

DEVELOPING NATION: PERFORMANCE MEASUREMENT IN A CONSTRAINT ENVIRONMENT

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ABSTRACT

This paper provides an overview of performance measurement systems practices in Malaysia. It is intended to capture the very essence of measuring activities in Malaysian hospitals using secondary data obtained from external sources. The objective of this paper is to provide an understanding of the factors that shape the performance measurement system in the Malaysian context. The researcher not only interviewed participants of the case studies but also governmental and non-governmental agencies that directly have an impact on healthcare policy. Measuring performance is the next step forward in healthcare sectors in Malaysia.

INTRODUCTION

As a developing country, Malaysia is on a par with other developing and developed countries in terms of health status. In making the effort to understand performance measurement practices in Malaysia, the evidence of the literature shows that the context in which the measurement exists must well be understood because the performance measurement system is nurtured and shaped by its environment. The contexts referred to are public health, health manpower, characteristics of healthcare systems, healthcare facilities, roles of public and private healthcare systems, and health status.

MALAYSIAN HEALTH SYSTEM

The government in its report (8th Malaysia Plan) stated, “The focus of health sector development will be to further improve the health status of the population, particularly the low income and the disadvantaged groups and optimise utilisation of resources in the delivery of healthcare.” The Ministry is attempting to integrate planning to ensure that healthcare services have equal distribution between rural (44%) and urban (56%) areas and public (80%) and private (20%) sectors. In the light of this, the government has strengthened its implementation mechanism for effective governance of the healthcare sector.

Recently, the Malaysian healthcare sector has undergone rapid changes to accommodate the population needs of the country. This has been pointed out by the Director-General of Health, Tan Sri Dato’ Dr Abu Bakar Suleiman in his book report, *Health in Malaysia: Achievements and Challenges* (2000), “ the health sector in Malaysia is undergoing considerable changes, in the country’s effort to make its health care system more capable of meeting the challenges of the future.” The government budget allocation shows a steady increase in the operating budget from RM (Malaysian Ringgit) 1.2 million to 3.4 million, an increase of sixty-five (65) percent over a twelve-year period. Health has been recognised as an important sector: there is an increase in the health budget from 4.3 % of GDP (1985) to 5.8% (1997). Government spending (expenditure) according to states can be seen in table 1

TABLE 1 HEALTH MINISTRY BUDGET ALLOCATION, MALAYSIA
Allocation (RM'000) 1985 1990 1995

Allocation (RM'000)	1985	1990	1995	
1997				
Operating budget	1,094,117.0	1,335,325.5	2,165,265.0	2,868,400.0
Development budget	162,205.3	504,996.3	427,966.0	578,538.0
Total Budget	1,256,322.3	1,840,321.0	2,598,231.0	3,446,938.0
Health as a % of national budget	4.3	5.5	5.3	5.8
% of GDP for health	1.7	1.7	1.3	1.3

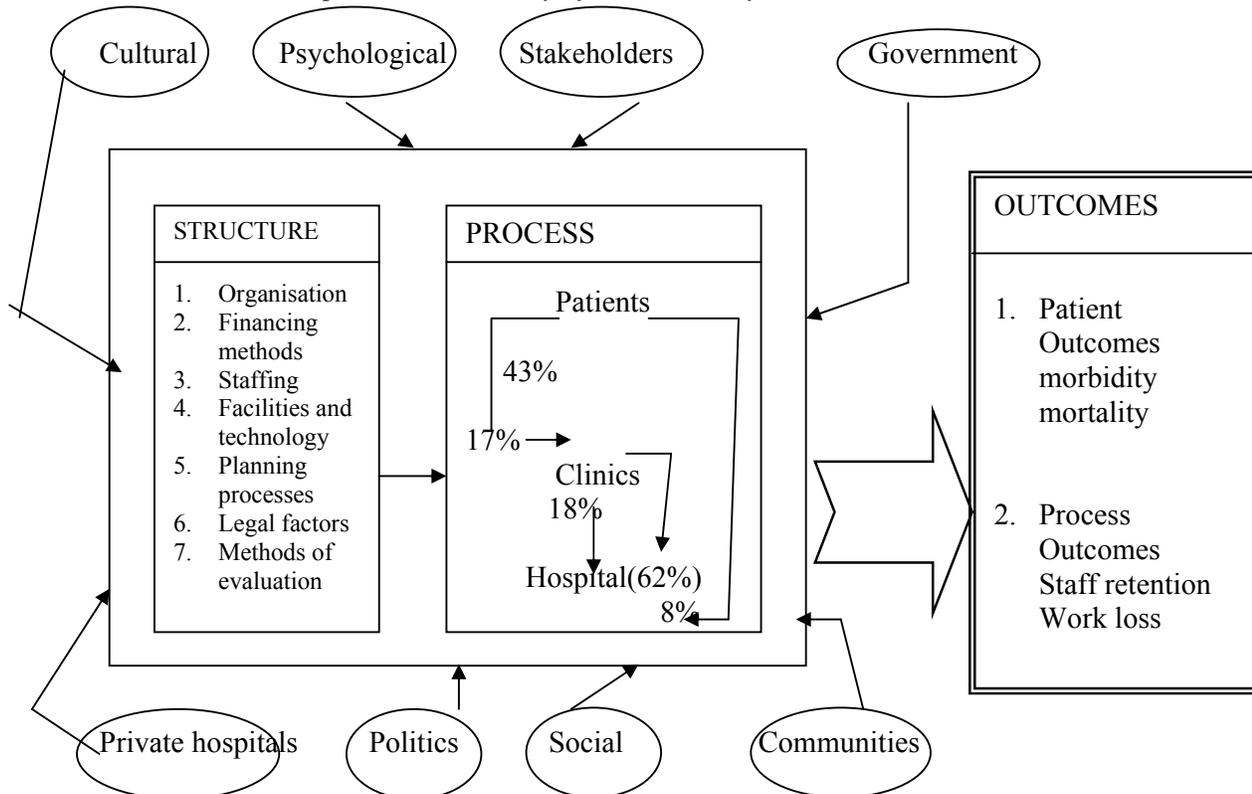
Source: Laporan Tahunan Kementerian Kesihatan Malaysia 1986, 1991, 1996, 1998

The objective of healthcare systems according to the Institute of Public Health is adequacy and equity in access to a minimum of healthcare for all citizens; the cost of healthcare should not exceed an acceptable share of national resources; and the mix of services chosen should secure health outcomes and consumer satisfaction at minimum cost.

There is a growing need for continuous improvement in the health care sectors. Demographic and epidemiological changes have altered and will continue to alter demand for the healthcare industry. These healthcare changes, also called healthcare reform, require a comprehensive view of the various players in the industry. Figure 1 shows an interaction of variables in the healthcare systems in Malaysia according to the Donabedian model. Familiarity with the model enhance understanding of how healthcare systems function in a volatile environment. This environment in turn affects health policies directly and indirectly. The model provides structured views of variables that interplay within the health systems. It has been noticed that if the burden of disease is high, it results in low average labour productivity (Dunlop and Martins 1995). This phenomenon can be seen from less developed countries to sustain socio-economic development because to solve the diseases which arise from society such as malaria, leprosy, tuberculosis and other pathogenic agents. The government knows that the progress of a nation is contingent on population health. This is reflected in government expenditure by State in the Eighth Malaysian Plan. The expenditure on health depends on the needs of the state. The following tables show government allocation and expenditure.

Programme	8 th MP		7 th MP
	Allocation	Expenditure	Allocation
Patient Care Services	2,691.85	2,640.04	4,169.00
New hospitals	1,510.86	1,447.39	2,284.60
Refurbishment	180.99	1,192.65	1,884.40
Public Health Services	889.32	917.91	1,020.60
Urban health	375.15	456.37	306.10
Rural health	500.17	447.54	708.30
Environmental health	14.00	14.00	6.20
Other Health Services	155.93	167.55	310.40
Training	150.93	162.55	285.40
R & D	5.0	5.0	25.00
Total	3,737.10	3,725.5	5,500.00

Source: Annual Report 1998, Ministry of Health Malaysia



Laporan Bengkel Kebangsaan Mengintegrasikan penyelidikan system kesihatan dengan pengurusan, Institut Kesihatan Unum, Kementerian Kesihatan Malaysia.

The Malaysian healthcare industry is growing at a slow pace. This is due to lack of manpower in all facilities across Malaysia. Table 3 below demonstrates that healthcare personnel are greatly overburdened in their workload. This overwork has created a lot of tension and deterioration of the healthcare industry image in the eyes of the public. As Jarman et al (1999) pointed out that, “There is good evidence that patient outcomes improve as the number of doctors increases”. There is a critical need to acquire more clinical personnel, especially dentists and pharmacists, in the health care systems.

TABLE 3 HEALTH MANPOWER 1999

<u>Health Personnel</u>	Public	Private	Total
Total number of doctors	8,723	6,780	15,503
Total number of dentists	873	1,231	2,104
Total number of pharmacists	363	1,766	2,129
Total number of nurses	18,134	5,538	23,672
one Doctor per population	2,604	3,350	1,465
one Dentist per population	25,406	18,017	10,542
one Pharmacist per population	61,101	12,559	10,418
one Nurses per population	1,223	4,005	937

Source: Health Fact, Ministry of Health Malaysia, February 2000

In comparison with equivalent figures for developed countries, the table demonstrates that more healthcare workers are needed to serve a population of twenty-two (22) million people. Table 4 shows the statistics for manpower from 1985 to 1997 according to categories of specialisations. The number shown does not match the Malaysian population, as some of the previous statistics demonstrate acute shortages of clinical personnel in the field. The researcher observed symptoms of ‘organisational lethargy’ in most hospitals investigated, especially public hospitals. Hospitals are not able to cope with the overload of cases and there is a widening gap between facilities and the needs of the population, aggravated by a shortage of healthcare workers.

TABLE 45 HEALTH MANPOWER IN MALAYSIA

Category	1985	1990	1995	1997
Doctor	4,939	7,012	9,608	14,248
Dental Officer	1,041	1,471	1,750	1,865
Pharmacist	843	1,239	1,537	1,746
Health Inspector	879	1,007	1,425	2,052
Physiotherapy	118	170	217	233
Radiographer	280	385	422	505
Nurse	10,311	11,569	13,647	16,068
Rural Nurse	5,047	5,492	5,495	5,827
Dental Nurse	940	1,102	1,223	1,388
Dental Technician	260	337	362	424
Medical Assistant	2,350	3,342	4,261	4,074
Pharmacist Assistant	1,330	1,567	1,879	2,162
Medical Lab Tech	879	1,370	1,698	1,784
Asst Med Lab Tech	879	835	980	1,050

Source : Ministry of Health Malaysia Annual Report 1986, 1991, 1996, 1998

To highlight this point, table 5 shows facilities state-by-state in relation to area and population. In terms of access and equity, the ratio shows improvement in some states; however, there are states at a critical point such as Sabah and Sarawak due to geographical disadvantage. These two states show low density of population and overcrowding in health facilities, ie Sabah (3,067 patients in hospitals) and Sarawak (4,446 patients in hospitals). Overall, an average of 2,000 patrons per health facility poses a serious threat to care unless measures are taken to rectify the situation.

As one of the directors in a public hospital puts it, “ government is not in the business of making money, but to serve the population at whatever cost.” This is in fact what the government is doing, taking on social responsibilities, as most government hospitals are heavily subsidised, as can be seen from case studies in this thesis. Figure 2 illustrates the channel of communication between healthcare agencies in Malaysia, which has been practised by the government only since they have coordinated health matters across organisations.

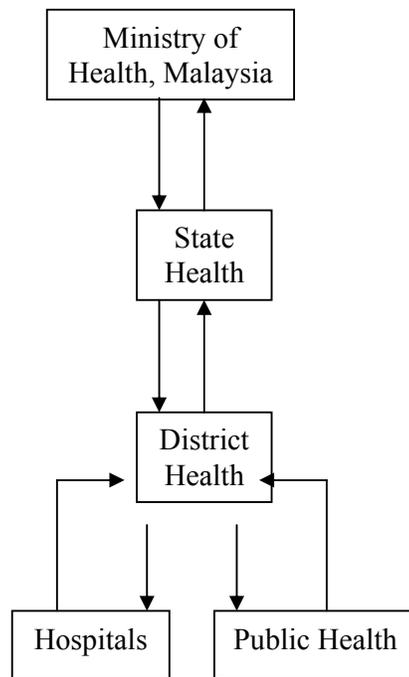
TABLE 5 RATIO OF HEALTH FACILITIES TO POPULATION AND GEOGRAPHICAL AREA BY STATES 1995

State	Total number of health facilities of all types	Square km per health facilities	Population per health facility
Perlis	68	8.4	2,109
Kedah	480	15.1	2,290
Pulau Pinang	126	1.6	1,847
Perak	686	19.3	1,849
Wilayah	390	0.4	1,861
Selangor	851	6.5	2,162
Negri Sembilan	259	20.5	2,339
Melaka	205	5.9	1,963
Johor	757	17.7	2,145
Pahang	415	66.9	2,124
Terengganu	260	39.4	2,667
Kelantan	376	31.6	2,714
Sarawak	336	156.3	4,446
Sabah	292	208.1	3,067

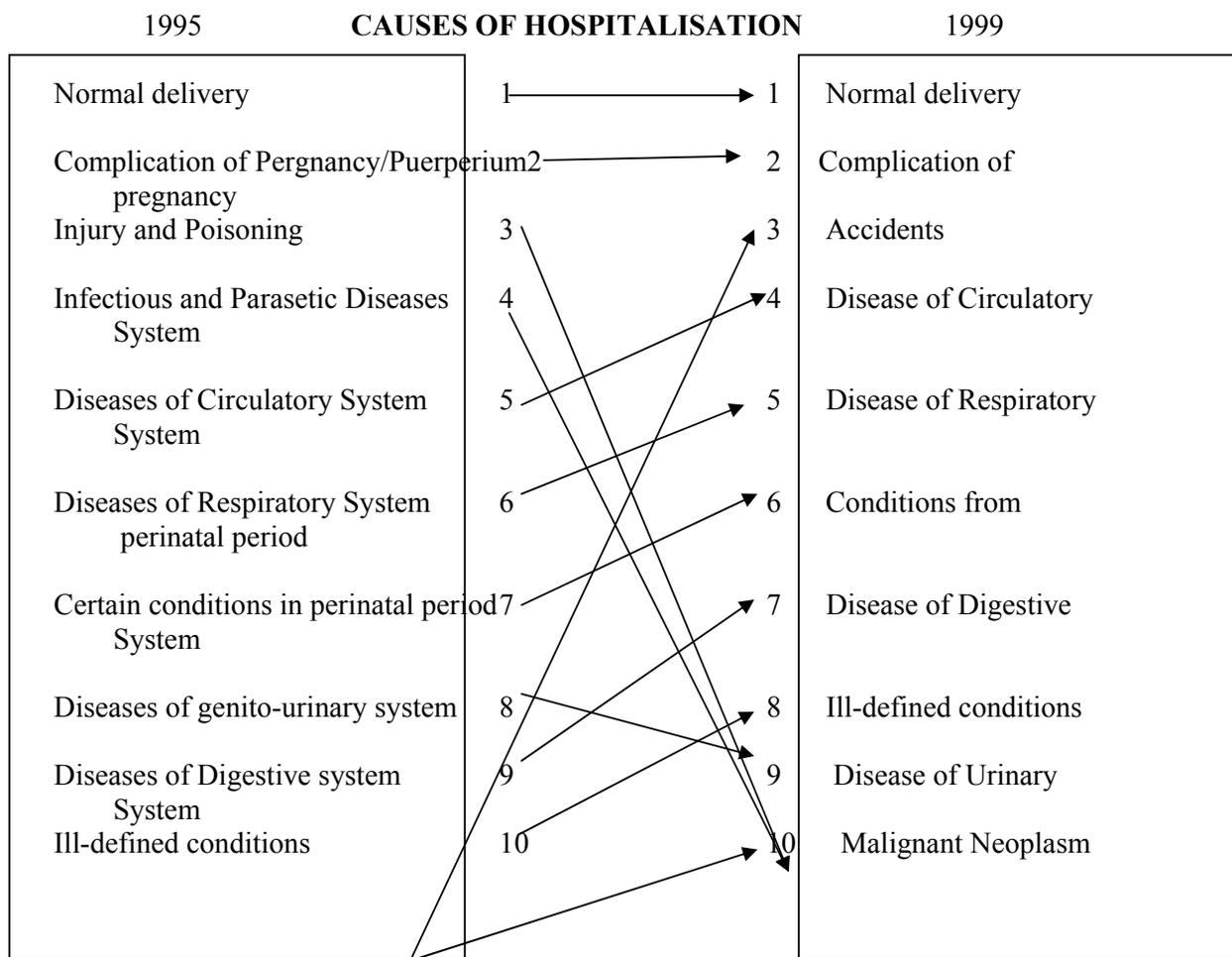
Source: Ministry of Health Malaysia 2000

TABLE 6 UTILISATION OF HOSPITALS –ADMISSIONS PER 1,000 POPULATION BY STATE

	1970 ← (26 years changes) → 1996				
	No of admission	Admission rate	No of admission	Admission rate	inc
Perlis	6,099	61.8	20,623	96.7	35.0
Kedah	26,170	34.3	120,403	80.0	45.6
Pulau Pinang	37,636	60.3	88,799	73.4	13.1
Perak	57,907	43.1	169,494	81.4	38.3
Selangor	51,129	45.7	269,900	63.2	13.8
Negri Sembilan	31,146	76.4	69,498	88.8	4.5
Melaka	12,775	39.5	42,608	73.9	34.4
Johor	45,843	44.7	175,249	70.2	25.5
Pahang	19,290	56.2	90,894	74.9	18.6
Terengganu	7,611	24.8	65,435	69.0	44.2
Kelantan	9,032	16.3	77,876	55.2	38.9
Total	304,638	44.1	1,190,779	71.2	26.8



Adapted from: Annual Report 1998, Ministry of Health, Malaysia



Source: 1. Kementerian Kesihatan Malaysia (1995), Laporan Tahunan, Jabatan Percetakan Malaysia, Kuala Lumpur, Malaysia. 2. Kementerian Kesihatan Malaysia (1999), Laporan Tahunan, Jabatan Percetakan Malaysia,

THE ROLE OF PUBLIC AND PRIVATE SECTORS IN MALAYSIA

The Ministry has successfully implemented a policy to stimulate growth among clinical workers especially doctors. This can be seen from 1970 to 1997, where doctors to population ratio reduced gradually from 4,105 to 1,521, a reduction of almost two-hundred (200) percent over 27 years (see table 6). The Ministry is still battling to close the gaps among states and penetrate rural areas for better access and equity among populations.

The emergence of private health care has forced the government to reconsider its role as the primary healthcare provider. The government has shifted its role from curative health care to preventive health care. The two-tier system (public and private) has to be integrated as well as coordinated so that redundancy of services can be eliminated. The overlap of services of these sectors creates inefficiency in the health system. The government has recently passed the 'Akta Hospital-Hospital Swasta 1998'. This 'Akta' (a Malay word for an Act passed by

parliament) has been tabled in a Cabinet meeting and is waiting to be gazetted into a government publication. It was enacted to control private sector activities as well as distribution of health facilities across Malaysia. The government is serious in its intention to provide health to every corner of the country by giving more responsibilities to the private sector. Sharing accountability for access and equity is the main agenda of the government in regard to the private health provider.

It is the intention of the government to provide the best service at a lower cost. This is apparent from its strategy. Among other things, the health system proposed by the government envisages a system that is:

- Affordable – healthcare costs should be within the means of the country and the healthcare financing systems that exists, but should also take into consideration individual access to health and health related services.
- Equitable – each individual, regardless of socio-economic status, age, race, religion or gender, shall be provided with basic healthcare of an acceptable standard.
- Efficient – the health services should be effective, appropriate and result in good outcomes.
- Technologically appropriate – interventions in healthcare should be suitable for the purpose, time, place and cost as well as appropriate for observed priorities in health.
- Environmentally adoptable – the health systems should be flexible and have the ability to respond to changes in the physical and socio-economic environment.
- Consumer friendly – the ‘client’ should be the focus at the centre of every health endeavour, in order to make the service easy to use. In future, client-driven healthcare may be the aim.
- Strong on quality, innovation, and health promotion – criteria to meet the changing demands and expectation of the population, and these must be optimised to further enhance the health status of Malaysians.
- Promoting individual responsibility and community participation – basic principles of healthcare that stress the fact that health does not entirely depend on health services alone. There are also socio-economic and other significant determinants, such as people’s responsibility for their own health and opportunities available to participate in their own care.

These objectives listed above are difficult to achieve since public health is a social entity. For example to be equitable as well as efficient is almost impossible. To be at the forefront of technology and at the same time affordable is difficult to achieve. There is a trade-off that the government has to consider in their decision making. It is a hard choice because it affects government spending as well as government allocation. It is difficult to achieve because as a third world country, Malaysia is not without social problems, including poverty.

TRACKING PERFORMANCE MEASUREMENT ACTIVITIES IN MALAYSIA

Performance measurement activities in healthcare sector are an emerging concept in Malaysia especially in the public sector. In its recent efforts, the Institute of Public Health (IPH) is developing clinical and non-clinical indicators for the public. Presently indicators are collected at the operational level (hospital site) and kept by the head of department at the respective hospitals. There is communication between national and regional level in respect to indicators collected. As Chapter six will reveal in the case studies report at the regional level, the researcher found that the effort is not geared towards performance measurement practices. Healthcare information systems are also in their infancy. IPH is coordinating efforts to use the existing information to communicate the indicators to the public. This

efforts of collecting indicators are a formalisation of performance measurement systems in Malaysia.

The government has realised that performance measurement is crucial in determining success in a system. This effort can be seen through Institute of Public Health and two other new formation of institution dedicated to research in healthcare; Institute of Health Management and Institute of Health Promotion. The Institute of Public Health focuses on health systems research and public health, while the Institute of Health Management focuses on health management research and the Institute of Health Promotion focuses on behavioural research and health education.

To coordinate the data collection of this new initiatives to measure performance, the Ministry has set up a committee, named the “ National Quality Assurance Programme” (QAP) (see figure 3.9). This committee reflects the commitment of the Ministry to quality. Every level of health at different aspects of health are assessed to reflect Malaysian performance on quality of care. This structure takes into consideration ‘top-down approach’, that is the national indicators collected, and ‘bottom-up’, that is hospital specific indicators collected at the district or regional level.

How are these measures selected?

According to Lim and Sivalal (1991), “Each of the major clinical disciplines identified two problem-areas that were considered important and relevant to most hospitals.” These include inpatient and outpatient departments. Issues addressed are patient care, resource utilisation and patient satisfaction. Indicators were developed for each area of concern in order to develop a standardised monitoring system. These indicators act as a alert signal or warning of potential problems.

The indicators (table 3.37) collected are not based on pre and post-admission, severity of cases, case mix and other extraneous conditions which are beyond the control of the Ministry of Health. This is to ensure that indicators are valid and reliable. The following are indicators for the whole programme implemented by the Ministry of Health. Lim and Sivalal (1991) pointed out that institutions that did not conform to standards set were required to carry out investigations using protocols drawn up for each indicator.

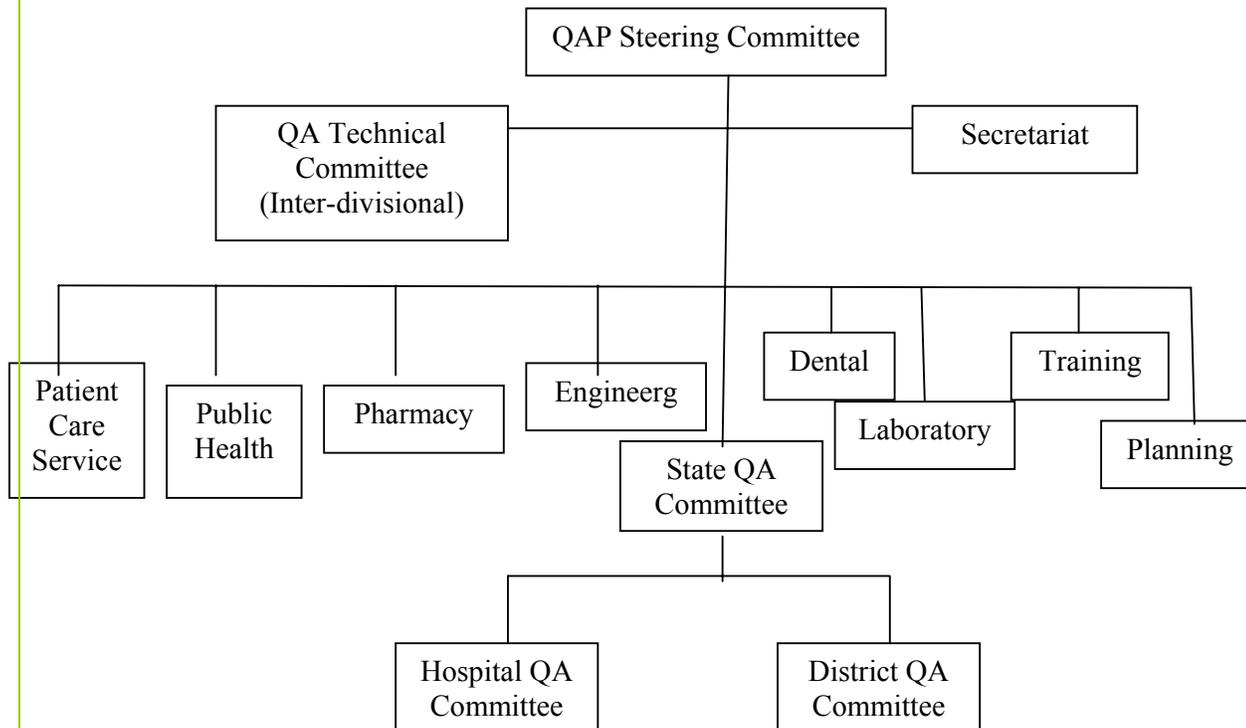


FIGURE 3 MALAYSIA HEALTHCARE COMMITTEE

TABLE 7 MEASUREMENT IMPLEMENTATION AT MINISTRY LEVEL

Programme Division	Implementation year	No of indicators
Patient care services	1985	19
Pharmaceutical services	1990	7
Public health services	1990	13
Engineering services	1992	7
Dental services	1992	9
Laboratory services	1992	11
Training & manpower	1996	5
Planning & Development	1998	3
Total		74

NATIONAL INDICATOR APPROACH

Patient care Services

This is a pioneering programme to collect indicators in Malaysia. This approach was been described by the WHO consultant as, “highly commendable, admirable innovation, pioneering.” (Collopy et al, 1996). It was intended to stimulate hospitals to compare to national standards. The list of nineteen indicators are the following:

- Death due to typhoid
- Death due to elective cholecystectomy

- Death due to to haemorrhage of pregnancy
- Death due to eclampsia
- Hospital gross death rate
- Incidence of POP cast complication
- Incidence of post-operative wound infection
- Incidence of pressure sores in bed-ridden patients
- Bed occupancy rate
- Average length of stay
- Myocardial infarction case fatality rate
- Death due to gastroenteritis
- Head injury case fatality rate
- Acute respiratory infection case fatality rate
- Laboratory specimens rejection rate
- Proportion of urgent laboratory tests
- Proportion of outpatients undergoing X-ray examinations
- Proportions of inpatients undergoing X-ray examinations
- Proportions of X-ray films rejected.

HOSPITAL SPECIFIC APPROACH

Public Health Services

This is a hospital specific approach in collecting indicators in the area of public health. Started in 1990 with initial of thirteen (13) indicators chosen, they were:

- 6 for maternal and child health
 - eclampsia
 - puerperal sepsis
 - neonatal tetanus
 - severe neonatal jaundice
 - 3rd dose of DPT coverage children under 1 year
 - visual defect
- 2 for disease control
 - morbidity index
 - average time notification index for typhoid
- 2 for food quality control
 - detection rate for contravening microbiological standards
 - detection rate for contravening non-microbiological standards
- 3 vector disease control
 - dengue notification index
 - dengue outbreak control index
 - malaria death

Dental services

The Ministry of Health is the main provider of primary, secondary and tertiary dental care to the population. The dental programme currently monitors twelve (12) indicators under the NIA. The planning and implementation of the dental programme covers:

- primary school children
- secondary school children
- pre-school children

- antenatal mothers
- adults

Pharmaceutical services

It was initiated in 1987 and officially launched in 1990. Three main areas were covered, ie hospital pharmacy, production of sterile preparations, and financial resources and management (store). Seven (7) indicators were developed to monitor these areas of concern

- therapeutic drug monitoring
- total parenteral monitoring
- unit of use/unit dose drug delivery system
- pharmacy-based cytotoxic drug reconstitution service
- drug information service

Engineering services

The objective of engineering services are monitoring of drinking water quality, medical usage of radiation and hospital engineering facilities. In March 1997, the engineering division were awarded ISO9002.

Laboratory services

According Suleiman, Abu Bakar (1984), “ high quality medical care is heavily dependent on a high quality laboratory service in order for accurate and timely diagnoses to be made as well as follow up treatment of patients.”

Six (6) service performance and three (3) timeliness indicators were implemented as a start. No difficulties were encountered especially for Chemical pathology, medical microbiology and haematology since these areas have existing standards from National External Quality Assessment Schemes (EQAS). Tests monitored include coagulation test, prothrombin time, international normalisation ratio (INR), and Activated Partial Prothrombin time (APPT).

Training and Manpower services

The function of these services is produce well-trained personnel in the area of quality healthcare. Five indicators were selected for the purpose. They are:

- teacher-student contact hours per teacher per 6 months
- teacher-student ratio
- percentage of lesson plan completed
- percentage of students not able to complete all clinical experiences (logbook)
- percentage passes per examination as stipulated in the curriculum

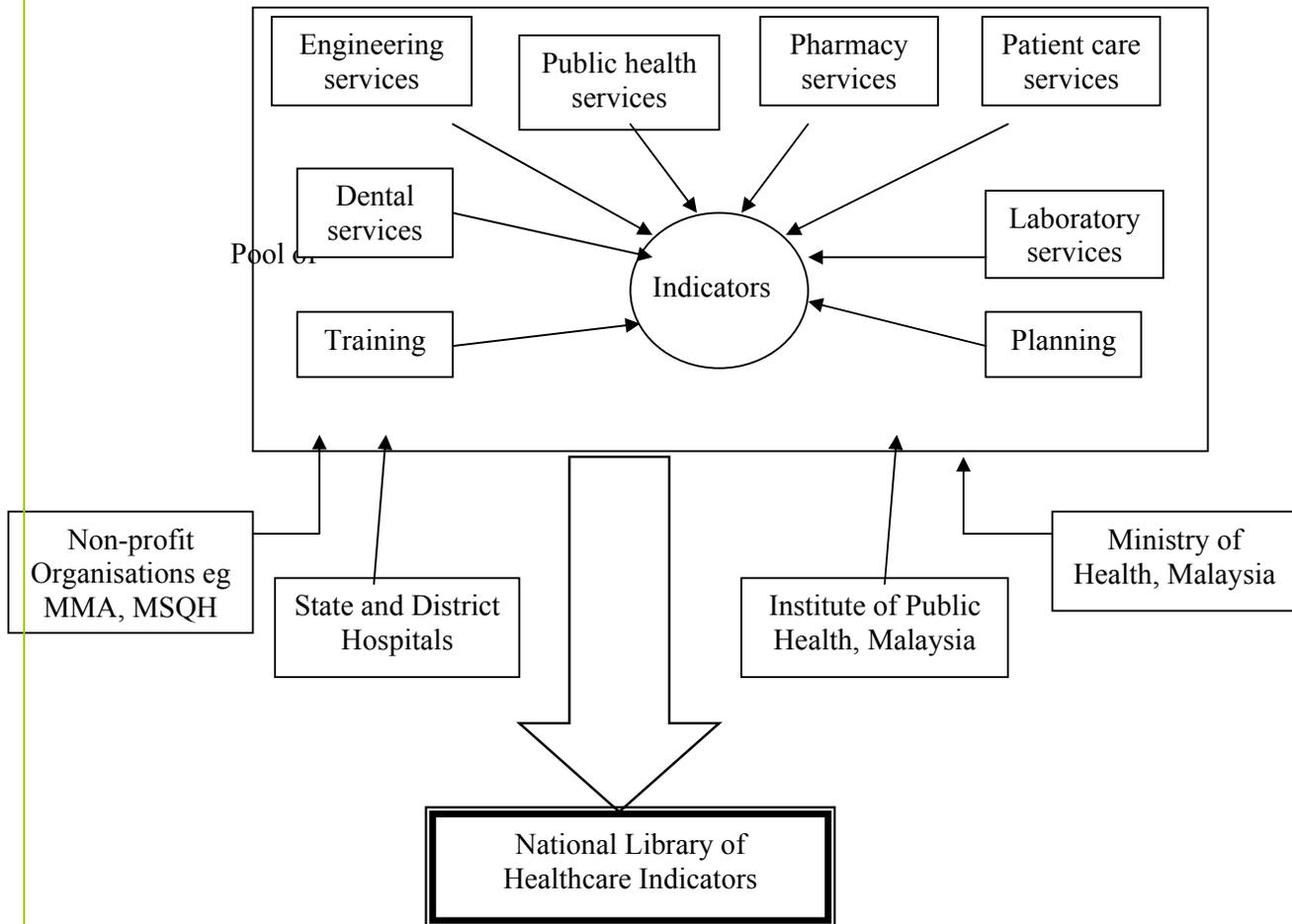
Planning and Development services

The objective of these services is to formulate an integrated health plan which includes health facilities for service delivery. Three (3) indicators were developed, one indicator for looking into equity and two for health status. Indicators mentioned are:

- static health facility population ratio
- infant mortality rate
- disease specific mortality rate.

Figure 4 gives a comprehensive view of indicators collected in relation to others, governmental and non-governmental agencies. All of this forms a National Library of Healthcare Indicators which will be monitored more closely. At the moment, the Joint

Commission of Accreditation in Healthcare Organisation in United States has successfully compiled approximately two thousand (2,000) tested indicators in different areas of healthcare practices. It is used as an instrument for accreditation of for both public and private healthcare providers.



Adapted from: National Library of Healthcare Indicators (1997), Joint Commission on Accreditation of Healthcare Organisation, Illinois.

CONCLUSION

The purpose of this paper is provide the Malaysian context for measuring performance in a healthcare setting. Secondary data were collected during the fieldwork. The aim of this chapter is to understand the factors that shape performance measurement systems in Malaysia. It serves as environmental scanning to look at industry structure and activities in tracking performance measurements in Malaysian hospitals, the public as well as the private sectors. Secondary data reveal that performance measurement activities are undertaken by the public sector at the national level. These are the 'National Indicator Approach', consisting of nineteen (19) indicators, and the 'Hospital Specific Approach', consisting of forty-two (42) indicators from different services. The private sector, on the other hand, is independent, and collects its own indicators for the purpose of decision making by top management. Both sectors have different purposes in mind.

REFERENCES

Abu Bakar, S (1996), "Developing Nations: Health Development in an Environment of Limited Resources", presented at the first International Conference on Priorities in Health Care, Stockholm, October.

Collopy, BT , Campbell, JC , Williams, JW , Portelli, RJ , Ibrahim, JE , Cicuttini, FM, Majoor, JW and Mc Neil, JJ (1999), "Acute Health Clinical Indicator Project", ACHS Care Evaluation Program, Monash University Department of Epidemiology and Medicine, Department of Human Services, Victoria.

Directory of Researchers in Medical Sector, (Jan, 1998), School of Medical Science, USM, IPRA Medical Panel.

Donabedian, A (1980), The Definition of Quality and Approaches to Its Assessment, Ann Arbor: Health Administration Press.

Dunlop, D and Martins, J (1995), *An International Assessment of Health Care Financing Lessons for Developed Countries*, (eds). EDI Seminar Series, World Bank.

Government of Malaysia (1990), Sixth Malaysia Plan, National Press Department, Kuala Lumpur, Malaysia.

Information and Documentation System Unit (1986), Ministry of Health, National Printing Department, Kuala Lumpur.

----- (1988), Ministry of Health, National Printing Department, Kuala Lumpur.

----- (1992), Ministry of Health, National Printing Department, Kuala Lumpur.

----- (1998), Ministry of Health, National Printing Department, Kuala Lumpur.

Institut Kesihatan Umum (1985), "Laporan Bengkel kebangsaan Mengintegrasikan Penyelidikan Sistem Kesihatan Dengan Pengurusan", 11 -16 Febuari, Jalan Bangsar Kuala Lumpur

Istitut Tadbiran Negara(1991), *Malaysia Kita*, Percetakan Nasional Malaysia Berhad :Kuala Lumpur , Malaysia.

Kementerian Kesihatan Malaysia (1990), Laporan Tahunan, Jabatan Percetakan Negara,Kuala Lumpur, Malaysia

----- (1991), Laporan Tahunan, Jabatan Percetakan Negara,Kuala Lumpur, Malaysia

----- (1997), Laporan Tahunan, Jabatan Percetakan Negara,Kuala Lumpur, Malaysia

----- (1998), Laporan Tahunan, Jabatan Percetakan Negara, Kuala Lumpur, Malaysia

----- (1998), Buletin Q, Edaran Umum, Jabatan Percetakan Negara, Kuala Lumpur, Malaysia.

Kementerian Penerangan Malaysia (1998), Malaysia Kita, Jabatan Percetakan Negara,, Malaysia.

Lim, EW and Sivalal, S (1991), "Overview of Quality Assurance Program", Paper presented at the National Quality Assurance Conference at PJ Hilton, November, Ministry of Health, Kuala Lumpur, Malaysia

Mahathir, M (1991), "Malaysia: The Way Forward", Working Paper (February) Inaugural Meeting of the Malaysian Business Council, Kuala Lumpur.

Ministry of Health Malaysia (1999), *Patient Care Service Quality Assurance Programme*, Quality and Standards Unit, Medical Development Division, Ministry of Health Malaysia.

Ministry of Health (1996), Seventh Malaysian Plan 1996-2000, Jabatan Percetakan Negara, Kuala Lumpur, Malaysia.

----- (1994), Annual Report 1994, Jabatan Percetakan Negara: Kuala Lumpur, Malaysia

----- (1998), Annual Report 1998, Jabatan Percetakan Negara: Kuala Lumpur, Malaysia

----- 1999), Annual Report 1999, Jabatan Percetakan Negara: Kuala Lumpur, Malaysia

Ministry of Sciences and Technology (1994), Annual Report of the National Council for Scientific Research and Development, Jabatan Percetakan Negara, Kuala Lumpur, Malaysia.

Tan Sri Dato' Dr. Abu Bakar bin Suleiman (1995), "Working for Health", A Collection of Keynote Addresses and Working Paper Presented by The Director General of Health Malaysia From 1990-1995, Ministry of health Malaysia, CETAKRAPI Sdn. Bhd. K. Lumpur.

Tan Sri Dato' Dr. Abu Bakar bin Suleiman and Dato' Dr. M. Jegathesan (1995), "Health in Malaysia : Achievements and Challenges", Jabatan Percetakan Negara: Kuala Lumpur.

World Health Organisation (1996), Charting the Future, The World Health Report, Fighting Disease and Fostering Development.