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Operational benchmarking of Japanese and Danish hospitals

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Abstract
This benchmarking model is designed as an integration of three organizational dimensions suited for the healthcare sector. The model incorporates posterior operational indicators, and evaluates upon aggregation of performance. The model is tested upon seven cases from Japan and Denmark. Japanese hospitals focus on productivity and reducing errors provide operational benefits, which primarily is achieved by high degree of overwork among staff. Danish hospitals on the contrary pay the price of productivity, with focus on pleasing caring needs of the patient and limiting overwork among employees.

Keywords: Benchmarking, Healthcare, Operational performance

Benchmarking healthcare
Healthcare performance assessment today often incorporate several dimensions such as safety, effectiveness, appropriateness, timeliness and responsiveness of services, along with measures of efficiency and equity (Wait & Nolte 2005). However this variety of dimensions have left the health care industry where no framework is unanimously accepted as tool for measuring and benchmarking the quality and performance of

healthcare services (Ondategui-Parra et al. 2004). The disagreement originates from the fact that performance indicators are inherently controversial in healthcare, because they require an operational definition to be measured. As a result the use and development of new methods for measuring and evaluating healthcare performance has been rapidly evolving, and debated, in the last decades (Folan & Browne 2005). Even though there are disagreement towards the usefulness of benchmarking in healthcare (MacVaugh 2006), most countries have developed comprehensive national strategies for collecting data and evaluating quality and performance within their own healthcare system. Benchmarking healthcare performance has become an intrinsic part within most developed health care systems, which enables politicians, national agencies and hospital managers to survey the delivered services (Purbey, Mukherjee, & Bhar 2007). But these benchmarks rely on national understanding of quality and performance, which often differs greatly from country to country.

Internationally, accreditation agencies like the HQS, ISQua and Joint Commission provide the possibility for hospitals to be certified according to a set of international standards for good quality. But these accreditation frameworks "just" approve hospital procedures they do not mutually compare hospitals. One agency which conducts healthcare comparison in an international context is the Organisation for Economic Co-operation and Development (OECD). The OECD performs a repetitive assessment where healthcare sectors as a whole, are mutually compared. The 2009 comparison announced that Japan uses fewer physicians and fewer nurses than the OECD average, but at the same time has the highest number of acute beds and significantly more diagnostic technology than OECD average (Official OECD webpage 2010). At the same time, Denmark has an average number of doctors and diagnostic equipment but well above average on nurses, and a significantly lower number of acute beds than OECD average. On the basis of this OECD benchmark, the Danish healthcare system seems considerably more inefficient than the Japanese, more people taking care of fewer beds and less equipment.

But these figures are strategic national indicators, which do not tell the story of operational performance at a Danish hospital or at a Japanese hospital. Cultural differences, different legal foundation and varying expectations to delivered care are factors which are not addressed in the OECD benchmark. If international benchmarking should be used in an operational context, and not just in a political context, the indicators need to resemble the versatile performance information managers use to make informed decisions at the hospitals (Dummer 2007;Liyanage & Egbu 2008). Scientists have proposed several frameworks which enable benchmarking across national borders. Many of these benchmarking frameworks relate to the use of financial indicators as a mean to assess whether a hospital has good or bad performance, e.g. (Chen et al. 2006; Evans 2004). But healthcare performance and quality implies much more than economic figures and assessment of medical errors, why versatile performance evaluation tools often are addressed. Griffith (2002) framework uses Balanced Scorecard to assess performance as a multitude of indicators (Griffith, Alexander, & Warden 2002). But the framework does not compile results, and only represent them as singular measures which represent an operational informative disadvantage. Swaminathan (2008) tries to aggregate healthcare performance outcome to present information on progress according to childhood immunization (Swaminathan, Chernew, & Scanlon 2008). But the narrow focus only portrays a fraction of performance for a department, which is limiting the potential as a mean to benchmark hospital performance. The Analytical Hierarchical Process (AHP) used by Dey (2008) is an attempt to provide insight into weaknesses within healthcare organizations (Dey,

Hariharan, & Despic 2008). A comprehensive framework which enables benchmarking across countries, struggles with one particular problem namely subjectivity.

Motivation and method

Benchmarking traditionally struggles with trade offs like the ones described and for that reason this paper tries to propose a new way to evaluate hospital performance in two different healthcare sectors. By evaluating Danish and Japanese hospitals upon indicators which are used in managing operational performance in both sectors, country specific differences are accentuated. Not focusing on high level indicators, but emphasis on describing operational performance for departments. By aggregating performance for quantifiable indicators of large scope, the paper tries to compensate for some of the challenges in international benchmarking.

The benchmark is being developed in a comparative research project, where both researchers and clinicians from Denmark and Japan have been involved. The development of the benchmarking model has been performed as a multiple case-study in two consecutive phases. First a qualitative development phase and second a quantitative evaluation phase. The qualitative selection of suitable indicators is performed in close collaboration with clinicians which participated in interviews, and subsequent served as respondents to data questionnaires. Using quantitative data analysis to benchmark the hospitals upon the selected indicators, an insight to performance differences among the Japanese and Danish hospitals are provided.

The case hospitals

For this benchmark seven case departments are included, four Danish and three Japanese. The first Japanese hospital is public hospital belonging to a local municipality, the second and third hospitals are University hospitals, respectively belonging to a national and a private university. The Danish cases are located on four individual sites, belonging to the same public hospital. The Danish hospitals were merged at management level, but the four sites all acts as operational parts in the new hospital, see Table 1

Table 1: Case hospitals for comparison

Hospital	***Located***	***Case department***	***Employees***
Hospital A	Fukuoka, Japan	Dialysis	14
Hospital B	Ibaragi, Japan	Radiology	21
Hospital C	Tokyo, Japan	Dialysis	48
Hospital D	Jutland, Denmark	Radiology	45
Hospital E	Jutland, Denmark	Radiology	16
Hospital F	Jutland, Denmark	Radiology	44
Hospital G	Jutland, Denmark	Radiology	9

The case departments chosen for the benchmark are all “producing” department, thereby no admission or intensive wards. This is a deliberate choice, because wards have different tasks than producing department, which might bias the result.

Two different healthcare systems

Because this paper deals with benchmarking in Japan and in Denmark, two very different healthcare systems, this section would shortly introduce the fundamentals in both.

The Japanese healthcare

After 1945 the governments of the Allied Forces reconstructed the political and social structure of Japan, and new laws and actions were implemented, having a great and positive consequences for health (Suzuki, Gibbs, & Fujisaki 2008). The Japanese social security system has continued to grow, especially the last decade. In fact, social security has created many job opportunities as demonstrated by the fact that the number of workers in the healthcare and welfare sector almost doubled from about 1.7 million in 2000 to about 3.3 million in 2005 (Kousei Roudou Hakusho 2009). An important characteristic of the Japanese system is that many of the hospitals are privately owned, in particular the smaller hospitals. (Chen, Yamauchi, Kato, Nishimura, & Ito 2006). Japan has about the lowest per capita health care costs is 2.51 (Intl $, 2006;) among the developed nations of the world and its population is one of the healthiest. That is largely due to lifestyle factors, such as low rates of obesity and violence.

Japan would in the future encounter with some severe demographical changes. The population began to decline in 2005, and in the future Japan will face further aging of society with fewer children leading to further population decrease (National Institute of Population and Social Security Research). It is predicted that by 2030, Japan's seniority rate will rise to 31.8%, indicating that one out of three Japanese will be a senior citizen (aged 65 or older), and that the figure will top the 40% in 2055 (Tatara & Okamoto 2009). There is a concern that changes in demographic structure may lead to the decline in the labour force and affect the sustainable development of the Japanese economy and thereby healthcare sector. Another concern is doctor shortages, although the number of doctors increased there still is a severe shortage of doctors in many areas, particularly in a country side.

Danish healthcare

Denmark's healthcare sector is primarily public, covering 98% of all admission beds. The private sector dealing primarily with small clinical procedures, pharmaceutical and dental care (Strandberg-Larsen et al. 2007). Public hospitals in Denmark are part of the municipal administrative structure, which consists of five regions and 98 municipalities. It is the primary task of the regions to manage the health care system, that is the hospitals, psychiatric units and health care insurance system. The total expenditure on health per capita is 3.34 (Intl $, 2006), which compared to Japans 2.51 is relatively high (Official WHO webpage 2010).

The Danish social security system faces like the Japanese some critical challenges over the years to come. As Japan, Denmark faces aging population, which demands nursing and treatment. Due to change in life styles and work characteristics, more and more Danes are struck with life-style diseases like obesity and diabetes. Combined with recruitment difficulties, Danish healthcare are in need for more human resources in the sector, or future comprehensive structural changes. Many Danish hospitals struggle with overcrowding, which constitutes an emerging problem.

The benchmarking procedure

The aim of this benchmark is to present performance as one superior aggregated index which acts as a common denominator for all included indicators in the comparison. This approach has previously been used by Nakajima (1986) which introduced the use of aggregated indicators into an Overall-Equipment-Efficiency indicator (OEE) (Nakajima 1986). The OEE measure included *Availability*, *Performance*, and *Quality* combined into one single measure. In benchmarking context, the aggregated indicator approach

has been used by De Toni (2008) to evaluate research institutions (De Toni et al. 2008). The merging of indicators provides indexes of performance, which does not relate to one single measure, but is a representation of all included lower level indicators, see Figure 1.

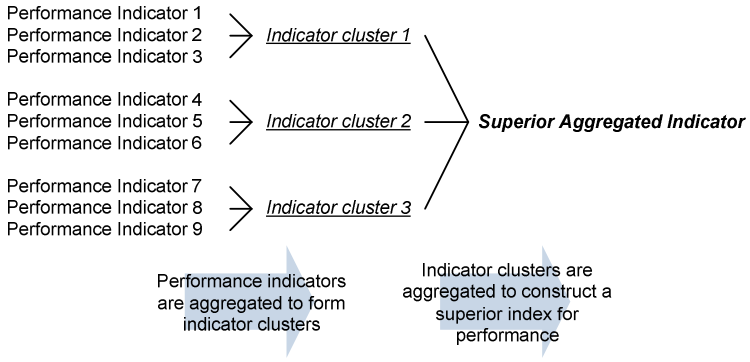

Figure 1: Guiding principle

To be able to compare performance outcome of different performance indicators into one key performance value, normalization of the data is necessary. Normalization serves the purpose of bringing the indicators into a dimensionless quantity, thereby making the indicators comparable (Stapenhurst 2009). As data normalization method the Standard score is chosen, or more commonly referred to as the z-score, see Equation 1. The z-score corresponds to a data point in a normal distribution. It converts all indicators to a common scale and thereby making them comparable regardless of data foundation.

$$z - score = \frac{(\text{Data point}_n - \text{Mean})}{\text{Standard Deviation}} \tag{1}$$

An advantage of using the z-score is that it encourages mean scores over high variation, which obey with the primary objective for healthcare facilities of complying with standards for acceptable performance (Lim, Tang, & Jackson 1999). It is more desirable for hospitals to be performing acceptable on all indicators, than perfect in some and poor in others, thereby reducing performance inconsistency in delivered care.

The benchmarking procedure is performed in three consecutive steps, which starts by calculating the mean value and the standard deviation from the collected data. Second, each indicator in the benchmark is transformed into a z-score representing each data value in relation to the standard deviation. Finally, all z-scores are aggregated through summarization. This aggregated result represents the performance level by each particular facility, in a particular cluster of indicators, see Figure 2.

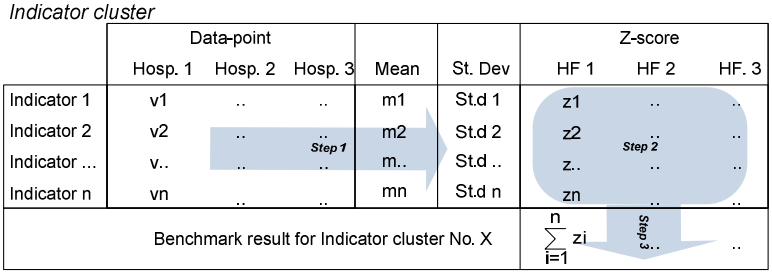

Figure 2: Benchmarking procedure

The procedure repeats itself whenever indicators or clusters are aggregated to a superior level. As a result of this approach the number of included indicators is unimportant, because each indicator equally acts as contributor to a given cluster. Mathematically indicators in "large" clusters have minor weight, than the indicators in "smaller" clusters. Because all healthcare facilities are evaluated upon a unified hierarchy of indicators, weighting of individual indicators is considered negligible.

Selection of indicators

The next step is the identification of indicators to be implemented in the benchmark. The overall structural frame was decided beforehand, where *Patients*, *Employees* and *Operations* constituted the backbone in the benchmark. The reason why these were chosen is that they constitute the main stakeholders in healthcare. There were set no limitations for how many indicators could be in each dimension. Furthermore it should be mentioned that the number of indicators in each dimension is not an expression for the importance of that cluster, but a result of the availability of comparable data.

To make a fair selection of indicators, clinicians from both Japan and Denmark have been interviewed according to which indicators were, in their opinion, meaningful and useful in daily operations. Based on these interviews, questionnaires were used to collect quantitative data. Based on the interviews it was possible to construct a hierarchy of indicators which represented a common understanding of important performance indicators for management in the seven hospitals, see *Figure 3*.

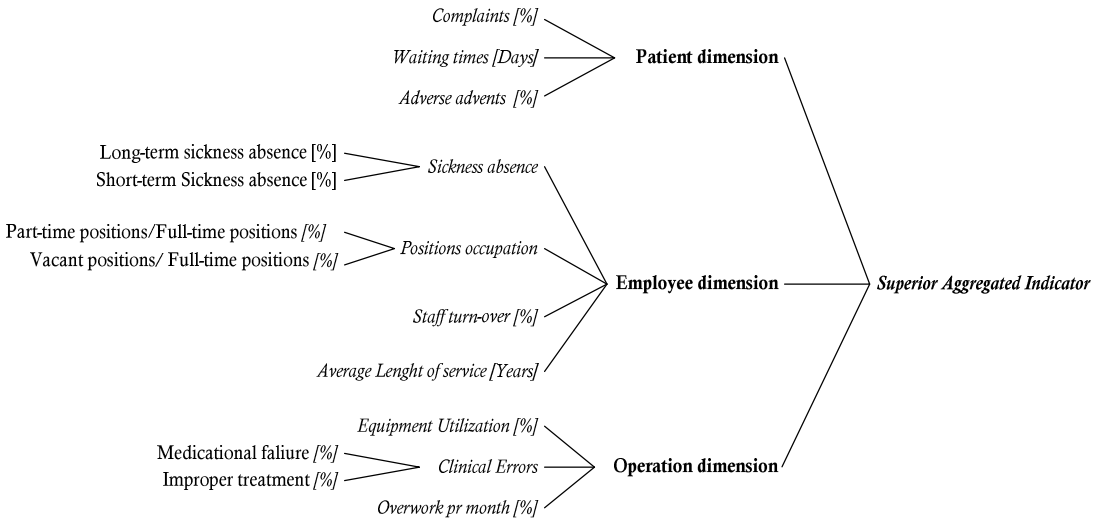

Figure 3: Indicator hierarchy

The reason why overwork is placed in the operations dimension and not the employee dimension is to adjust for the amount of resources put into heightening utilization and decreasing clinical errors. All performance indicators are made generic in the sense that they do not particularly address radiology or dialysis they might as well be applicable for any other producing departments, e.g. orthopaedics, cardiology, etc. Because the indicators in the operations dimension are heavily influenced by "production" indicators the presented hierarchy are assumed maladjusted for admission departments or intensive wards.

Benchmarking performance

The data foundation for the benchmark was collected during spring 2010, and represents the year of 2009. Aggregating the outcome of all three dimensions, the Japanese hospitals have an overall better result than the Danish, see Figure 4. The Japanese hospitals result is all positive indexes, with only one positive Danish hospital.

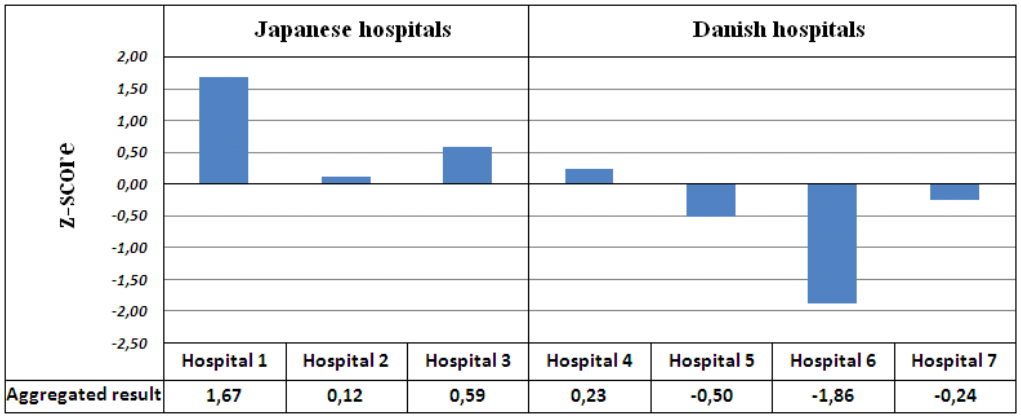

Figure 4: Aggregated benchmark result

To conduct the in-depth analysis of the foundation for the aggregated the result, each of the three dimensions are described in detail in Table 2. All the collected data are anonymous, so they would only appear as z-values in this presentation.

Table 2: Detailed benchmark result

	***Japanese hospitals* (z-values)**			***Danish hospitals* (z-values)**			
	Hospital 1	Hospital 2	Hospital 3	Hospital 4	Hospital 5	Hospital 6	Hospital 7
Complaints	0,47	-0,60	-2,05	0,46	0,47	0,63	0,63
Waiting times	0,79	0,79	0,79	-0,37	-0,06	-2,00	0,06
Adverse advents	1,37	-1,15	0,36	-0,14	0,36	-1,66	0,87
Patients dimension	***0,88***	***-0,32***	***-0,30***	***-0,02***	***0,26***	***-1,01***	***0,52***
Sickness absence	0,74	0,74	0,68	0,00	-0,37	-1,40	-0,40
Position occupation	0,34	0,01	0,44	-0,39	0,30	-0,45	-0,25
Staff turnover	-0,13	0,06	-0,12	0,24	-0,13	-0,25	0,33
Length of service	1,34	0,27	0,70	-0,58	-0,58	-0,58	-0,58
Employees dimension	***0,57***	***0,27***	***0,43***	***-0,18***	***-0,19***	***-0,67***	***-0,22***
Equipment utilization	0,62	1,08	0,42	1,22	-1,11	-0,91	-1,31
Clinical errors	1,02	1,11	1,01	-0,96	-0,72	-1,06	-0,39
Overwork	-0,47	-2,00	-0,52	0,77	0,64	0,83	0,76
Operations dimension	***0,39***	***0,06***	***0,30***	***0,34***	***-0,40***	***-0,38***	***-0,31***

It becomes apparent that the Hospital 1 excels over all other hospitals in the benchmark, having positive performance indexes for 8 out of 10 indicators. Hospital 4 is the best performing Danish hospital, especially because of a very fine operational dimension. As the only hospital in the benchmark, Hospital 4 has managed to keep a high utilization of equipment, with a minimum of overwork. The Japanese hospitals all have high equipment utilization levels, but this is mainly achieved by a high degree of overwork. Another distinct difference between Danish and Japanese hospitals seems to

be the employee dimension, where Danish hospitals have lower performance than the Japanese. There are two key explanations for this, sickness absence and length of service. Due to increasing pressure on the Danish healthcare, sickness absence has become a significant factor in several hospitals, plus shifting jobs is considered an career vice advantage in Denmark. Japanese hospitals excel within waiting times, which constitutes a major problem in Danish healthcare within most specialties.

Discussion

The results of this study accentuate some of the performance differences between Japanese and Danish healthcare. Both countries have what most professionals would acknowledge as high performing healthcare sectors. Though there are big differences in which areas the hospitals have high performance. As suggested in the OECD benchmark Japanese hospitals are very efficient, and this combined with a relative low rate of clinical errors. This benchmark highlight two main explanations for the high efficiency, namely overwork and sickness absence. Both of these factors are contributing to more available human resources for production, enhancing the probability of high utilization. Efficiency and few errors resemble what is known from Japanese industrial production, which has been known for the same virtues.

Danish healthcare has for many years made efforts to satisfy the caring needs of the patient during admission. There are signs that the Danish efforts in the nursing patients have been on the cost of productivity. Because this benchmark does not include satisfaction surveys, due to lacking Japanese data, it is impossible to conclude whether the efforts have paid off in relation to patients. The only indication of patient satisfaction is a low degree of patient complaints at the Danish hospitals. Implementing patient satisfaction in benchmarking across national borders would be a very difficult, because cultural differences presumably would heavily influence the answers. There are indications that Japanese healthcare is striving towards more patient oriented care in the future. Recently, more attention has been paid to patient's rights such as informed consent and shared decision-making (Tatara & Okamoto 2009). This change in focus suggests that Danish healthcare is ahead in terms of patient care, though it is impossible to validate upon the presented results in this benchmark.

The employee dimension is interesting because it stresses that Japanese hospitals outperforms Danish hospitals. But it is important to recognize that the indicators used in the benchmark do not tell about satisfaction with work itself. It only relates to the how well the department is running from management point of view. The ability to hold on to experienced employees, having limited turnover and low sickness absence is considered to be organizational benefits. It has to be mentioned though, that turnover for Japanese doctors is special. Japanese doctors virtually belong to a professor in the medical university. In most cases the professor has authority to send his former student to another hospital every second or third year, independent from their will and wish. For that reason doctor's turnover is rather high in Japan. Turnover rate is therefore not a reliable indicator of doctor's satisfaction in Japan. In Denmark though, this indicator is, among others, a reasonable sign of satisfaction, but because of the differences it is unsuitable as a benchmark for employee satisfaction. The use of part-time workers is also an important factor in the employee dimension, because the part-time/full-time ratio should be as low as possible. The reason is that many part-time workers and vacant positions are considered a flow problem for organizations. As the results shows, Danish hospitals struggles more with keeping a stable workforce than the Japanese hospitals.

Related to the employee dimension, overwork constitutes a significant difference between the two countries. Because of shortage of healthcare staff, particularly doctors

in Japan, a small number of doctors have to take care of many patients. Therefore they must work longer hours, which is indicated in the benchmark. The amount of working hours in Japan is very seldom in Denmark, due to labour agreement and legislation. Because the overwork indicator is placed in the operations dimension in this benchmark, the outcome is not affecting the employee dimension. Therefore the employee dimension would from management point of view provide reasonable performance information, but not as a token of good working conditions. It has not during the research period been possible to gather data on work-life satisfaction from Japanese hospitals.

Implementing more indicators into the proposed framework would further clarify some differences between hospitals in different healthcare sectors. The development of this benchmark has shown that Danish managers use significantly more performance information in the management of department than the Japanese managers does. Limited data availability and lack of uniformity of data across countries, limits the scope of most benchmarking initiatives. This has of course also affected this benchmark in the development of the hierarchy, where uniform data were shortage. In particular, Japanese hospitals do not have enough data related to indicators which Danish hospitals hold, and therefore hospital managers or department leaders must in some cases estimate them. This can lead to low reliability of data. A solution towards securing higher reliability in the future work is to question hospital managers about confidence or an estimate of error towards the data. This could be valuable information to the data which is not regular recorded at the hospital. Based on the estimated value and confidence, it would be possible to calculate a value or degree of each indicator with allowance which resembles a confidence interval or limit. Comparison between two countries' hospitals is thereby possible in terms of the indicator value for Danish hospitals, and upper and lower confidence limits as well as the mean value of the indicator for Japanese hospitals.

Another important discussion is regarding weighting of indicators within the framework. The importance of the individual indicators is different between the countries. Because of different healthcare and social systems for instance, sickness absence is not so meaningful in Japanese hospitals while it is a good indicator for employee satisfaction in Denmark. Allocation of weight profiles for the indicator hierarchies may be a way of enhancing the reliability of the model. If data are available from many hospitals, it is possible to apply the Factor Analysis or the Principal Component Analysis (PCA) separately to Danish and Japanese data. Thereby estimate factor loadings to all the indicators for each of dimensions, thereby obtaining two sets of weights: Danish criteria and Japanese criteria. Alternatively the AHP could be applied. These techniques are easy approachable if there are sufficient data available.

Conclusion

The paper discovers some of the differences between Japanese and Danish healthcare. The results point to Japanese hospitals as having better aggregated performance than the Danish hospitals. High equipment utilization and few clinical errors are to some extend achieved by much overwork among Japanese healthcare staff. Danish hospitals pay the price of productivity by focus on pleasing the caring needs of the patient and limiting working hours for employees. The structure of the benchmark is regarded suitable for evaluating operational healthcare performance, because of the possibility of calculating performance in few key indicators, without loosing the strength of deep detailed measures. Though there are seen some difficulties with international benchmarking, primarily caused by cultural and structural differences and availability of data.

References

Chen, X. y., Yamauchi, K., Kato, K., Nishimura, A., & Ito, K. 2006, "Using the balanced scorecard to measure Chinese and Japanese hospital performance", *International Journal of Health Care Quality Assurance*, vol. 19, no. 4, pp. 339-350.

De Toni, A. F., Montagner, M., Tonchia, S., & Zanchetta, A. "Benchmarking Performances of Research institutions: A Measurement Model", in *EurOMA International Conference 2008*.

Dey, P. K., Hariharan, S., & Despic, O. 2008, "Managing healthcare performance in analytical framework", *Benchmarking: An International Journal*, vol. 15, no. 4, pp. 444-468.

Dummer, J. 2007, "Health care performance and accountability", *International Journal of Health Care Quality Assurance*, vol. 20, no. 1, pp. 34-39.

Evans, J. R. 2004, "An exploratory study of performance measurement systems and relationships with performance results", *Journal of Operations Management*, vol. 22, no. 3, pp. 219-232.

Folan, P. & Browne, J. 2005, "A review of performance measurement: Towards performance management", *Computers in Industry*, vol. 56, no. 7, pp. 663-680.

Griffith, J. R., Alexander, J. A., & Warden, G. L. 2002, "Measuring comparative hospital performance / Practitioner response", *Journal of Healthcare Management*, vol. 47, no. 1, pp. 41-57.

Kousei Roudou Hakusho 2009, *Annual Health, Labour and Welfare Report 2007-2008*, Japanese Ministry of Health,Labour and Welfare.

Lim, P. C., Tang, N. K. H., & Jackson, P. M. 1999, "An innovative framework for health care performance measurement", *Managing Service Quality*, vol. 9, no. 6, pp. 423-433.

Liyanage, C. & Egbu, C. 2008, "A performance management framework for healthcare facilities management", *Journal of Facilities Management*, vol. 6, no. 1, pp. 23-36.

MacVaugh, T. 2006, "Benchmarking: Should the art or science be benched?", *Healthcare Purchasing News*, vol. 30, no. 4, p. 13.

Nakajima, S. 1986, "TPM - Challenge to the improvement of productivity by small group activities", *Maintenance Management International*, vol. 6, no. 2, pp. 73-83.

Official OECD webpage, J. Official OECD webpage, Japan. 2010. 10-4-2010.
Ref Type: Internet Communication

Official WHO webpage, D. Official WHO webpage, Denmark. 2010. 7-4-2010.
Ref Type: Internet Communication

Ondategui-Parra, S., Bhagwat, J. G., Gill, I. E., Nathanson, E., Seltzer, S., & Ros, P. R. 2004, "Essential practice performance measurement", *Journal of the American College of Radiology*, vol. 1, no. 8, pp. 559-566.

Purbey, S., Mukherjee, K., & Bhar, C. 2007, "Performance measurement system for healthcare processes", *International Journal of Productivity and Performance Management*, vol. 56, no. 3, pp. 241-251.

Stapenhurst, T. 2009, "Normalization: How to Compare Apples with Pears," in *The Benchmarking Book: A How-to-Guide to Best Practice for Managers and Practitioners*, 1 edn, Oxford, pp. 112-137.

Strandberg-Larsen, M., Nielsen, M. B., Vallgårda, S., Krasnik, A., Vrangbæk, K., & Mossialos, E. 2007, *Japan: Health system review. Health Systems in Transition*, European Observatory on Health Systems and Policies, 9(6).

Suzuki, Y., Gibbs, T., & Fujisaki, K. 2008, "Medical education in Japan: A challenge to the healthcare system", *Medical Teacher*, vol. 30, no. 9-10, p. 846.

Swaminathan, S., Chernew, M., & Scanlon, D. P. 2008, "Persistence of HMO Performance Measures", *Health Services Research*, vol. 43, no. 6, pp. 2033-2049.

Tatara, K. & Okamoto, E. 2009, *Japan: Health system review. Health Systems in transition*, The European Observatory on Health Systems and Policies, 11(5).

Wait, S. & Nolte, E. 2005, "Benchmarking health systems: trends, conceptual issues and future perspectives", *Benchmarking: An International Journal*, vol. 12, no. 5, pp. 436-448.