PERFORMANCE INDICATORS IN ACADEMIC RADIOLOGY DEPARTMENTS IN THE UNITED STATES

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To my parents, Antonio and Mentxu.

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INTRODUCTION

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Imaging and Its Implications for the Healthcare Sector

The practice of medicine is undergoing continuous change, and one of the key facilitators of this change is medical imaging.

Medical Imaging or Imaging can be defined as an ensemble of diagnostic tests displaying the human body, performed and interpreted by physicians regardless of their specialty (radiology, cardiology, ob-gyn, etc.). Radiology is the portion of medical imaging performed by radiologists. Imaging, one of the fastest growing fields in medicine due in part to its unavoidable link to technology, is facing tremendous challenges. As new technologies are developed and more applications for existing technologies are proposed, there is a sharp increase in the use of imaging by clinical specialties, so that imaging has become an essential component in the practice of clinical medicine[1,2,3]. This vast rise in imaging demand and utilization is expected to boost the number of imaging procedures performed in 2008 to more than 500 million in the United States (US) alone, basically doubling of studies performed early in this decade[4]. This increase is led by advanced imaging procedures (especially in Positron Emission Tomography –PET-, Magnetic Resonance Imaging –MRI-, and Computed Tomography –CT-). For example, PET imaging increased 79% in 2002. This trend represents an enormous workload increment for radiologists, who already face the challenge of a reduced workforce[5]. The increment in clinical workload for an average

academic radiologist has been calculated at more than 55% between 1996 and 2003[6].

This particular increase in imaging utilization is added to the general higher utilization rate of the health care system due to a population that continues to grow and gray[7,8]. By 2020, 16% of the population will be over 65 years old and the number of people living in the US with a chronic condition will reach 157 million, compared to 12% and 36 million in 2004, respectively[9]. The population over 65 years of age uses imaging services at a rate three times greater than those under 65[10].

As healthcare demand continues to climb and imaging utilization escalates more than ever, external pressure from the government and private parties financing the healthcare sector has been put on hospitals and physicians to control their imaging expenses. Rich countries everywhere are finding themselves struggling to finance healthcare. By year 2002 the total healthcare expenses in the US were 14.6 % of the Gross Domestic Product (GDP), that is $36,056 per capita, positioning the US as the country with the highest percentage of GDP expended in healthcare in the world[11]. In 2003, healthcare spending in the United States reached $1.7 trillion, and was projected to reach $1.8 trillion in 2004. That number represents 15.3% of the US GDP and is projected to reach 18.7% in 10 years[12]. Imaging is responsible for approximately 10% of these costs and it is rising[13]. These facts strengthen the concern about the cost of healthcare and create the need to stop this spiraling of costs, across the board with special attention to the segments with higher cost increases, such as imaging[14].

The concern about costs of healthcare in the US is in clear contrast with patients' expectations. Today, mainly because of the use of Internet, consumers have extensive information at their fingertips, are well informed and aware of the benefits of new methods, and expect the latest technologies and surgical procedures[4]. Greater patient access to imaging facilities and direct-to-consumer marketing techniques also increase the demand for less-invasive procedures and consequently increase imaging volume[10].

Demanding patients in an already competitive environment force insurers to offer more services while containing the price of premiums[15], which leaves payers with only one way to reduce costs – by decreasing reimbursement and payments to hospitals and health care providers. Reduced reimbursement and increased costs are reasons for concern in hospitals whose focus is on keeping profits steady. One solution is to increase patient volume to maintain profit margins, "washing-off" the decline in revenues[15]. This approach is particularly important in imaging because radiology departments are among the most profitable in hospitals. Thus, hospitals and practice administrators need to pay closer attention to their organization and process and try to optimize their efficiency[15].

In the words of *The Economist*, a publication devoted to financial news, when it comes to the healthcare sector, "the goal must be to get better value for the record sums of money being lavished on it"[14]. This is obvious to most people, but still the healthcare sector is "undeveloped" when it comes to management and finances. Many share the opinion that suppliers of products and services inside healthcare know less about their costs than in

any other business sector[16], but this is changing. Currently, considering the changes in managed care competition and reforms by the government, it is irresponsible to not know about operational costs in detail. Every practice must understand its cost structure[16].

There is general agreement that the need for research in operations management information has grown, and even scientifically focused journals have opened their pages to publish on financial and operational topics because of the expansion and application of these issues in medicine[16].

We hope that this overview of today's healthcare environment highlights the fundamental importance of a tight managerial understanding and control of the imaging services. To simplify the process of evaluating an Imaging Department, we need to implement a set of performance indicators so it is possible to generate a common base of information for all stakeholders and to keep track of changes and improvements. The basic goal of management performance indicators (MPI's) is to provide useful information to all agents involved in the healthcare system –lawmakers, payers, users, providers, service managers, and others[17]. Given the different expectations that different stakeholders have, MPI's may vary extensively. One of the goals in implementing a set of MPI's is to meet those expectations and to provide a key tool to understand a department "at a glance."

The last step in managerial research in healthcare is to share the information. The healthcare sector is considered a public asset in which government, payers, providers, patients and the general population are involved and all need to know what is happening and is new. In the US,

information about performance of hospitals, health professionals, and healthcare organizations has been made public for more than a decade. This disclosure of information is intended to impact the decision-making process. There are several potential gains from the public disclosure of these data, but use of information by provider organizations for quality improvement may be the most productive[18]. Having robust and accepted MPI's is essential to be able to compare the shared health information.

Origins of Performance Measurements

The idea of monitoring the performance of healthcare providers is not new. In the early 1900s, Dr. Codman launched the concept of performance measurement for healthcare and presented the idea in 1915 to the Boston Medical Society. He proposed a detailed system of records including post-discharge follow-up and inter-hospital comparisons to assure quality of services and compare performance between physicians[19]. As expected his ideas were not accepted, and several years passed before healthcare institutions began measuring performance, quality, and productivity.

On the logistics side another milestone is crucial. Modern logistics, operational concepts, and operations management (OM) as a system gained vast importance during World War II. This system was used by the American Armed Forces for the deployment of weapons, fuel allocation decisions, and planning of attack strategies and troop movements[20]. In the 1950s, industries observed that OM could be a substantial source of competitive advantage to provide better services, use fewer resources, and reach

markets faster. However, the healthcare sector did not see the need to improve its efficiency until the 1980s, when managed care competition and federal and local reimbursement reforms presented a serious financial challenge to medical institutions and service departments[16]. In an economically challenging environment it becomes crucial to monitor performance so that healthcare centers can provide high-quality services while staying within operational boundaries. During the 1990s there was growing consensus about the need for radiology managers to investigate mechanisms for cost containment and increase productivity, as qualitative measurement of healthcare delivery alone was not sufficient[21].

Physicians and hospital administrators also agreed on monitoring healthcare quality and on the fact that this is impossible without the use of quality and operational indicators. Indicators create the basis for accountability, quality improvement, prioritization, and transparency in the healthcare system[22], but even though most people are in favor of measurement, very few are comfortable being measured[23].

The Balanced Scorecard (BSC) Approach in Imaging

Imaging has become fundamental to the practice of medicine, as it is an essential extension of the physical examination and can empower physicians to provide the most effective and efficient patient care[24]. From a managerial point of view, radiology services are among the hospital's most profitable departments, and they attract patients to the hospitals from physicians' offices and small private radiology facilities without advanced

imaging services[24]. Imaging is a critical component of patient care that can impact an organization's ability to capture and increase market share. Few other services are more central to a healthcare organization than imaging[10].

Improved productivity is a necessity for both radiology department leaders and hospital administrators, and the only way to meet the overwhelming demand for imaging services. Focusing in productivity is opposed to the traditional approach of rationing care while intensifying workload[25]. Higher productivity is achieved through management and technology solutions that range in their level of complexity and required investment. Without paying attention to achieve the highest possible productivity, hospitals are not able to handle the increased demand for imaging in the modern healthcare's harsh financial environment[10]. One of the dilemmas is to improve productivity without sacrificing quality and while reducing costs[26]. A useful proposal is to keep quality as the ultimate goal within the department[27,29]. Then measurements would lead the path to changes that translate into realistic and desirable levels of excellence[27]. The cycle could be described as follows: high quality care (better outcomes) produces satisfied consumers that then drive marketing efforts and lead to excellent financial performance[30].

The first action required before implementing any change in the way a radiology department is run, evaluated, or perceived is to develop a global strategy. A balanced score card (BSC) is more than a set of measures. It translates the strategy of the organization into objectives based on the

balanced perspectives of the parties involved. The BSC attempts to develop a link between the organization's strategy, objectives, and measurements through consistency of the measurements and by adding a cause-effect relation between the variables[17].

Since strategy is an integral part of the BSC, it is key to review its definition. A strategy is an integrated set of actions consistent with the long-term vision of an organization to deliver value to a chosen set of customers, with a cost structure that allows excellent returns[31]. With that concept in mind, it becomes obvious that radiology departments require a strategy to increase returns and achieve organizational goals. To this end, it is best if hospital based radiology departments work in close collaboration with the hospital administration in developing a common strategy and goals. An effective strategy for imaging encompasses technology, services, and management[11].

Imaging's strategy impacts many important aspects of hospital dynamics, such as service line development, physician recruitment, and overall revenue. Organizations must understand this impact and develop site-specific strategies to best meet their needs and potential. Providing imaging services involves much more than purchasing a scanner and plugging it in. Institutions that adopt a plug-it-in approach to imaging aren't successful and expose themselves to competition from other imaging providers[24].

Senior leadership must define clear strategic goals that apply to the entire department. Knowing the goals enables managers to understand in what aspects of performance measurements must be centered[31]. Operational decisions are then made in support of business strategies[32]. Radiology administrators who are inexperienced in process management and redesign systems try to resolve their operational problems by ineffective strategies, such as: (i) identifying and cutting costs without deeply understanding the problems within the system, (ii) adding information systems and medical equipment to the existing ones, or (iii) imposing higher performance standards and holding employees responsible for meeting them (e.g., by tying bonuses to performance) without a system redesign. An effective approach would be to adopt the managerial skills of OM. OM is essential to bridge the gaps between traditional and modern radiology management[32,33]. OM helps achieve goals by focusing on the analysis of processes, quality of standards and operational strategies to facilitate executive decision-making. After studying and understanding the processes in a radiology department, a strategy is set.

To have a strategy is the beginning. Developing a strategy that helps achieve the department's goals generates a need for tools to assess whether the strategy is effective or not. Hence, the establishment of a departmental BSC, as originally developed by Kaplan and Norton[34,35]. A BSC is composed of a balanced set of measures capturing the critical activities of the organization that are the drivers of future performance[34]. "Balanced" refers to the inclusion of all-important aspects of the practice in the organization:

financial, customer satisfaction, quality, productivity, employees' development, and organizational growth. These aspects have a tendency to overlap each other to generate a general view. Evaluation of individual aspects is avoided[17,35].

The BSC reflects the mission, vision, and strategic direction of an organization. This approach to encompass apparently conflicted areas was develop for use in different industries but a growing number of hospitals and health care organizations have begun to make the concept of their own[36,37]. The idea is to approach development as a whole and avoid compartmentalized addressing of obstacles[25]. BSC can be considered as a managerial tool that aligns stakeholders' perspectives in order to help the organization's leadership to define meaningful strategic objectives and measurable improvement and development[38,39]. The BSC is built over four main areas. 1) Financial Aspects: or how do we look to our stakeholders? 2) Customer Satisfaction Aspects: or how do our customers see us? 3) Internal Aspects: or what must we excel at? And 4) The Learning and Growth Perspective: Can we continue to improve and create value?[26, 37-41]. It is vital to highlight the fact that a BSC should not be adapted from other organizations and should reflect special characteristics and needs. As an example academic radiology departments could and should substitute the mandate to succeed financially (how do we look to our stakeholders?) with the revised question: what financial condition must we achieve to allow us to accomplish our mission?[38]

The BSC is constructed from a reduced number of specific and yet meaningful indicators[41]. The indicators included in the BSC are collectively referred to as "dashboard indicators"[42-44], a "dashboard" being the visual display of the MPI's included in the BSC. . To develop a dashboard four (4) questions must be answered. What are the measures? What are the data sources? Does baseline data exist? And is there comparative data? (internally, externally, national)[36,45-48]. Thus, dashboard provides a comprehensive snapshot of all ongoing departmental activities over time. The MPI's that constitute the dashboard should be easily accessible to everyone in a department.

Using Management Performance Indicators to Develop Dashboards in Hospital-Based Imaging Services

Management performance indicators (MPI) are objective tools that assess and evaluate key components of an organization, allowing to set goals at each level and track performance over time. MPI's are widely used in healthcare industry, even though there is no well established system, they are not unanimously accepted as tools, and they have traditionally been equated with financial measurement only. It has been suggested that in addition to financial outcomes, healthcare organizations should assess intangible assets that affect the bottom line such as clinical processes, staff skills and patient satisfaction[49]. It is important to note that, to the extent of

our knowledge, there is no published standard set of MPI's used by academic radiology departments across the US.

One of the central issues in performance measurement remains the absence of agreement about what should be measured. MPI's are becoming an integral part of healthcare but further standardization of data collection is imperative[23]. On one hand, too much information is costly to collect, though it does provide answers for some stakeholders; on the other hand, too little information is useless to most stakeholders[23]. The challenge is to develop and implement indicators that uncover as much reality as possible[22].

The MPI's selected by the team should convert broad strategic goals into quantifiable metrics[50]. A well-selected MPI's set has the following characteristics: (1) it is accurate: it measures performance with precision; (2) it is comprehensive: when compared with other indicators, it should give a clear picture of the key organizational processes; (3) it is free from bias: information should be gathered impartially; (4) it is quantifiable: it should be measurable to determine the extent to which desired outcomes are achieved; (5) it is valid: it should measure what is relevant for achieving targets; and (6) it is verifiable: the information collected should be such that it can be independently checked as correct by qualified individuals[51].

Additionally, to promote a culture of continuous improvement, MPI's should be benchmarked. Benchmarking is the process of setting standards against which we can compare our own performance. The process should be done both internally (against historical levels) and externally (against comparable outside organizations).

Key Applications for the Performance Indicators' Measuring System

The applications of MPI's data are multiple. There is general consensus that it is increasingly important for radiologists to monitor and manage the financial, quality, and productivity aspects of their practices. This is the only way to assure that the available resources are to provide the expected high-quality patient care. However, for a majority the value of performance measurement is truly appreciated when tangible improvements in care can be shown to be the product of the measurement and when stakeholders are making data-driven decisions[22].

Applications of MPI's include: (i) establishing standards in clinical settings, in the teaching profession, and in medical science so that centers of excellence can be created; (ii) correlating productivity and salaries; (iii) assisting with both planning and decision making in the area of manpower needs and equipment acquisition; (iv) providing the quantitative data necessary to evaluate radiology department activities; and (v) following up on improvement after changes have been implemented[21]. When these applications are accomplished the implementation of a quality management system in healthcare becomes an important task[52].

Purchasers and regulators, for accountability, demand "Measuring systems". These demands have become a major driver for the extensive work in measurement over the past decade or so[23]. Today, the same data that were used by HMOs and government to reduce expenses in health are in the 1990s are used by hospitals and organizations to negotiate higher fees and adjust reimbursement payments[53-55].

Ultimately, MPI's are the basis on which to develop an imaging dashboard.

OBJECTIVES

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General Objective

The purpose of this set of papers is to describe the patterns of use of management performance indicators in academic radiology departments in the United States.

Specific Objectives

Specific objectives are to:

- To assess the productivity, financial, and quality indicators used by academic radiology departments across the US.
- To determine which MPI are measured most frequently in academic radiology departments .
- To assess the frequency of monitoring used for productivity, financial, and quality indicators.
- To determine whether the indicators obtained in academic radiology departments are used for benchmarking.
- To correlate the number of indicators used with the geographical location of the hospital.
- To correlate the size of the hospital with the number of radiological procedures performed annually.
- To determine the relation between the number of indicators used and the size of the hospital.

- To determine whether the total number of performance indicators used varies according to the number of radiological examinations performed.
- To determine whether there is a correlation between categories of performance indicators.
- To evaluate whether there is any association between the number of full time equivalent (FTE) employees and the performance indicators utilized by radiology departments.
- To assess whether the total number of performance indicators (outcome as the dependent variable) adopted by academic radiology departments was determined by the US region where the hospital is located.
- To determine the relation between the size of both the hospital and the radiology department and the number of performance indicators in each of the six established categories.
- To present the Balance Scorecard and Dashboard developed for the Brigham and Women's Hospital (BWH) Radiology Department based on the publication of these papers.

MATERIALS AND METHODS

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We performed an extensive literature review on current managerial techniques, uses, and opinions on performance indicators. Later, we conducted a cross-sectional study validated by a survey of the members of the Society of Chairmen of Academic Radiology Departments (SCARD).
Our study met the criteria for an exemption from review by the Brigham and Women's Hospital Institutional Review Board. All individuals who were sent the questionnaire were informed of the purpose of our study and of the fact that responses would be kept confidential.

Survey

A cross-sectional multi-institutional survey study was conducted among academic radiology departments across the country from May to November 2002. An electronic survey questionnaire was designed after an extensive literature review and was pilot tested in four teaching hospitals affiliated to Harvard Medical School, with approval from the president of SCARD. On the basis of responses obtained from the pilot study, the questionnaire was modified and the final survey was sent across the nation to all 132 members of SCARD. Focus groups and expert panels established face validity during pilot testing. Pilot testing focused on improving the format and contents of the questionnaire and increasing the clarity of questions. To increase the response rate, the questionnaire was sent in

stages up to three times to all SCARD members by email, once every 3 weeks, and by fax 2 months after the last electronic version. The responses were kept confidential and anonymous by the Web master's assigning every hospital an identification number. The process was automated, and questionnaires were automatically sent again to non-responding SCARD members. The investigators had access only to the final database with identification numbers. The electronic questionnaire was designed so that the responder could not move forward to the next question without answering the previous one. Thus, all questionnaires that were returned were completely answered. Six categories of 28 performance indicators were examined. A more detailed definition of the study terms is provided in the Appendix 1. A total of 158 variables were included in the analysis in the following categories: *(a)* general organization (11 variables), *(b)* volume and productivity (nine indicators, 50 variables), *(c)* radiology reporting (three indicators, 18 variables), *(d)* access to examinations (four indicators, 30 variables), *(e)* customer satisfaction (five indicators, 28 variables), and *(f)* finance (seven indicators, 21 variables). The survey questionnaire was designed on the basis of the most common performance indicators used in healthcare settings, according to an extensive literature review[2-3,14,16-18]. Information obtained for each category of performance indicators consisted of *(a)* which indicators the department used and *(b)* how often they were monitored.

General Organization

The general organizational indicators included the following: *(a)* the region of the country in which the hospital was located (Pacific, Southwest, Midwest, Northeast, or South), *(b)* the number of hospital beds, *(c)* the number of radiological examinations performed per year, and *(d)* the number of full-time employees working in the radiology department. We used the number of hospital beds and the number of radiological examinations as proxies for the size of the hospital and the size of the radiology department, respectively.

Productivity

The following productivity indicators were studied: *(a)* examination volume, *(b)* examination volume per modality, *(c)* technical relative value units (RVUs), *(d)* professional RVUs, *(e)* technical RVUs per full-time–equivalent (FTE) employee, *(f)* professional RVUs per FTE employee, *(g)* gross charges by modality, *(h)* collections by FTE employee, and *(i)* volume by resource or device.

Radiology Reporting

The third category of performance indicators studied was radiology reporting. This category included questions regarding transcription time (time from verbal dictation of examination results to transcribed preliminary results), signature time (time from preliminary results to report finalization), and report turnaround time (time from examination completion to report finalization).

Access to Examinations

The next set of performance indicators surveyed was regarding both outpatient and inpatient access to examinations. The aim was to study whether the institutions monitored patient waiting time to get an appointment for the following examination modalities: *(a)* magnetic resonance (MR) imaging, *(b)* mammography, *(c)* nuclear imaging, and *(d)* computed tomography (CT).

Customer Satisfaction

"Customers" in the field of radiology comprise patients and their referring physicians, as well as radiology staff members. The customer satisfaction indicators that were studied included: *(a)* patient satisfaction, *(b)* ambulatory waiting time, *(c)* patient complaints, *(d)* referring physician satisfaction, and *(e)* radiology employee satisfaction.

Statistical Analysis

Statistical methods included summary statistics, the Pearson test of independence, nonparametric Spearman rank correlation analysis, multiple regression analysis, and analysis of variance (ANOVA).

First, a descriptive analysis was performed to assess the general organizational characteristics of the responding institutions, as well as the number, type, use of preset standards, and monitoring frequency of performance indicators used by radiology departments. We also analyzed the general organizational characteristics of the departments by using the

minimum and maximum number of performance indicators, as well as the most frequently monitored indicators in each category.

Second, we employed the Pearson test to analyze whether there was any relationship between the type of performance indicators used and the U.S. location of the hospital, its size, or the number of imaging examinations performed per year, the regional location, or the size of the hospital.

Third, nonparametric correlation analysis with the Spearman rank correlation coefficient *(r)* was performed to assess specific variables. Fourth, we used a multiple regression analysis (explanatory or independent variables).

Only the variables that were statistically significant (P _ .05) in the bivariate analysis were reported in the final model.

Finally, using ANOVA, we assessed whether there was a significant difference in the number of performance indicators per category or the total number of performance indicators used according to the regional location or the size of the hospital.

All statistical analyses described above were performed with the software program SPSS 11. Three authors in consensus performed all analyses.

RESULTS

RESULTS

The results of our review and survey are available in the following publications:

- Practice Management Performance Indicators in Academic Radiology Departments. *Radiology* 2004; 233:716-722.
- Use of Productivity and Financial Indicators for Monitoring Performance in Academic Radiology Departments: U.S. Nationwide Survey. *Radiology* 2005; 236: 214-219.
- Survey Of The Use Of Quality Indicators In Academic Radiology Departments. Accepted for publication. *American Journal of Radiology (AJR)* 2005
- Essential Practice Performance Measurement. *J Am Coll Radiol* 2004; 1: 559-566.
- Clinical Operations Management in Radiology. J Am Coll *Radiol* 2004; 1: 632-640.

Ondategui-Parra S, Bhagwat JG, Zou KH, Gogate A, Intriere LA, Kelly P, et al. Practice management performance indicators in academic radiology departments. Radiology. 2004; 233(3): 716-22.

Ondategui-Parra S, Bhagwat JG, Zou KH, Nathanson E, Gill IE, Ros PR. Use of productivity and financial indicators for monitoring performance in academic radiology departments: US Nationwide Survey. Radiology. 2005; 236(1): 214-19.

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DISCUSSION

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Because of their usefulness, MPI's have increased in importance around the world (e.g., summit in Paris, Danish National Indicator Project, National Service Frameworks in the UK)[3, 56]. Especially in the United States, with the tremendous amount of money spent in healthcare and today's competitive environment, it is of paramount importance to use MPI's. To manage a radiology department without measuring performance would be "flying blind" for the managerial team, and that in today's economical environment is unthinkable. MPI's in radiology departments are nothing if not essential.

Given present conditions radiologists are more involved in economic, financial and managerial aspects of their practice than a decade ago. This trend is most likely to continue making this subject one that deserves special attention and needs to be taught to current and future healthcare leaders, including radiologists, hospital administrators, radiology and hospital managers, and those under training to fill these positions.

There are several advantages of employing performance indicators in radiology. MPI's can increase revenue and operational margins for departments; they help to identify and correct poor work processes and identify the activities that decrease quality of services provided and negatively affect customers' satisfaction[57]. These advantages and several others explain why about 95% of the radiology departments in the US

measure their performance. Despite the extensive use of indicators, there is no agreement in the appropriate set of indicators that should be used by academic radiology departments.

The lack of standardized set of MPI's in the US, which includes not only the indicators needed but the amount, frequency, and rules for measuring, suggest the need for creating a standard system. Such a system should include not only productivity indicators but also financial, quality, and customer satisfaction ones.

Productivity indicators are the most widely used and most commonly include: examination volume, examination volume per modality and professional RVUs. The problem with these measures is that they are not comprehensive of a radiologist's clinical productivity and fail to include activities such as continuing medical education, research, administrative and teaching duties. Although these activities are not measurable in terms of clinical productivity, they are an important part of an academic radiologist's workload and thus need to be incorporated into the evaluation of a his/her performance.

Financial status is monitored by the use of different indicators, most commonly: general expenses, days in accounts receivable and collections by modality. These have the problem of not reflecting the status of the department as a whole. More extensive measurement and more specific indicators are thus needed. Indicators of results reporting, access to examination, and customer's satisfaction are not comprehensive enough and lack consistency as well.

The results and data obtained through the use of performance indicators need to be available and actively transmitted to all stakeholders in a simple way. Our study showed that, even if measurements were performed, the results weren't transmitted to all the personnel involved: referring physicians, patients, providers, employees, managers, and senior leadership. Furthermore, fewer than half the departments used the MPI's obtained for benchmarking. It is of capital importance to communicate these indicators and then benchmark them. Failing to do so is a major drawback; if the data are collected and available but are not used, they lose all their advantages and benefits.

The research performed in this matter was crucial to develop the BSC-Dashboard of the radiology department at the Brigham and Women's Hospital (BWH). The BWH is a major teaching hospital affiliated with Harvard Medical School in Boston, Massachusetts. BWH has a capacity of 750 beds, with more than 50,000 discharges a year. Over 500 hundred employees work in the radiology department. The radiology department performed more than 500,000 procedures in 2004. At the BWH an interdepartmental dashboard was designed and implemented in 2002. The definitive structure is annexed in Appendix 3. The process from the approval of the concept to the implementation of the surgery and nursing BSC took almost two years. The Radiology Department's dashboard is still under development. Several steps have been taken to complete the project.

The BSC at the BWH is available at any time to the managerial staff through the intranet. Access is provided through the Center for Clinical

Excellence. The BSC is presented as an IT tool for improvement. The easy access is an important feature that must be considered at all times.

Healthcare providers around the world are faced with the notion of limited resources, forcing them to look for better ways to utilize their assets. In years to come, it will be essential for the healthcare sector to use resources as efficiently as possible, making it crucial that the process of implementing managerial tools to improve overall performance is well known. Given the extraordinary importance that imaging has gained; radiology is becoming a fundamental piece in the overall performance of healthcare organizations. The financial success of radiology departments will depend on the implementation of managerial tools proven to be effective. The publication of information and research in new approaches to management in radiology has become a healthcare priority.

APPENDIXES

APPENDIX 1

GLOSSARY

Benchmark: Comparative standard against which others may be compared. The value is calculated using the academic, specialty-specific billing data to determine statistical comparisons. The value is updated annually using a sampling methodology and trimming process to remove outliers and identify central tendency.

Billings: Gross billed charges entered into the billing system for each CPT code.

CFTE (Clinical Full Time Equivalent) Imputed: A measure of clinical activity of an individual physician or group of physicians relative to the benchmark value for a given specialty. This is computed by dividing the actual RVUs (work or total) generated by the benchmark value selected in the report (mean, median, 75th percentile, etc).

CFTE Reported: The percent of time spent in billable clinical activity, as reported by the participant. Participants must provide these data in order to calculate other measures. Note: if you see patients where a bill is not entered into the billing system from which data are submitted to the FPSC, you should reduce the reported CFTE by the appropriate amount.

CFTE Imputed/Reported: The ratio of the imputed CFTE to reported CFTE. This ratio measures the relative productivity of providers. In other words, it

tells what an individual provider or group of providers is producing compared to what is expected.

Charge Lag: The number of days it takes to enter a service charge in the billing system from the date of the service.

Clinical Full Time Equivalent (CFTE): The percent of full-time a provider spends in billable, clinical activity. Percent clinical effort cannot exceed 100%

Current Procedural Terminology Code (CPT code): A systematic listing and coding of procedures and services performed by physicians. Each procedure or service is identified with a five-digit CPT code to simplify the reporting and billing of services.

CPT Family: A grouping of CPT codes related to a common category of procedure (e.g., Surgery, Evaluation and management).

CPT Range: A subset of codes within a CPT Family that defines a particular grouping related procedures (e.g., Surgery-Musculoskeletal).

Management Performance Indicators: indicators utilized for management of departmental activities to improve performance.

Practice Expense Relative Value Unit (Practice Expense RVU): A unit of measure used to express the amount of practice overhead costs of a service relative to other services.

Relative Value Unit (RVU): A non-monetary unit of measure used to express the time, complexity and cost of performing a given service relative to those of performing other procedures.

Standard: Something set up and established by authority as a rule for the measure of quantity, weight, extent, value or quality (Merriam Webster)

Total Relative Value Unit (Total RVU): The value consists of three components: the physician work involved (Work RVU), practice overhead costs (Practice Expense RVUs) and malpractice expense (Malpractice RVUs). RVUs are used as the basis for reimbursement of physicians' services by Medicare and by many other third-party players.

Variable: A characteristic that can be measured or categorized quantitatively.

Work Relative Value Unit (Work RVU): A unit of measure used to express the amount of effort (time, intensity of effort, technical skills) required of a provider in performing a given service relative to other services.

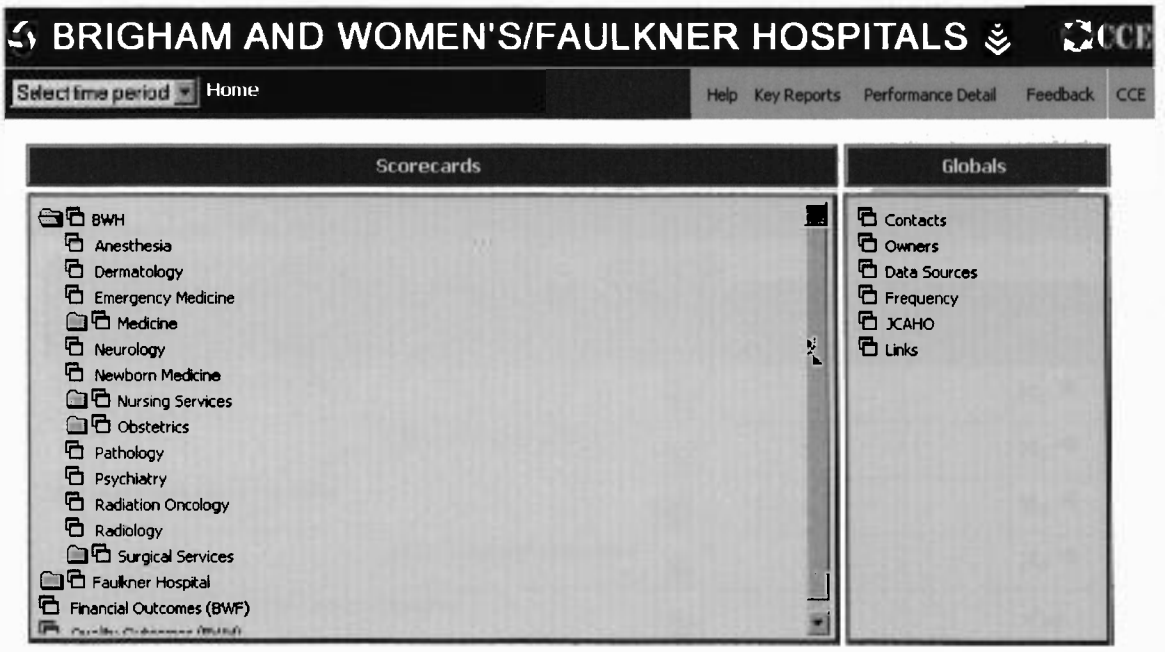
APPENDIX 2

STEPS IN IMPLEMENTING A DEPARTMENTAL SCORECARD[58]

1. Establish an Executive Champion (i.e. Hospital Vice President)
2. Select and educate a BSC development group
3. Develop "strategy map" and strategic goals for the deptartment
4. Inventory/brainstorm all potential measures for each goal
5. Determine which measures exist or can be captured
6. Rationalize list of measures
7. Develop detailed measure documentation
8. Develop data extracts
9. Develop "report" specifications
10. Develop BSC reporting hierarchy & security access
11. Data warehouse, scorecard, measure, report, programming
12. Scorecard Questions and Answers (reconciliation against source system & reports)

APPENDIX 3

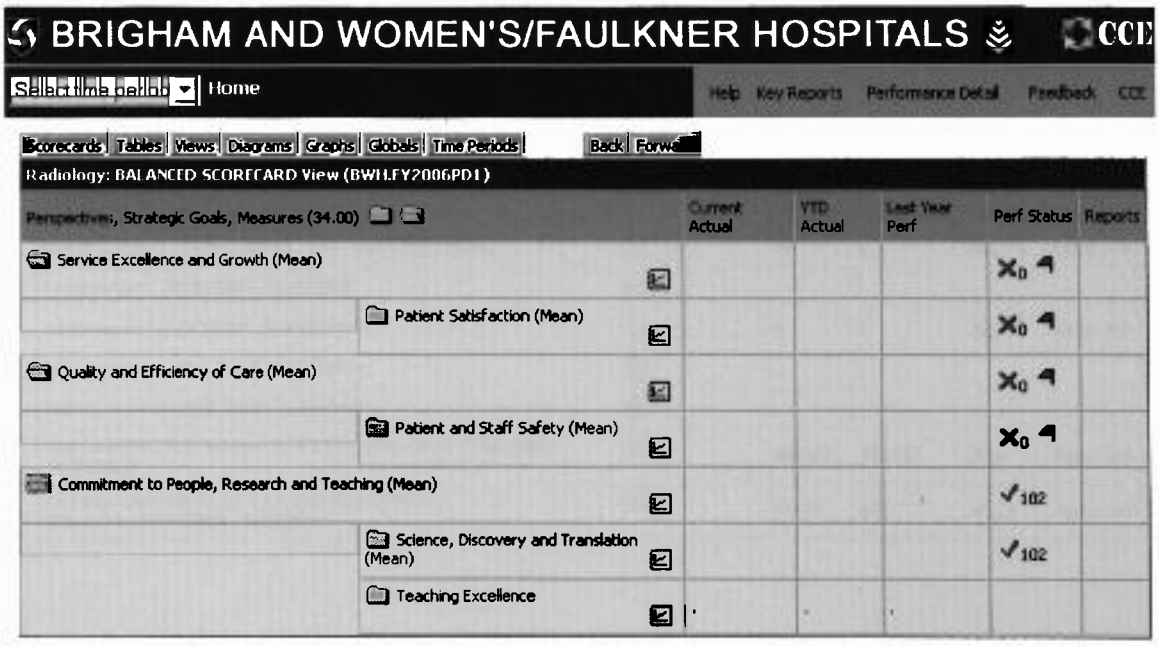
BRIGHAM AND WOMEN'S HOSPITAL BALANCED SCORECARD

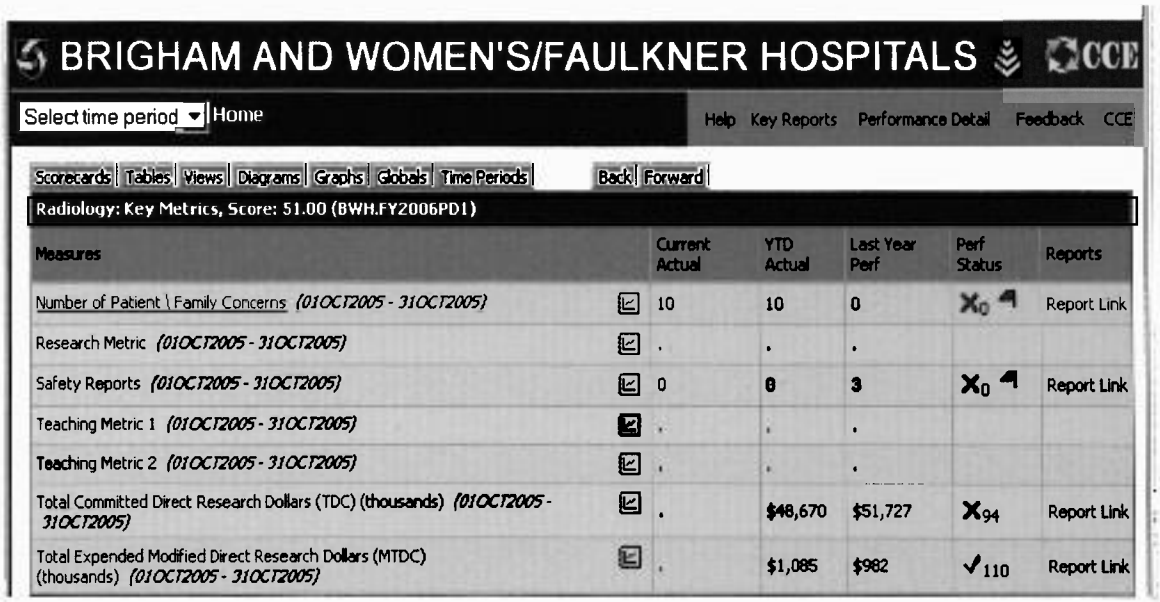


APPENDIX 4

BRIGHAM AND WOMEN'S HOSPITAL DEPARTMENT OF RADIOLOGY

BALANCED SCORECARD-DASHBOARD





BRIGHAM AND WOMEN'S/FAULKNER HOSPITALS

Select time period | Home | Help | Key Reports | Performance Detail | Feedback | CCE

Scorecards | Tables | Views | Diagrams | Graphs | Globals | Time Periods | Back | Forward

Radiology: Key Metrics, Score: 51.00 (BWH.FY2006PD1)

Measures	Current Actual	YTD Actual	Last Year Perf	Perf Status	Reports
Number of Patient \ Family Concerns *(01OCT2005 - 31OCT2005)*	10	10	0	X0	Report Link
Research Metric *(01OCT2005 - 31OCT2005)*	.	.	.		
Safety Reports *(01OCT2005 - 31OCT2005)*	0	0	3	X0	Report Link
Teaching Metric 1 *(01OCT2005 - 31OCT2005)*	.	.	.		
Teaching Metric 2 *(01OCT2005 - 31OCT2005)*	.	.	.		
Total Committed Direct Research Dollars (TDC) (thousands) *(01OCT2005 - 31OCT2005)*	.	$48,670	$51,727	X94	Report Link
Total Expended Modified Direct Research Dollars (MTDC) (thousands) *(01OCT2005 - 31OCT2005)*	.	$1,085	$982	✓110	Report Link

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