and regulations as well as national culture are different from Western countries.

With the background mentioned so far, we started a project on holistic hospital management in April 2011. The main purpose of the project is to support healthcare organizations in conducting evidence-based management from holistic views, including not only safety and efficiency of medical activities but also other important aspects such as patient and employee satisfaction. In this project, we would create a conceptual framework for holistic hospital management based on a limited number of performance indicators, and methods for assessing the current states in hospital performance and translating them into action plans for improvement. Subsequently, we plan to implement the framework and assessment methods as a computer-based tool which can be used for various management activities, from monitoring and control of hospital operations to strategic planning for improving hospital services.

In this paper, we report a conceptual framework of holistic hospital management based on performance indicators as the first phase of the project. The framework was examined and a minimum set of indicators were determined by the use of systematic review of literature and expert rating in questionnaire survey. We also discuss two implications of the theoretical framework as a future direction of the project: qualitative improvement – a more useful and effective set of performance indicators,

and quantitative extension – broader applications to specific healthcare settings.

2. Theoretical framework

In this section, we describe a theoretical framework of holistic hospital management, i.e., concept and structure of performance indicators required for the management system. Schematic illustration of the theoretical framework is shown in Figure 1. In this study, an indicator is referred to an indication of a specific state or phenomenon which can be *quantitatively* measured or assessed from its related data. A sub-indicator is defined as an indication of the same state or phenomenon as its superordinate indicator, but more specific based on cases or conditions such as professional groups, diseases, procedures and periods. As taxonomy of performance indicators, our framework has three primary axes of indicator characterization: (1) stakeholder perspective, (2) assessment property, and (3) whole-part hierarchy. Each of these axes was corresponding to an intended application purpose of the framework: (1) performance assessment from stakeholder views, (2) applicability of interpretation of measurement results to improvement actions, and (3) creation of management tools ranging from an organization-wide system to a department/specialty based system.

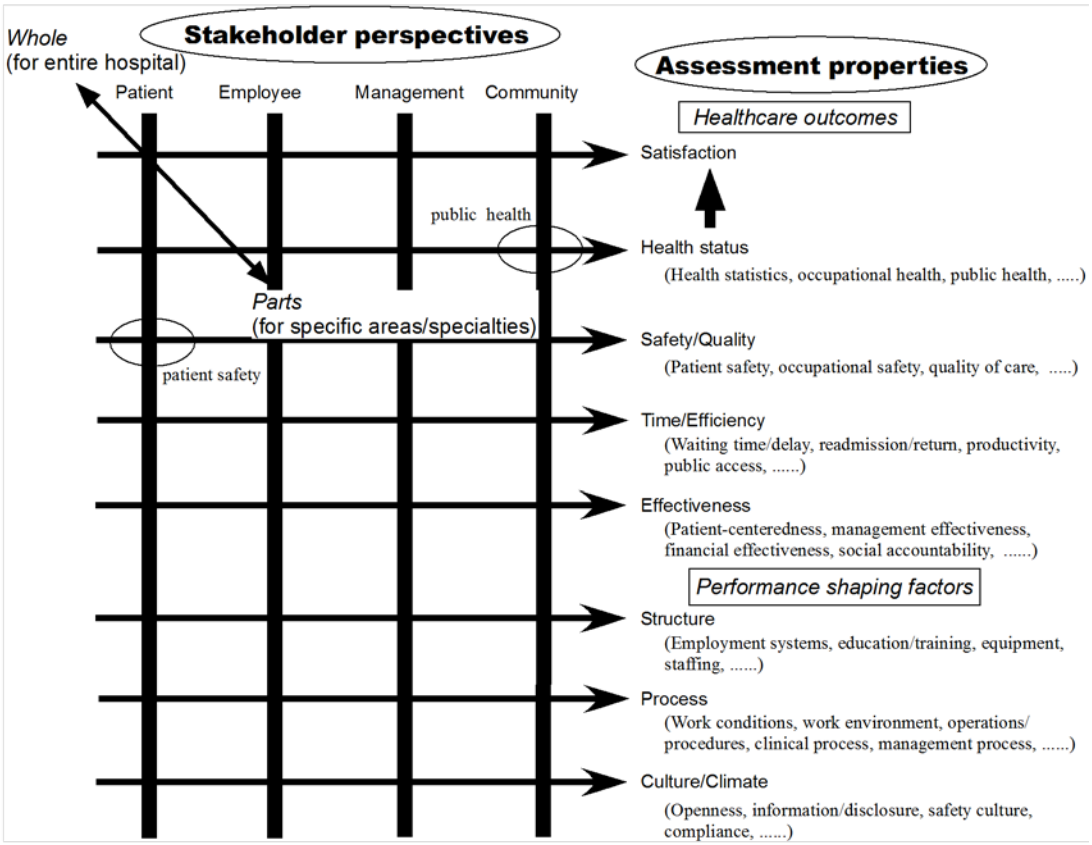

Figure 1 Theoretical framework of holistic hospital management

The whole-part hierarchy is related to the level of decomposition from the entire hospital to a specific department or specialty (Rasmussen, 1976). In this paper, we focus on application to the entire hospital performance, and only one extreme of this axis is applicable (therefore this axis is negligible). Other elements in the theoretical framework are described in Table 1.

Table 1 Structure of performance indicators

Components in framework	Description
Stakeholder perspectives	Classification of measures, indicators and sub-indicators from key healthcare stakeholders that are the most concerned. The following four stakeholders are focused on in this study: patient, employee, management and community.
Aspects (assessment properties)	Characterization of indicators and sub-indicators from evaluation aspects or management purposes. Assessment properties are composed of eight aspects, i.e., satisfaction; health status; safety/quality; time/efficiency; effectiveness; structure; process; and culture/climate, which are largely divided into two types: (1) healthcare outcomes – that are consequences or goals of healthcare activities – and (2) performance shaping factors (PSFs) – which may impact on healthcare outcomes.
Dimensions (measures)	Each aspect of assessment is composed by multiple dimensions, which represent characterization of present states as an abstract factor within an organization/department, based on stakeholder perspectives, e.g., "patient safety" dimension is fallen into the safety/quality aspect of patient perspective. Each stakeholder perspective generally has one or more dimensions, but does not necessarily have a dimension in every aspect in its nature, depending on the combination of aspects and stakeholder perspectives, e.g., no dimension of "structure" aspect for the patient perspective. Each dimension includes one or multiple indicators.
Indicators	Indication of specific states or phenomenon which can be quantitatively measured or assessed by use of management data, operational records, questionnaire responses collected by a particular type of healthcare stakeholders, and other methods. In the literature survey of this paper, indices which applied different calculation procedures, e.g., indices of "mean waiting time for consultation" and "percentage of waiting time longer than two hours" – waiting time – or different labelling for the same or similar concepts, e.g., injury incidents, adverse events, and sentinel events – adverse events –, were grouped in the same indicator. We must determine a single quantitative method (definition) for each indicator or sub-indicator which will be selected for an implemented hospital management system.
Sub-indicators	Subsets of a particular indicator for specific cases, e.g., based on the professional groups, diseases or period.

Many stakeholders such as patients, families/relatives, employees, hospital owners, leaders and managers, policy makers, authorities and industry (e.g., pharmaceutical and medical equipment industry) are involved in modern healthcare. It is evident that healthcare performance is required to capture from perspectives of various important stakeholders. In this paper, we selected the following stakeholders: patients (including families and relatives), employees, management, and community. On the one hand these four stakeholders are active players within the hospital/clinic and as influential external actors, and all of them, on the other, have different interests in health and related issues.

There have been some indicator systems frequently used in healthcare, and each system introduced some aspects or dimensions that can classify indicators in terms of assessment properties. As mentioned previously, Donabedian's (1988) framework adopted three aspects of outcome, structure and process for healthcare performance assessment. The balanced scorecard directed more to its strategic applications rather than merely performance measurement (Kaplan and Norton, 1996), and therefore it included three aspects that can drive a firm's changes or innovation, i.e., customer satisfaction, internal processes, and learning and growth, as well as another aspect that directly measures financial performance. In this paper, we take a more comprehensive approach to classification of assessment properties, adopting a hierarchical structure with a number of managerial characteristics in healthcare

As for assessment properties, our theoretical framework has a total of eight aspects. These aspects are largely classified into two categories: healthcare outcome and performance shaping factor (PSF). The former category was composed of several aspects related to consequences directly or indirectly derived from activities and operations within a hospital. The latter category, which was named after discipline of human reliability analysis/assessment (HRA; e.g., Hollnagel, 1993), represents conditions or factors that may impact on healthcare outcomes. Thus, indicators in the PSF category may be "formative" elements which lead to changes in the value of latent conditions, while those in the healthcare outcome category may work as "reflective" variables which are the results of the changes in the latent conditions. This formative-reflective distinction will help us provide useful implications for improvement actions or initiatives, e.g., what indicators can interpret what problems may exist in the hospital or what actions/initiative should be taken. However, an isolated view of hospital performance by a single indicator may possibly mislead to wrong interpretation of the current status, and therefore one should carefully assess the hospital performance with combination of indicators in both the PSF and the outcome category, considering their inter-relationships for a particular phenomenon or problem.

In our framework, indicators in the healthcare outcome category are further broken down to the following five aspects: satisfaction, health status, safety/quality, time/efficiency and effectiveness. This configuration of the outcome category almost corresponds to six aspects for hospital goals recommended by the Institute of Medicine (2001): safe, effective, patient-centered, timely, efficient and equitable. As

Donabedian (1988) stated that patient satisfaction is an expression of their judgment on all aspects, performance results of the "satisfaction" aspect may be influenced by all other aspects of healthcare outcomes such as health status, safety/quality and time/efficiency. Therefore, indictors from the satisfaction aspect may be a promising means when capturing overall hospital performance quickly but approximately, but should be assessed not only from patient satisfaction but also from employee (and possibly management) satisfaction.

The PSF category has the following three aspects: structure, process and culture/climate. Donabedian's framework included two of these three aspects, i.e., structure and process, to assess healthcare conditions, and moreover there have been no or few frameworks that explicitly described "PSF" or related dimensions. It is well known that organizational culture – climate is a related concept as its surface manifestation – is correlated with various indices of organizational performance (e.g., Schein, 1992; 2000). Taking up the safety aspect as an outcome property, for instance, it has been acknowledged that quality and safety are affected not only by structural and process factors, but also by employee attitudes to and perceptions of their job roles and safety related issues, their organization and management, i.e., safety culture (e.g., Itoh et al., 2012). Therefore, it is natural to include a culture/climate aspect in the PSF category. For these reasons, our indicator system can be considered one extended from the Donabedian framework in that healthcare performance can be measured and assessed *more comprehensively* from contributing factors to healthcare outcomes.

As mentioned above, each indicator (and its sub-indicators) is characterized as a combination of *stakeholder perspective* and *assessment property.* An intersection with a particular aspect of assessment and a stakeholder represents a measure or dimension, which refers to a related issue to the aspect from the stakeholder's view as an abstract factor. Each intersection has typically one or a few measures, but does not necessarily have one, depending on its combination. For instance, regarding the time/efficiency aspect, two dimensions possibly come from the patient perspective, i.e., waiting/delay and cancelation, and more from management perspective, e.g., readmission/return, organizational efficiency, equipment efficiency and staff efficiency, whereas no measure may be attributed to this aspect from the employee perspective because of no or little concern of hospital staff with these or related issues. One or more indicators and sub-indicators are typically assigned to each measure. For instance, possible indicators in the waiting/delay measure (from time/efficiency aspect, and the patient perspective) are waiting time for operation, outpatient waiting time and waiting time for admission.

3. Methods

According to the theoretical framework mentioned in the last section, a set of performance indicators were selected based on data sources elicited primarily by two methods. In the selection process of indicators, we tried to ascertain face validity,

content validity and construct validity of indicators as well as their usefulness and relevance to the given context of use, i.e., application to holistic management for general, acute hospitals in Japan. Johantgen et al. (1998) implied that no study has performed well-defined, reliability and validity tests for healthcare performance indicators. Thus, it seems of great difficulty to undertake formal tests of validities for indicators. For this reason, in this study, validity tests were performed primarily by expert judgment with reference to potential indicators elicited by literature survey and interviews with healthcare professionals. For face validity, we examined whether the indicator set is acceptable by its potential use. Content validity of the indicators was checked whether all the measures or dimensions are covered by indicators properly. We confirmed construct validity by examination of indicators about internal reliability, i.e., inter-related but not too similar each other, in each measure.

Overall steps for the selection process of performance indicators are described as follows:

1. Performance indicators that can potentially be used for healthcare management were extracted from results of *systematic review* of literature.
2. A *questionnaire-based survey* was conducted for healthcare experts to elicit a limited number of key performance indicators. Interviews were made to confirm three types of validity for the set of key indicators.

3.1 Systematic review

We searched for articles in PubMed and PubMed Central (PMC) published between November 1965 and June 2012. The following six sets of keywords were used for searching in all fields: (1) “performance indicator(s)”, (2) “safety indicator(s)”, (3) “quality indicator(s)”, (4) “management indicator(s)”, (5) “operations management” AND “indicator(s)”, and (6) “performance measurement” AND “indicator(s)”. Only peer-reviewed articles written in English were included for review. Articles in reference lists of selected papers as “relevant” to this study – for which we use the term “relevant articles” – were also reviewed. The first author of the present paper primarily performed the review process, and the second author checked the review results in the end of each step of screening process. The screening process was performed in the following steps (a figure in parentheses indicates the number of articles remained after execution of each step): removing duplicated articles (14,866 articles), title screening (1,620), abstract screening (659), and full-text screening (24).

To elicit the relevant articles from the searched articles, we used the following selection criteria:

- *Clear description of indicators*: an article included clear description of indicators.
- *Application to work setting*: indicators were applied to actual work setting in healthcare.
- *Multiple measures*: an article included indicators from not only one but multiple

measures.

- *Measurable indicators*: indicators were not only defined but also quantitatively measured or assessed.
- *Management purpose*: indicators were used for the purpose of management of a hospital or departments.

An article that fulfilled all these five conditions was determined as relevant. We summarized each relevant article in terms of essential information for future use of indicator selection, as shown in Table 2. Example summary descriptions of a relevant article are provided in Appendix A, taking Basu et al. (2010) as a case. An example of mapping of indicators to the theoretical framework can be seen in Appendix B for the same case.

Table 2 Elicited information from each relevant article

Information	Description/categories
Source of article	Authors, title, journal, vol., no., pages, and year.
Outline of article	Objectives, main conclusions, strengths and weaknesses, etc.
Place and period of study	City, country; investigation period
Setting applied	Hospital type, specific department or specialty, etc.
Organizational level applied	Entire hospital, all departments, some /part of departments/work units, etc.
Indicators (and sub-indicators)	Indicator labels, definitions, and calculation (equations).
Data collection method	Operational/achievement record, observation, questionnaire (e.g., self-report, BSC, Likert scale), interview, expert rating/judgment (brain storming, Delphi technique), etc.
Purposes of indicators	Just recording, statistics generation, intervention, operational performance assessment, strategic goal planning, tactical planning, operational status monitoring/tracking, etc.
Validity/reliability of indicators	Internal reliability, test-retest reliability, inert-rater reliability, external reliability (criterion validity), content validity, etc.
Implementation as tool/instrument	Whether indicators were implemented as a tool or instrument for ease of use to other organizations

3.2 Questionnaire to healthcare experts

A major purpose of questionnaire-based survey was to select a limited number of indicators, which are useful for hospital management in the Japanese context, from viewpoints of healthcare experts, including hospital leaders and employees. The questionnaire comprised a main part of “usefulness” rating, and some open-ended questions related to specific indicators on hospital management. In the main part, respondents were asked to give their “usefulness” rating for each indicator on a three category scale, including two extremes. Expression of one extreme (positive) was “the indicator is of *critical* importance for hospital management”. The other extreme

(negative) was instructed in the following statement: “the indicator does *not make sense* for hospital management. It is just a waste of time to collect the data”. Therefore, the intermediate response option was *not* actually neutral, raging broadly from “slightly disagree” (negative) to “slightly agree” (positive) in the sense of a Likert-type scale. The intension of using this scale was to select only a small number of indicators to which a majority of healthcare experts acknowledge extremely high value, but no or very few have strong objection.

A total of 66 indicators (cf. Appendix C) were offered in the questionnaire, selected based on the results of the systematic review and interviews with healthcare professionals within the project team. No indicator from the community perspective was included since most “community” indicators were labeled similarly to those from the patient or management perspective, e.g., adverse event, waiting time and mortality rate, and were define to calculate by aggregated data from hospitals within a local area. Respondents were also invited to indicate other important indicators that were not included as closed-ended items in the questionnaire.

We collected a total of 19 responses from healthcare experts, all of who were Japanese working in hospitals of Japan, including a professor who was responsible for an internal medicine department of a university hospital, two hospital leaders and two deputy hospital leaders who were also physicians, three physicians, six nurses and five clinical engineers. Response rate was almost 100% since questionnaires were distributed to member hospitals of this project.

4. Results

4.1 Performance indicators frequently used

Among 24 relevant articles, more than a half of healthcare indicator studies (15 articles) were conducted in Western countries, i.e., USA (Coyne, 1982; Curtright et al., 2000; Griffith et al., 2002; Orton et al., 2003; Radford et al., 2007; Shukla et al., 1997), New Zealand (Gauld et al., 2011) and Europe (Basu et al., 2010; Chang et al., 2002; Foster et al., 1990; Rath et al., 1999; Traberg and Jacobsen, 2012a; 2012b; Verzola et al., 2009), including a cross-cultural study conducted inside of Western countries (Kazandjian et al., 2003), whareas seven studies, one of which was a cross-national project between Japan and China (Chen et al., 2006), were conducted in Asia (Chiu et al., 2007; Chu et al., 2009; El-Jardali et al., 2011; Gross, 2004; Rabbani et al., 2011) and Africa (van Eygen et al., 2007). The other studies compared hospital performance between countries exceeding a cultural border, including the US, Europe and Asia (de Korne et al., 2010; Kazandjian et al., 1996). Besides these studies, as mentioned in the Introduction Section, there have been a number of international and national projects on performance indicators – we had detected 31 projects by the use of a different search method – particularly in Western countries. However, most of these projects were published in non-peer-reviewed articles, e.g., government reports and website, and were not included application results of their

indicators although they were actually measured in healthcare settings. In addition, primary objectives of these projects were generation of nation-wide statistics and cross-national comparisons on healthcare performance for accountability, while our aim of the systematic review was to elicited “performance indicator” studies that tried to conduct with management purposes. For these reasons, only a few articles on these projects fulfilled the selection criteria of the systematic review.

We elicited a total of 761 indicators and sub-indicators – including those with overlapped and similar labels – from the 24 relevant articles. Grouping indicators having the same or very similar concept into one, all the indicators and sub-indicators elicited from these studies are provided in Appendix D, according to the theoretical framework. Frequency of use for indicators (and sub-indicators) is shown for each combination of the assessment property and the stakeholder perspective in Table 3. As can be seen in this table, nearly a half of indicators elicited from the former studies were attributed measures from the management perspective. In particular, indicators on the time/efficiency and the health status measures occupied a large part. Followed by the management perspective, indicators from the patient perspective frequently appeared in indicator systems. Most of these indicators were characterized either as patient satisfaction, patient safety or efficiency-related measures. In contrast, only a small proportion of indicators were elicited from the employee and the community perspective. From great contributions of professional staff as key players and increasing concerns with human factors issues in healthcare (e.g., Kohn et al., 1999), measures (and therefore indicators) from the employee perspective should be more frequently applied to hospital management.

Table 3 Number and proportion of indicators appearing in former studies

Stakeholder perspectives	Healthcare outcomes					Performance Shaping Factors			Total
	Satis-faction	Health status	Safety/ Quality	Time/ Efficiency	Effective-ness	Structure	Process	Culture/ Climate	
Patient	34	0	32	26	4	0	3	10	109
	7.9%	0.0%	7.5%	6.1%	0.9%	0.0%	0.7%	2.3%	25.5%
Employee	13	10	5	0	0	21	17	0	66
	3.0%	2.3%	1.2%	0.0%	0.0%	4.9%	4.0%	0.0%	15.4%
Management	1	51	3	73	30	10	21	3	192
	0.2%	11.9%	0.7%	17.1%	7.0%	2.3%	4.9%	0.7%	44.9%
Community	0	19	0	5	19	6	2	0	61
	0.0%	4.4%	0.0%	1.2%	4.4%	3.7%	0.5%	0.0%	14.3%
Total	48	80	40	104	53	47	43	13	428
	11.2%	18.7%	9.3%	24.3%	12.4%	11.0%	10.0%	3.0%	100.0%

Upper row: the number of indicators; Lower row: percentage of indicators.

A majority of indicators elicited from the former studies (76%) were fallen into measures related to the healthcare outcomes. In contrast, only less than a quarter of indicators (24%) came from PSF measures. Although it has been well acknowledged

that organizational problems frequently become *latent causal factors* that contribute to the occurrence of human error made by frontline personnel (Reason, 1997), percent usage of structure-, process- and culture-related measures were small even from the management perspective. Therefore, we should increase percentage of application of indicators on PSF measures to hospital management.

Table 4 Indicators frequently used in former studies

Stakeholder perspectives	Measures	Indicators	Frequency of use
Patient	Patient satisfaction	Overall satisfaction	7
		Satisfaction with specific professionals	4
		Satisfaction with specific care/service	3
	Patient complaint	Overall complaints	8
	Patient safety	Incident/Errors (specific cases)	8
		Incident/Errors	3
		Accident/adverse event	7
		Nosocomial infection	6
		Nosocomial infection (specific cases)	5
	Waiting/Delay	Waiting time for specific cases	5
		Waiting time in emergency room	4
		Waiting time for treatment/consultation	3
	Cancelation	Cancelled operations	4
	Information	Information by specific staff groups	3
		Received written information	3
Employee	Employee satisfaction	Overall satisfaction	6
	Occupational health	Sickness leave	5
	Occupational safety	Errors/incidents	4
	Work conditions	Staff turnover	6
	Employee competence	Research opportunities	3
Management	Health statistics	Mortality/Death	7
		Mortality/Death (specific disease)	7
		Survival/Revival	3
		Number of operations/procedures	6
	Readmission/return	Unscheduled readmission	6
		Unexpected return	5
		Unscheduled readmission (specific cases)	4
	Organizational efficiency	Length of stay	11
		Bed occupancy	6
	Financial effectiveness	Financial measures	7
		Cost effectiveness	4
		Cost/expenditure	3
	Staffing	Full-time equivalents	3
		Full-time staff	3
	Management process	Patient transfer	3
Community	Waiting/Delay	Waiting time	3
	Public access	GP availability	3

Individual indicators used in relatively frequent in the former studies are shown in Table 4. The indicator most frequently used was length of stay, which appeared in

almost half of the relevant articles. There was a slight variation about usage of indictors, depending on the stakeholder perspectives. There were almost as many "frequent-to-use" indicators from the management perspective as from the patient perspective. Selecting indicators used in five or more articles, seven, three, eight and no indicators were fallen into the patient, the employee, the management and the community perspective, respectively. In addition, only a single indicator was selected on a specific measure from the patient and the employee perspective except for the patient safety – which hospital experts themselves acknowledged one of the most crucial problems –, while multiple indicators comprised each measure selected from the management perspective, e.g., length of stay and bed occupancy on the organizational efficiency measure; and unscheduled readmission and unexpected return on the readmission/return measure. This may indicate that more indicators should be included in each measure from the patient and the employee perspective from the viewpoint of construct validity, and indicators on other measures from the management perspective can be added for improving content validity.

4.2 Expert ratings of performance indicators

Results of expert ratings are summarized in Table 5 in terms of the number of positive and negative responses to the question about "usefulness" of each indicator for hospital management. This table included only indicators that were rated either positive (useful) or negative (useless) by many respondents. As can be seen in this table (b), there was no indicator to which *many* healthcare experts rated "useless" for hospital management with the same criterion of "useful" indicators. Therefore, the "useless" criterion was taken as much lower, i.e., 3 or more negative responses, in the table. Even for the indicators that met this reduced criterion, the number of negative respondents was smaller than or equal to that of positive ones. All six "useless" indictors were categorized into three measures: waiting/delay, cancellation, and employee competence. Four indicators on the former two measures were stemmed from the patient perspective, and had shared or similar key words. In contrast to Japanese expert views, these indicators were commonly used in the existing studies, most of which were conducted in Western countries. This inconsistency seems to derive primarily from differences in healthcare systems between Japan and these countries.

A number of healthcare experts acknowledged importance of indicators in patient satisfaction and patient safety measures. Those indicators were also almost in the highest rank of usage among the relevant studies conducted in the other countries. This may suggest that indicators in patient satisfaction and patient safety are universally important for hospital management regardless of countries. Similar to the patient perspective, indicators on employee satisfaction and occupational safety, i.e., needle stick injury, were rated highly "useful" by a majority of Japanese experts. This trend was also shared with the relevant studies in the other countries. In addition, as can be seen in Table 5, healthcare respondents gave high values of "usefulness" to many indicators from the management perspective, most of which also appeared in

the former Western studies. In contrast, a Japanese trend to work conditions was seen from expert rating: several indicators on this measure, specifically related to workload, i.e., overtime, length of service and the number of staff per bed, were acknowledged "useful" for hospital management.

Table 5 Indicators rated positively and negatively by healthcare experts

(a) Indicators rated positively

Indicators	No. rated		Indicators	No. rated	
	positive	negative		positive	negative
(1) Patient perspective					
Overall satisfaction	13	1	Satisfaction with treatment	12	0
Satisfaction with nurses	11	0	Satisfaction with physicians	10	0
Satisfaction with care/service	10	0	Accident/adverse event	13	0
Incident/Errors	12	0	Patient complaint	10	0
Nosocomial infection	10	0	Outpatient waiting times	10	1
Received written information	9	0	Waiting time in Emergency Room	8	1
(2) Employee perspective					
Overall employee satisfaction	11	0	Satisfaction with organization	11	0
Satisfaction with job	10	0	Satisfaction with hospital facilities	11	0
Needle stick injury	10	0	Overtime	11	0
Staff turnover	8	0	Sickness leave	9	0
Number of staff per bed	11	1	Length of service	9	0
Occupied position	9	0			
(3) Management perspective					
Mortality/Death	10	1	Morbidity	8	0
Survival/Revival	9	0	Number of patients per day	12	0
Number of outpatients per day	13	0	Inpatient admission	12	0
No. of operations/procedures	12	0	Unscheduled readmission	8	0
Unscheduled returns to ICU/OR	9	0	Bed occupancy	11	1
Number of outpatients per doctor	10	0	No. of emergency patients per dr.	8	0
Admissions per bed	12	0	Length of stay	12	0
Equipment utilization	9	0	Full-time equivalents	10	0
Full-time staff	10	0	Cost/expenditure	8	0
Cost effectiveness	9	0			

(b) Indicators rated negatively

Indicators	No. rated		Indicators	No. rated	
	positive	negative		positive	negative
(1) Patient perspective					
Waiting time for operation	6	3	Waiting time for admission	6	3
Cancelled operations	4	4	Cancelled examinations	5	3
(2) Employee perspective					
Academic papers written	5	4	Scientific projects	4	3

Table 6 Minimum set of performance indicators for Japanese hospitals

Stakeholder perspectives	Measures	Indicators
Patient	Patient satisfaction	Patient satisfaction survey (multiple items)
	Patient safety	Incident/Errors
		Accident/adverse event
		Nosocomial infection (specific germs, e.g., MRSA, and C. difficile)
	Waiting/Delay	Outpatient waiting time
		Waiting time in emergency room
	Information	Received written information
Employee	Employee satisfaction	Employee satisfaction survey (multiple items)
	Occupational health	Sickness leave
	Occupational safety	Needle stick injury
	Work conditions	Staff turnover
		Overtime
		Length of service
		Occupied position
	Employment conditions	Number of staff per bed
Management	Health statistics	Mortality (specific disease, e.g., stillbirths/infant deaths, post-operative mortality and perioperative mortality)
		Survival/Revival (specific disease, e.g., breast cancer, cervical cancer, colon cancer and lung cancer)
		Number of outpatients per day
		Inpatient admission
		Number of operations/procedures
	Readmission/return	Unscheduled readmission
		Unexpected return to ICU/OR
	Organizational efficiency	Bed occupancy
		Length of stay
		Admissions per bed
		Number of outpatients per doctor
		Number of emergency patients per doctor
	Financial effectiveness	Financial measures
		Cost/expenditure
	Staffing	Full-time equivalents
		Full-time staff
	Safety culture	Safety culture survey (multiple items)

5. Discussion

5.1 Indicator selection for Japanese context

Integrating results of the literature reviews and the questionnaire survey mentioned so far, as well as interviews with healthcare professionals, we selected key performance indicators for holistic hospital management in the Japanese context. A tentative, probably a minimum set of indicators are shown in Table 6. These indicators were determined in the following procedure: we first selected indicators that frequently appeared in the relevant articles. Subsequently, we modified the first selection of indicators by taking into account the Japanese healthcare context from the results of

the questionnaire survey and expert interviews. Finally, the revised set of indicators was confirmed from viewpoints of face-, content- and construct-validity by some healthcare members of our project.

Overall satisfaction has been typically assessed by the use of questionnaire which includes multiple items of healthcare elements. Thus, the questionnaire must cover other satisfaction indicators such as satisfaction with treatment, physicians and nurses. Therefore, all related indicators from the patient and the employee perspective were substituted to patient satisfaction and employee satisfaction survey, respectively. No frequently used culture/climate indicator was found by the literature survey. However, a safety culture survey was included to generate indicators from the management perspective for the importance for hospital management.

In addition to the results of the systematic review, sub-indicators of nosocomial infection, mortality and survival/revival based on specific germs or diseases were rated highly “useful” by Japanese experts. Their superordinate indicators can typically be measured by summation of the relevant sub-indicators. Therefore, typical sub-indicators were selected for and the original indicators were removed from the entire set for construct validity. Example sub-indicators of the nosocomial infection were Methicillin-resistant Staphylococcus aureus (MRSA) and Clostridium difficile (C. difficile).

5.2 Implications of theoretical framework

The major purpose of the theoretical framework proposed in this paper was its application to hospital management from holistic views. We have primarily two different but inter-related directions for effective use of the theoretical framework as its implications: application to hospital settings, and development of derivatives having a narrower, limited scope, e.g., within the same clinical specialty. For the first implication, a hospital manager will be able to customize a set of performance indicators for its own purposes by including additional “important” ones (if any) to and/or removing “useless” ones from the set mentioned in the last subsection. Such an indicator set comprising only a limited number of “essential” indicators will be required for hospital management.

Connecting to the second implication, the framework prepares the third axis of indicator characteristics, i.e., whole-part hierarchy. Using this axis, an indicator set for a specific specialty or clinical department, e.g., dialysis and outpatient clinics, can be effectively described along with common indicators applicable to any specialty. In addition, indicators applicable to a narrow, specific clinical field may allow us to address to a core part of problems more easily and deeply they are represented in more detailed, specific and closer to particular actions or decision making elements.

5.3 Limitations

There are three major limitations that we should note in this study, Firstly, a small

number of studies related to the objective of the present study, i.e., 24 articles, had been identified by the systematic review of literature. This seems to derive primarily from the stringent selection criteria that we adopted, in particular indicators from multiple measures and application to actual setting. Therefore, we should have applied more lenient criteria, excluding one or a few of these conditions from the selection criteria, to obtain a larger number of relevant papers. However, the primary purpose of the systematic review was not identification of an exact set of "useful" indicators for hospital management, but preliminary selection of potential indicators. Therefore, we believe that the indicators elicited from the 24 relevant articles were enough applicable for this purpose.

Secondly, the systematic review results exhibited a country bias in terms of the number of performance indicator studies, i.e., a majority in Western countries. In particular, we could find very few relevant studies that were made in Japanese setting although we believe there have been a greater number of Japanese studies than we did actually obtain on the topic taken up in this paper. It can be speculated the language problem as a major reason for few studies in the Japanese context. Therefore, we must include one or a few Japanese databases for systematic review in a future study.

Finally and more importantly, only a small number of healthcare experts participated in the questionnaire based survey for rating "usefulness" of potential indicators. It may also be plausible that data collected in the survey were somewhat biased since all of the respondents were healthcare staff working for the organizations of the project members. In addition, they were more likely to make positive rating and were reluctant to view indicators negatively for their usefulness. This is a pilot study on holistic hospital management to be applied to the Japanese context. Accordingly, this paper aimed to establish its theoretical framework and we had used the results of the expert judgment to determine a *tentative*, minimum set of indicators as well as to identify essential differences in "key" performance indicators between Japanese and Western context. The data of expert rating collected in this study can be considered enough applicable to this objective of the present paper.

6. Conclusion

In this paper, we developed a theoretical framework of performance measurement, aiming at its application to holistic hospital management in the Japanese context. This framework emphasized applicability to evidence-based assessment from healthcare stakeholders' perspectives, and translation of assessment results into improvement actions. For the former point of view, we selected patients, employees, management and community as important stakeholders in healthcare. Performance indicators were arranged from assessment properties as well as stakeholder perspectives. Connecting to the latter issue, the theoretical framework included two types of assessment properties: (1) healthcare outcomes – by which operational problems, faults or weaknesses in the entire organization or its departments can be identified – and (2) performance shaping factors – through which hospital managers can easily address

latent causes of each problem from aspects of process, structure and culture/climate within the organization.

As one of the major goals of the project, we aim to support small-sized hospitals and clinics, which neither have full-time personnel nor time even for fundamental tasks concerning risk and operations management, to perform management activities through a computer-based tool implemented the proposed framework. Accumulated data of performance indicators sent from hospitals/clinics must be essential sources of hospital management. Each hospital compares its current performance with the national standard, e.g., mean values of the indicators over Japan, and also benchmarks the best hospital (best practice) selected among those having similar organizational characteristics, e.g., size (the number of beds) and clinical specialties. Such benchmarking allows any hospital to identify its strengths and weaknesses both for operations performance and their organizational factors. These management activities and functions can be automated, and will be implemented as a management tool in the near future.

In the next step of our project, i.e., practical use of the theoretical framework as a management system, we must elaborate the set of key performance indicators based on analysis results of proper data collected from a number of healthcare experts. In the present study, the indicator set, which was shown in Table 9, was selected on the basis of usefulness for hospital management with consideration of face, content and construct validity. In addition to these three types of validities, we must further take into consideration other requirements for design of performance indicators such as “collectability” of indicators (how easily data are collected for a specific indicator), methods for reliably collecting data, and definitions of indicators (how to calculate each indicator; numerator and denominator). Once we establish the effective set of key indicators, we would implement a prototype of computer-based management tool in order to preliminarily evaluate its usefulness and extract practical problems and their solution ideas.

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Appendix

A. Summary example of relevant article (in case of Basu et al., 2010)

- **Source of article**: Basu, A., Howell, R. and Gopinath, D. (2010). Clinical performance indicators: Intolerance for variety? *International Journal of Health Care Quality Assurance*. Vol. 23, No. 4, pp. 436-449.
- **Outline of article**: [Objectives] To analyze the data regarding the different clinical quality indicators mentioned in the Intelligent Board (2006) and to determine whether the results could be reliably used to interpret hospital performance. [Results and main conclusions] Each indicator was measured monthly and calculated its mean over a year and a moving average, and its trend was analyzed. Based on the application results, they concluded that the performance of this hospital can be interpreted as unchanged, better or worse, depending on the indicator used. A background intention of this paper may be to apply the indicators to performance comparisons between

hospitals. However, they suggested that the use of clinical performance indicators to rank hospitals may be questionable due to lack of reliable data collection systems, lack of reliable comparative data, and multiplicity of factors which contribute to the performance. Instead, they suggested that a suitable alternative application of the indicators could be to compare the hospital's own statistics with those from previous years which would reflect an effective process of ongoing improvement. [Strength] Indicators examined in this study were discussed from various viewpoints with previous studies. [Weakness] Only one hospital data were applied to the indicators, and data application period was very short.

- **Place and period of study**: Manchester, UK; April 2006 – March 2007
- Setting applied: A single hospital, i.e., Trafford General Hospital; periodical comparisons of performance indicators in the same hospital.
- **Organizational level applied**: Entire hospital.
- **Indicators (and sub-indicators)**: (1) Mortality → (1-1) Total mortality, (1-2) Mortality as percentage of the patients discharged; (2) Readmission → (2-1) Readmissions within 28 days of discharge, (2-2) Readmissions as percentage of the total number of patients discharged; (3) Infections → (3-1) Infections with two specific types of bacteria, which were determined by NHS or hospital trusts, (3-2) Infections with MRSA (methicillin resistant staphylococcus aureus), (3-3) Infections with Clostridium difficile; (4) Claims against the hospital.
- **Data collection method**: Operational/managerial data in the hospital; the data were requested to collect from those provided to the Trafford General Hospital's Trust Board.
- **Purposes of indicators**: Assessment of non-financial performance of the hospital: the hospital could compare with its own statistics from previous years.
- **Validity/reliability of indicators**: No test of validity/reliability; just discussion of the indicators examined.
- **Implementation as tool/instrument**: NA.

B. Example of indicator mapping to the proposed framework (in case of Basu et al., 2010)

Original description		Mapping to the proposed framework				
Indicators	**Sub-indicators**	**Stakeholder**	**Measures**	**Indicators**	**Sub-indicators**	**Assessment property**
Mortality	Total mortality	Management	Health statistics	Mortality		Health status
	Mortality as a percentage of the patients discharged	Management	Health statistics	Mortality (for specific cases)	Mortality of the patients discharged	Health status
Readmission	Readmissions within 28 days of discharge	Management	Readmission/ return	Unscheduled readmission		Time/Efficiency
	Readmissions as a percentage of the total number of patients discharged	Management	Readmission/ return	Unscheduled readmission		Time/Efficiency
Infections	Methicillin resistant staphylococcus aureus (MRSA)	Patient	Patient safety	Infections (for specific cases)	Infection of MRSA	Safety/Quality
	Clostridium difficile (C. difficile)	Patient	Patient safety	Infections (for specific cases)	Infection of C. difficile	Safety/Quality

C. Indicators rated by healthcare experts

(1) Patient perspective

- Overall patient satisfaction
- Patient satisfaction with physicians
- Patient satisfaction with nurses
- Patient satisfaction with care/service
- Patient satisfaction with treatment
- Patient satisfaction with instrument cleanliness
- Patient complaint
- Accident/adverse event
- Incident/Errors
- Nosocomial infection
- Received written information
- Waiting time for operation/surgery
- Outpatient waiting times
- Waiting time for admission
- Waiting time in Emergency Room
- Cancelled operations
- Cancelled examinations

(2) Employee perspective

- Overall employee satisfaction
- Employee satisfaction with job
- Employee satisfaction with colleagues and workplace
- Employee satisfaction with hospital facilities
- Employee satisfaction with organization
- Employee satisfaction with IT
- Sickness leave
- Needle stick injury
- Staff turnover
- Overtime
- Number of staff per bed (based on professional group)
- Length of service (based on professional group)
- Average experience at the current department
- Occupied position (based on professional group)
- Expenditure on medical research
- Academic papers written
- Scientific projects
- Education possibilities
- Specialists (based on specialty)
- Resident physicians

(3) Management perspectives

- Mortality/Death (for specific cases)
- Morbidity
- Survival/Revival (for specific cases)
- Number of patients per day
- Number of outpatients per day
- Number of inpatients per day
- Inpatient admission
- Autopsy rate
- Number of operations/procedures (for specific cases)
- Unscheduled readmission
- Unscheduled returns to ICU/operating room
- Admission from unexpected return
- Bed occupancy
- Number of outpatients per doctor
- Number of emergency patients per doctor
- Admissions per bed
- Length of stay
- Equipment utilization
- Equipment utilization (for specific instruments)
- Full-time equivalents
- Full-time staff (based on department)
- Patient transfer (for specific cases)
- Emergency admission
- Day case
- Cross match/transfusion ratio
- Financial measures
- Cost/expenditure
- Cost effectiveness
- Net outpatient revenue/net patient revenue

D. Summary of Performance indicators used in selected articles

(1) Patient perspectives

Measures	Indicators	Sub-indicators	Property
Patient satisfaction	Overall satisfaction		SF
	Satisfaction with specific professionals	Satisfaction with physicians, primary care physicians, nurses, administrative staff, etc.	SF
	Satisfaction of specific patients	Satisfaction of outpatients, inpatients, emergency patients, etc.	SF
	Satisfaction with specific care/service	Satisfaction with primary care, subspecialty care, nursing, laboratory services, emergency care services, administrative service, etc.	SF
	Satisfaction with waiting time (for specific cases)	Satisfaction with waiting time to admission, with prolonging stay, etc.	SF
	Satisfaction with treatment		SF

	Satisfaction with specific information	Satisfaction with information to general practitioner, written and oral treatment information, etc.	SF
	Satisfaction with staff reactions to encountered failures		SF
	Satisfaction with accessibility	Satisfaction with ease of obtaining referrals, assortment of medications, etc.	SF
	Satisfaction with instrument cleanliness		SF
	Proportion of patients recommending hospital to others		SF
	Trust in staff		SF
Patient complaint	Overall complaints		SF
	Claims		SF
Patient safety	Accident/adverse event		SQ
	Specific adverse events	Severe adverse drug events	SQ
	Incident/Errors	Entire cases	SQ
		Specific cases	SQ
	Nosocomial infection	Entire cases	SQ
		Specific cases	SQ
	Delinquent medical record		SQ
Clinical quality	Overall quality of care and services		PR
	Pain alleviated		PR
	Overall coordination of care		PR
Information	Received written Information		CC
	Information by specific staff groups	Information provided by physicians, nurses, etc.	CC
	Coherence in information		CC
	Consulting room open		CC
Waiting/Delay	Waiting time for operation/surgery		TM
	Outpatient waiting times		TM
	Waiting time for admission		TM
	Waiting time for treatment/consultation		TM
	Waiting time in Emergency room		TM
	Waiting time for other specific cases		TM
	Delayed discharge		TM
Cancelation	Cancelled operations		TM
	Cancelled examinations		TM
	Cancellation in Emergency Department		TM
Patient-centered care	Mental health in primary care		EF
	Returning home following treatment	Returning home following treatment for a stroke, a fractured hip, etc.	EF
	Convenience of office hours		EF
	Barrier-free	Wheel-chair friendly lifts	EF

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(2) Employee perspectives

Measures	Indicators	Sub-indicators	Property
Employee satisfaction	Overall satisfaction		SF
	Satisfaction with job		SF
	Satisfaction with colleagues		SF
	Satisfaction with on-campus facilities		SF
	Satisfaction with organization		SF

	Satisfaction with supervisors		SF
	Satisfaction with IT		SF
Employee complaint	Employee complaints about interpersonal skills		SF
Occupational health	sickness leave		HS
	Sickness leave of specific professionals	Doctor, nurse, other professionals	HS
	Long-term sickness absence		HS
	Mental sickness		HS
	Physical sickness		HS
	Staff wellbeing		HS
Occupational safety	Errors/incidents	Specific cases	SQ
	Work hazards		SQ
Employment conditions	Personnel upgrade on career ladder		ST
	Part-time employees		ST
	Available posts		ST
	Number of staff per bed		ST
	Educational positions		ST
Work conditions	Staff turnover		PR
	Overtime		PR
	Hand hygiene	Measuring alcohol consumption	PR
	Work shift	Work shift of emergency medicine specialists	PR
	Workload of specific personnel		PR
	Length of service	Specific professionals	PR
	Average experience at the current department		PR
	Occupied position	All professionals	PR
		Specific professionals	PR
Employee competence	Research opportunities	Expenditure on medical research	ST
		Academic papers written	ST
		Scientific projects	ST
		Resources for research	ST
	Education opportunity	Resources for further education	ST
		Education possibilities	ST
		Teaching ability	ST
	Specialists	Specific specialties	ST
	Resident physicians	Specific specialties	ST
	Percentage of qualified nurses		ST
Training	Training opportunity/hours		ST
	Nurses in training		ST
	Training received	Specific training	ST

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(3) Management perspectives

Measures	Indicators	Sub-indicators	Property
Management satisfaction	Superior satisfaction		SF
Health statistics	Mortality/Death	Entire cases	HS
		Specific cases	HS
		Specific age groups	HS
		Specific setting	HS
	Morbidity		HS
	Survival/Revival	Entire cases	HS
		Specific cases	HS
	Patient attributes	Severity of disease	HS
		Percentage of elder patients	HS
		Percentage of younger patients	HS

		Patients hospitalizing in hospital (for specific term)	HS
		Number of patients with artificial respiration	HS
		Patient mix by geography and payer group	HS
		Patient enablement	HS
	Number of patients	Entire patient	HS
		Outpatient	HS
		Inpatient	HS
	Acute inpatient days		HS
	Payer mix		HS
	Inpatient admission	Specific ward	HS
	Autopsy rate		HS
	Number of operations/procedures	Entire hospital	HS
		Specific sites	HS
		Specific cases	HS
Organizational safety	Medical accidents leading to law suit rate		SQ
	Imperfect mandatory report		SQ
	Safety rules/procedures	Specific rules/procedures	SQ
Readmission/return	Unscheduled readmission	Entire cases	TM
		Specific cases	TM
	Unexpected return	Entire cases	TM
		Specific case	TM
		To specific site	TM
	Unexpected stay （to specific case)	Unplanned stay after daycare procedure	TM
		Unplanned stay following endoscopy	TM
	Admission from unexpected return		TM
Organizational efficiency	Throughput	Entire cases	TM
		Specific cases	TM
	Turnaround time	Entire cases	TM
		Specific cases	TM
	Operational time		TM
	Bed occupancy	Entire hospital	TM
		Specific setting	TM
	Clinical productivity		TM
	Outpatients per doctor		TM
	Emergency patients per doctor		TM
	Admissions per bed		TM
	Admitted inpatients per doctor		TM
	Acute load		TM
	Length of stay		TM
		In specific departments	TM
	Generic prescribing		TM
	New outpatients per inpatient discharge		TM
	Outpatient clinic sessions per available bed		TM
	Radiology film reject rate		TM
	Transfer time from ward to ICU		TM
	Paid hours per admission		TM
Staff efficiency	Employee Utilization		TM
	Medical productivity per medical team FTE		TM
Equipment efficiency	Equipment Utilization	In entire hospital	TM
		Of specific equipment/materials	TM
Staffing	Full-time equivalents		ST
	Full-time staff	For specific departments/cases	ST
	Staff qualification		ST
	Experience of the staff		ST
	Staff age		ST
Equipment	Available equipment	Specific machines/equipment	ST
Management process	Patient transfer	Specific cases	PR

Management process	Emergency admission	Specific cases	PR
	Observation requirement		PR
	Consultation rate	Specific cases	PR
	Discharge against medical advice		PR
Clinical process	Day case	Entire hospital	PR
		Specific case	PR
	Surgical prophylaxis		PR
	Clinical diagnosis and pathological diagnosis		PR
	Colonies developed after decontamination		PR
	Unexpected reoperation rate		PR
	Reintubation in recovery room		PR
	Patients receiving blood products		PR
	Initiation of antibiotics		PR
	Blood products transfused		PR
	Cross match/transfusion ratio		PR
Management effectiveness	Cost effective prescribing		EF
	Duration of consultation		EF
	Outpatient attendance		EF
	In time documentation of discharge summaries		EF
Financial effectiveness	Financial measures		EF
	Cost/expenditure		EF
	Admission effectiveness		EF
	Cost effectiveness	Cost per case	EF
		Cost per patient day	EF
		Pay per day	EF
		Expense per relative value unit	EF
		Dental cost per dental encounter	EF
		Medical benefit cost per full-time equivalents (FTE)	EF
		Total benefit cost per full-time equivalents	EF
	Outpatient activity		EF
Safety culture	Patient safety culture		CC
Compliance	Restraint compliance documentation rate		CC
	Management compliance for safety		CC

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(4) Community perspectives

Measures	Indicators	Sub-indicators	Property
Public health	Deaths/mortality in the area	Entire area	HS
		Specific causes	HS
	Discharge and deaths in the area		HS
	Injuries in the area	Specific causes	HS
	Adult dental registrations		HS
	Mammograms for women		HS
	Blood pressure measurement		HS
Health statistics in the region	Net patient flow		HS
	Procedures/operations	Specific cases	HS
	New outpatients		HS
	Total outpatients		HS
Waiting/Delay (community)	Waiting for admission		TM
	Waiting time	Specific cases	TM
	Waiting list		TM

Public access	Unit size		ST
	Available beds		ST
	Information for citizens	By specific media	ST
	GP availability		ST
	Information for GPs		ST
	Outpatient session		ST
	Visit to a private physician		ST
Effective healthcare	Day cases		EF
	Elective surgery rates		EF
	Early detection of cancer		EF
	Childhood immunizations		EF
Social accountability	Hospital's contribution to society		EF
	Board of Governors' environmental scan		EF
	Market share		EF
Community support	Community support provided per admission		EF

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