1 The Transformation of the Health of Our People: An Overview

Lee Chien Earn* and K. Satku†

Singapore's healthcare system is recognised today as being one of the best in the world. The World Health Organisation ranked it 6th best among 191 countries in 2000, based on eight criteria;[1] Bloomberg declared Singapore as the healthiest country in the world in 2012, second among 51 countries in health efficiency in 2013 and first in 2014.[2] Indeed the statistics tell the story: the infant mortality rate in 2013 was 2 per thousand live births, maternal mortality was 0.025 per 1000 births and life expectancy was 82 years.[3] Per capita expenditure on healthcare in 2013 was US$2426.[4] In all these measures Singapore has, over many years, consistently ranked among the best in the world in terms of health outcomes and health efficiency.

Access to healthcare is assured, affordable, of good quality, and appropriate to need. The system remains viable because of a fiscal policy developed and refined over the last fifty years. The system can be improved, but in contrast to many developed countries, there is no looming crisis regarding sustainability.

The state of our health services today is contributed to by many factors. At the time of independence from Britain, Singapore was bequeathed a legacy of good health services and infrastructure. There was emphasis on developing preventive services and a network of curative services. Preventive services included public health services, maternal and child health (MCH) services, school health services and health education while curative services included outpatient dispensaries (OPDs) or primary care services, hospital services, and related supporting services such as pharmaceutical services and blood transfusion services. In the post-war years, the years leading up to independence of our nation, a ten-year building development

*Chief Executive Officer, Changi General Hospital, Singapore.

†Chairman, Health Sciences Authority, Singapore. Professor, Department of Orthopaedic Surgery, National University Health System, Singapore. Professor of Health Policy, Saw Swee Hock School of Public Health, National University of Singapore. Former Director of Medical Services (2004–2013), Ministry of Health, Singapore.

plan was drawn up, put into action in 1951, and completed in 1960.[5] Some of the buildings completed during this period included two operating theatre blocks (Surgery A and Surgery B), the Mistri Wing — for Paediatric care, and the School of Nursing, all at the General Hospital (later called the Outram Road General Hospital and now Singapore General Hospital); two new six storey blocks at Tan Tock Seng Hospital; and the Thomson Road Hospital, later known as Toa Payoh Hospital.[5]

The period immediately before and after independence was a time of great medical advances globally. New antibiotics and vaccines were discovered, as well as new drugs to control diseases such as leprosy, hypertension, and cancer. New technology resulted in better investigations such as the CT scan (computerised tomography) and MRI (magnetic resonance imaging) and new therapeutic procedures were developed, such as coronary artery by-pass grafting and later, coronary vessel stenting and joint replacement. Public health research revealed the effects of health-related behaviour such as smoking and its ill effects, and exercise and its benefits.

Singapore's healthcare professionals embraced the rapid progress happening in medical sciences globally. These advancements helped eradicate some illnesses like poliomyelitis and leprosy, prolong life by reducing premature death due to cancer and heart disease, and reduce years lived in disability by interventions such as cataract and joint replacement surgery, thereby improving quality of life.

However, the most significant factor in the progress of Singapore's health status was the Government's and the people's vision and commitment to the improvement of living conditions in general and of the health services in particular. Medical advances are, by themselves, useless unless there is access to them. Public health and other related developments were put in place as a result of good urban planning and a determination of the nation to succeed. The triumphs of public health that helped contain and eradicate the many infectious diseases that were rife in the early years of our nation were access to clean water, sanitation supplied to every household, health education, and accessible maternal and child healthcare. These were critical elements in the eradication of some of the more common causes of illnesses. In 1965, with independence and the economic success that followed, more healthcare infrastructure and manpower development took place. Ministry of Health's (MOH) per capita expenditure in 1965 was $38.[6] In 2013, Government Health Expenditure per person was estimated to be $1104.[4]

Health Services — The Early Years

There were a number of critical services already in place during the period of colonial rule which laid the foundations for further major developments and improvements in the health of our population. Prior to 1959, the environmental health services (including some personal health services) were run by the City Council Health Services and the Rural Board Health Services (Fig. 1.1). With self-government in

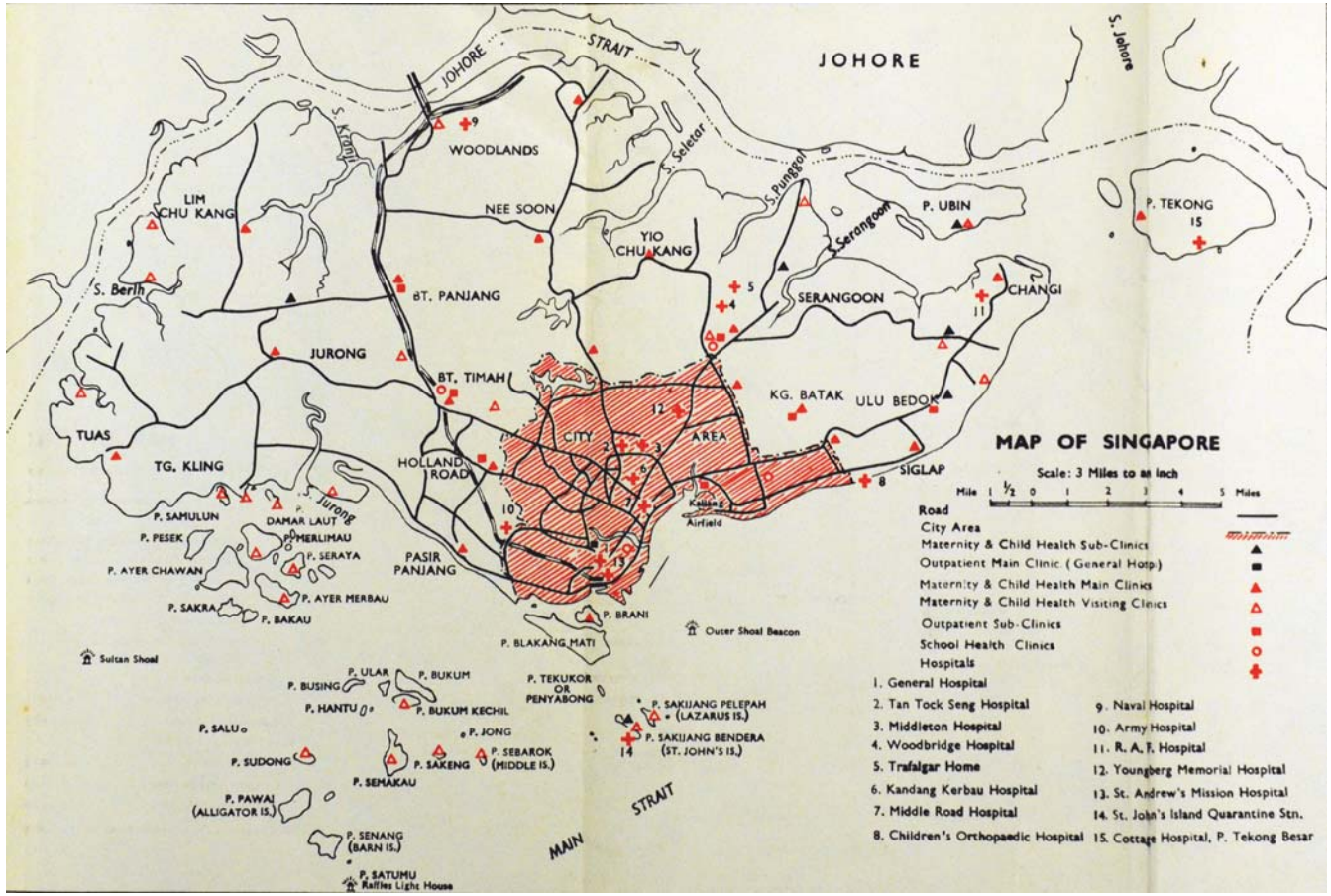

Fig. 1.1. Map of Singapore showing the various health facilities (1958).

1959, the Ministry of Health was reorganised. The functions of these two entities were brought under the Public Health Division (preventive services) of the Ministry of Health.[7]

The hospitals, including Middleton Hospital for infectious diseases, which were under the City Council, were included in the Hospitals Division (curative services) of the Ministry. Tan Tock Seng Hospital, which had been managed by a Committee of Management, was subjected to similar re-organisation and brought under the administration of the Hospitals Division of the Ministry.[7]

In 1965, the mid-year population was 1,864,900. There were 55,725 live births in 1965[6] giving a crude birth rate of 29.9/1000 population. This was a decline from the rate ten years earlier in 1955, which was 44.3/1000 population.

The infant mortality rate was 26/1000 live births, and the maternal mortality rate was 0.4/1000. Infectious diseases were common. Forty new cases of poliomyelitis, 230 cases of diphtheria, 278 cases of typhoid, 242 cases of leprosy and 201 cases of malaria were reported.[8] Life expectancy was 64 years.

There was an urgent need to improve both the preventive and curative services, and make them accessible to the citizens.

Preventive Health Services

School health services

School Health was one of the early preventive programmes. It was started in 1921.

The health status of our children in 1965 would be a fair reflection of the state of health of our population. There was a student population of 482,000 distributed across the 595 schools. A total of 150,000 were assessed by our School Health staff in 1965. About forty percent (40%) of students had varying degrees of dental caries. About 4% had skin conditions such as ringworm, eczema and scabies. 10 students were suspected to have leprosy. About 10% had defective vision. About 6 in 1000 or 0.6/100 had cardiac disease including acquired rheumatic heart disease, a condition in which heart valves malfunction after a bacterial infection. Worm infestation was present in about 6% of students. Despite a voluntary immunisation programme, 51 students were diagnosed with diphtheria, two (2) with poliomyelitis, and three (3) with whooping cough. Thirty-three thousand (33,000) undernourished children had to be put on a feeding scheme to help in their growth and development. Piped water was not available in about 10% of our schools on the main island. This was the state of the health of our school children when we gained independence.[6]

The immunisation programme was intensified through both the MCH services and schools; and soon diseases such as poliomyelitis, diphtheria and whooping cough became almost non-existent. The feeding scheme also contributed significantly to

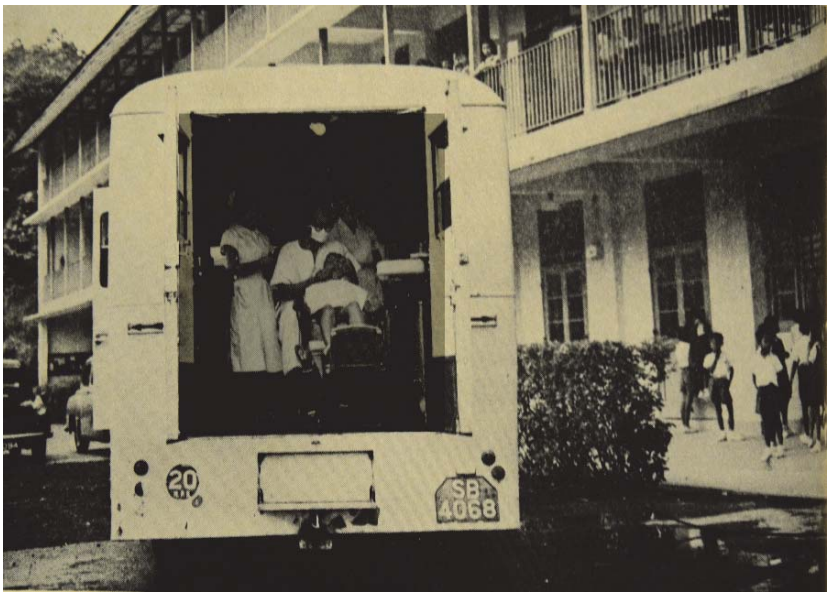

Fig. 1.2. Mobile dental clinic.

the improvement of health in the early years. A school dental service consisting of dental clinics in some primary schools and mobile dental clinics in others contributed to better dental hygiene (Fig. 1.2).

Improved sanitation across the island, and clean water supply through piped water including water from "stand pipes," contributed to the improvements to health of the school children and the general population. By the end of 1964, there were 2500 stand pipes distributed through the island[7] (Fig. 1.3).

School health services, including dental health services continues to be a major programme of the health services and has a one hundred percent reach to the children. The services at schools remain free.

Maternal and child health services

Another critical service that contributed to the rapid decline in infant mortality, maternal mortality and infectious diseases was the Maternal and Child Health services. Considered a preventive service, this service was also started during the colonial era and enhanced after independence.

In 1965, there was a network of clinics providing (i) main services (32 clinics); (ii) "kampong" (rural) midwives' services (10 clinics); and (iii) visiting centres (22 clinics).[6] Many mothers accessed antenatal services in the main clinics. The kampong midwives' services and visiting services reached out to mothers from the rural areas (Fig. 1.4).

Fig. 1.3. Stand pipes that brought clean water to rural areas.

Fig. 1.4. Nurses providing services in the rural areas.

As a consequence, mothers had better care and an increasing number of deliveries took place in hospitals or under the supervision of midwives.

In 1965, 38,849 deliveries were done at the Kandang Kerbau Maternity Hospital (KKMH), about 12,000 deliveries were carried out by confinement midwives at the home and about 4000 deliveries were in private clinics or hospitals. Out of a total of 55,725 births that year, less than a thousand deliveries took place without trained medical care.[6]

The Child Health Service provided at these clinics included a comprehensive immunisation programme (smallpox, poliomyelitis and DPT (diphtheria, pertussis (whooping cough), and tetanus)) and advice to mothers on child care and treatment of minor ailments.

Training and Health Education Unit

The Training and Health Education Unit undertook a number of programmes, which included; (i) training healthcare workers so that they could provide better care to mothers at the Maternal and Child Health Clinics and uphold standards during public health inspection; (ii) public health campaigns such as a blood donation drive, a spring cleaning campaign, and an anti-leprosy campaign. The anti-leprosy campaign lasted a full year with an educational exhibit staged at the community centres. The exhibition included talks, film shows and screening clinics.

Following the publication of a White Paper on family planning and the recommendations of a review committee in 1965, the functions of the Singapore Family Planning Association were transferred to a newly constituted board, the Singapore Family Planning and Population Board. This Board was to function from within the Ministry supported by both the Maternal and Child Health branch and the Training and Health Education branch. The Board set targets to control birth rate and began operations in 1966, following the passage of a Bill establishing the Singapore Family Planning and Population Board on 31st December 1965.[6]

Public Health Services

A host of public health services were provided by the Ministry in 1965. These included Environmental Health (general hygiene and sanitation, including public cleanliness, food hygiene, the control of the sale of food and drugs, and mosquito control), Quarantine and Epidemiology (control of infectious diseases through surveillance of international traffic and local infectious disease occurrence), Markets and Hawkers (licensing and control of hawkers and markets), Public Health Engineering, and management of cemeteries and crematoria. The Public Health Division also worked with the Ministry of National Development to provide clean

water through a network of piped water services, ensuring sanitary conditions in food manufacturing factories such as ice cream factories, and to provide appropriate disposal of refuse and night soil.

Many health issues arose with the rapid urbanisation and industrialisation of the country. The problems that were encountered included pollution of soil, water, food, air, and an increase in insect vectors such as mosquitoes and flies. Water usage had increased substantially without a corresponding increase in surface water drainage or sewerage, leading to public health hazards.[5] At a time when infectious diseases were common and endemic in Singapore, the public health services must be credited with having contributed most significantly to improvements of the health of the nation by improving environmental health and hygiene, thereby reducing mortality from infectious diseases and improving life expectancy of its citizens.

Curative Services

The period of the early sixties, the years of self-government, and the next couple of decades were characterised by the reorganisation and enhancement of the curative services run by the state, and building the healthcare workforce.

While the preventive services were almost exclusively provided by the state for free as a public good, the private sector played an important role in the curative services.

A number of significant changes took place. These included a new fiscal policy requiring recipients of services to co-pay while the state continued to absorb the major portion of the cost, the development of manpower, and new infrastructure.

Fiscal policy

Among the substantial changes made by the state in the early years was the introduction of fees, initially at the primary care facilities (outpatient dispensaries), and later in the acute hospitals.

While the government was not reluctant to spend for improvement of services, it was felt that there had to be some cost to the individual, without which the value of the healthcare provided would not be recognised or appreciated, and needless demands for healthcare might be made leading to substantial waste. Thus the policy of patients paying for some of the cost of healthcare was introduced from the very early years of internal self-government, even before independence in 1965.

To gradually change the popular concept that medical care was free, a fee system (50 cents per visit) was implemented for the first time in 1960 at the City Council Outpatient Dispensaries (OPDs).[9]

In addition to the City Council OPDs, four (4) new clinics under the Rural Board also charged 50 cents in 1963. From 1964, all OPDs charged 50 cents. In August 1967, a charge of one dollar was imposed for attendance at the clinics that were open on holidays and Sundays.

In 1962 and 1963, the attendances at the OPDs exceeded 3 million, but in 1964 and 1965, the total attendances dipped well below the 3 million mark. The rate of attendance per 1000 population was 1777 in 1962, 1778 in 1963, 1280 in 1964, and 1090 in 1965.

Island and Travelling Clinics which functioned because of need in the rural areas continued to be free.[10]

From December 1964, charges for delivery at KKMH were introduced and set at $10 for Singaporeans and $50 for others.[7]

In 1969, the MOH published a scheme of charges for all services including surgery (Fig. 1.5).[11] Not only were the fees specified for services in government hospitals and OPDs, but the fee limits for some private professional services were also specified. Hospitals had both full paying and "free" wards. For the latter wards, patients had to pay a nominal fee of $1 per day. This marked the end of free inpatient services and the beginning of subsidised wards.

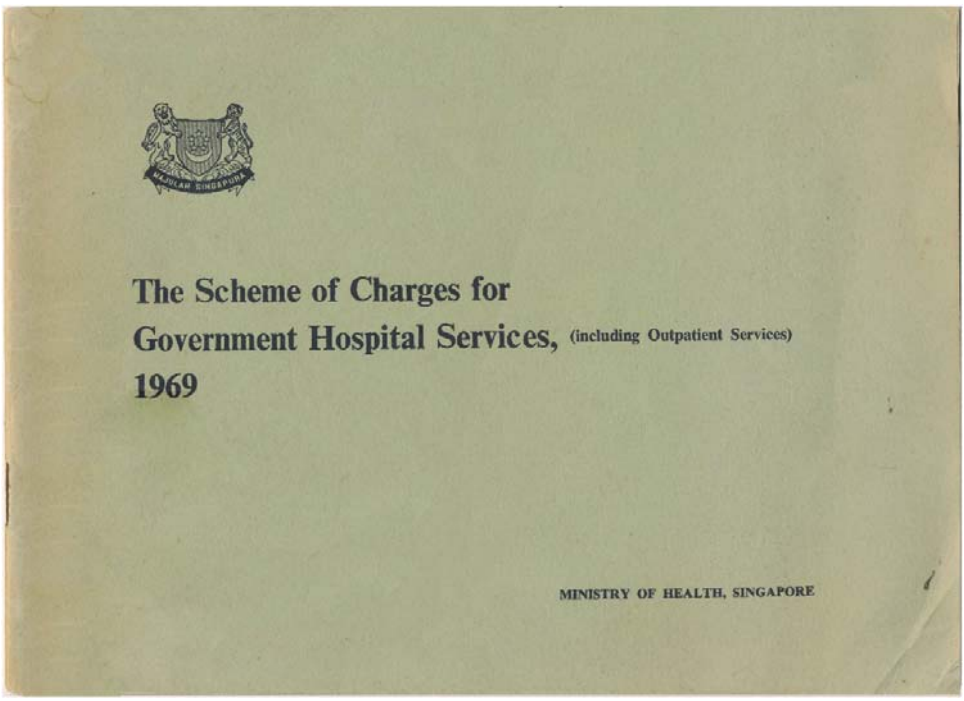

Fig. 1.5. The booklet on the scheme of charges.

The Singapore Ministry of Health Report for 1969 states: "From an essentially free medical service, the rapidly rising cost of sickness in recent years and demands of more urgent priorities have necessitated a gradual change in fiscal policy in health resulting in a small part of the total expenditure on health in 1969 being borne by the sick public to whom medical services are provided […] infectious diseases, TB, leprosy and hardship cases were exempted from payment."[11]

"In that year, 1969, there was a 15% drop in attendance at our OPDs due to the increased charge."[11]

The situation was closely monitored to ensure that individuals in need of healthcare were able to access the services.

Development and growth of healthcare professionals

During the colonial era, schools were established to train doctors, dentists, nurses, pharmacists, and radiographers. With an increase in demand for services, the number of healthcare professionals trained was gradually increased and postgraduate training was also instituted.

Hospitals and clinics

In the early years, infrastructure development took the form of expanding existing healthcare institutions and, as infectious diseases were brought under better control, conversion of facilities to acute care needs. One such development was Tan Tock Seng Hospital, which transformed from a hospital largely for patients with tuberculosis (TB) to an acute care general hospital. OPDs were also built to meet the needs of the population.

Public hospital services

In 1965, there were just two general hospitals for acute illness, the General Hospital at Outram Road (Fig. 1.6), (later known as Outram Road General Hospital — ORGH and now Singapore General Hospital) and the Thomson Road General Hospital (TRGH). Together they had 1674 beds (ORGH 1278 and TRGH 396).

Kandang Kerbau Maternity Hospital (KKMH) had 443 beds for obstetrics and gynaecological conditions. Hospitalisations for infectious diseases commanded a large number of beds at that time — 1320 beds at Tan Tock Seng Hospital were allocated for inpatient tuberculosis treatment (about 100 beds were set aside for other adult general medical adult conditions), 61 beds in Middle Road Hospital for venereal diseases, 250 beds for infectious diseases at Middleton Hospital, and

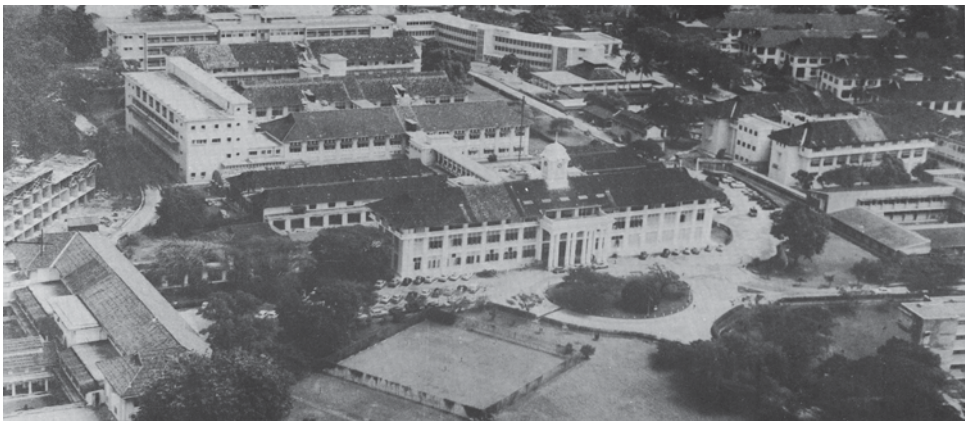

Fig. 1.6. The General Hospital at Outram Road.

Table 1.1. Public Hospitals in 1965 and Their Bed Capacity[6]

Public Hospital Beds Available in 1965		
General Hospital Outram Road	1278	General and acute care beds
Thomson RGH	396	
KKMH (Obstetrics & Gynaecology)	443	
TTSH (Tuberculosis)	1320	
MRH (Sexually Transmitted Diseases)	61	
Middleton Hospital (Infectious Diseases)	250	
Trafalgar Home (Leprosy)	965	
Woodbridge Hospital (Mental Illness)	1869	
Mental Defective Hospital	45	
Chronic Sick Hospital	70	
St Andrew's Orthopaedic Hospital	120	
	6817	

965 beds for leprosy in Trafalgar Home, totalling 2496 beds for infectious diseases. There were also 1869 beds at Woodbridge Hospital and 45 at the Mental Defective Hospital for the treatment of mental illness, 120 beds were available at St Andrew's Orthopaedic Hospital for children's orthopaedic illnesses and 70 beds at the Chronic Sick Hospital (Table 1.1).

Of the some 6800 beds, 2596 were for infectious diseases, 1914 beds for mental illness, and only 1674 beds were allocated for other acute illnesses. TB and leprosy, both chronic infectious diseases, were prevalent and patients required

some 2285 beds. New TB cases notified in 1965 numbered 4711 (252 cases per 100,000 population in 1965, current prevalence (circa 2013) being 38/100,000 population), while all TB cases on the register in December 1965 totalled 32,929[6] (giving a prevalence of between 1–2%). Other infectious diseases such as diphtheria (226 cases), typhoid fever (271), amoebic dysentery (328), malaria (201) and poliomyelitis (40) had to be contained as well.

Although in the post war years leading up to independence there was expansion in the number of beds for acute illness, there was a greater increase in beds for infectious diseases, making a ratio of 2 acute beds for every 3 beds for infectious diseases. To see improvements in citizens' health and infectious disease containment, it was necessary to improve living conditions and hygiene, as well as embark on programmes such as vaccination, all of which were pursued with vigour.

It is worth noting that when Thomson Road Hospital was conceived and built, it was meant for managing chronically sick patients who were too feeble to be discharged from the General Hospital at Outram Road. It was only in the years following self-government that Thomson Road Hospital was converted to a general hospital.[6]

A large number of beds was allocated for the treatment of mental illness because the main mode for managing these patients in the past was by institutionalising them.

In the general hospitals, there was already a system of classifying wards into paying and free wards. Those who wished to have extra comfort chose the paying wards and were housed in air-conditioned rooms. Air-conditioning was also made available in a single room in some free wards to enable the most sick to recover under optimal conditions. This practice continues to this day in our public healthcare institutions in the subsidised wards such as the intensive care and burns units.

An Emergency Unit was set up in 1964, and consolidated in 1965, replacing the Casualty Department. It was formed to treat serious medical and surgical cases requiring immediate care before transfer to the wards. It was the beginning of what we now know as "emergency medicine." Prior to this, patients requiring admission were immediately transferred to the wards for treatment.

However half of the cases attending the Emergency Unit were not emergency cases and a third of these non-emergency cases attended after office hours. Reasons given for this phenomenon, which still hold true today, include that OPDs and many GP clinics were closed in the evening and that working parents were unable to take their children to the doctor to seek medical attention during the day. The Emergency Unit was also tasked with developing contingencies to treat cases in the instance of a national emergency.

British military hospitals

There were two military hospitals, the Changi Hospital and the Alexandra Hospital, which continued to be operated by the British for their forces stationed in Singapore, until they left in 1976.

After this, the Changi Hospital was used for the local population. It was closed when the Changi General Hospital was built in 1999.[12]

Alexandra Hospital has continued to function as an acute care general hospital serving the needs of Singaporeans.

Private hospitals

There were already several hospitals listed as private hospitals in 1965 (see Table 1.2 Private hospitals in 1965 and their bed capacity[6]). The Kwong Wei Siu Hospital, the St Andrew's Mission Hospital (for children) and the Singapore Nursing Home were facilities for convalescence rather than for acute care.

Table 1.2. Private Hospitals in 1965 and Their Bed Capacity[6]

Private Hospital Beds Available in 1965	
Gleneagles Hospital (built 1959)	80
Mt Alvernia Hospital	128
Kwong Wei Siu Hospital	454
St Andrew's Mission Hospital (Children)	80
Singapore Nursing Home	54
Youngberg Hospital	67
	863

Outpatient services

The other arm of the curative services involved outpatient clinics, which were the specialty clinics in the hospitals and the primary care services in the community.

The specialist outpatient clinics saw over 1 million attendances annually.

The private sector played a significant role in the primary care sector from the very early years. Most of the doctors in private practice (469 doctors) ran clinics in the community. There were more than 300 private general practice clinics during the flu pandemic in 1957.[13]

The primary care service provided by the state was termed the Outpatient Dispensaries (OPDs), later called the Outpatient Services (OPS). Many of the dispensaries set up before the war were demolished during the war years; these services resumed gradually after the Second World War. In 1955, the services were grouped together as the outpatient services with the headquarters at the General Hospital (at Outram Road) and expanded over the years.[14] In August 1964, the Outpatient Service headquarters which had remained at the General Hospital was closed and moved to Maxwell OPD. By 1965, the government outpatient dispensary services comprised (i) 26 Outpatient Dispensaries (OPDs) across the main island each staffed by one or more doctors; (ii) two island clinics in the larger off-shore islands and three rural clinics staffed part-time by doctors, and five (5) travelling clinics to rural areas staffed by nurses or hospital assistants; and (iii) 5 staff dispensaries staffed by doctors.[6] The attendances at these clinics was in excess of two (2) million. Seven OPDs also offered laboratory tests.

Related services

There were several supporting services that were critical to the functioning of the health services — the pharmaceutical services, the blood transfusion services, and the chemistry department

Pharmaceutical services

This service was responsible for the procurement, manufacture, and supply of medicines, chemicals and surgical instruments and for their sale and use. In the early years, the pharmaceutical laboratory and store had an inventory for about four to six months of supply, costing about 1.5 to 2 million dollars. The laboratory was also responsible for the manufacture of tablets, ampoules and transfusion fluids from imported bulk chemicals and drugs and for the packing of sterile dressings. Checks on sterility and for the active ingredients in the medications were made by the pathology and chemistry department respectively. The Inspector of Poisons also made checks under the Poisons Ordinance and Medicines (Advertisement and Sales) Ordinance. Several convictions took place. A significant gap that was addressed later (1975) was the requirement to register medicines under the Medicines Act.

Blood transfusion services

The blood transfusion services was critical for the hospital services in particular the surgical services at the General Hospital at Outram Road and maternity services at

Fig. 1.7. Blood donation campaign in the sixties.

KKMH. In the early years campaigns had to be held to draw donors and mobile vans were employed to reach out to the donors (Fig. 1.7). The policy of not paying for donors or charging for the blood used, except for processing cost, continues to this day.

Department of Chemistry

In 1961, the Department of Chemistry was brought under the Ministry of Health. It was responsible for chemical analysis of drugs, toxicology, document analysis, and forensic science. Much of their work was used for evidence in court.[6]

Medical Advances in Hospital Services in the Early Years

Many new developments took place in the early years. Investments in specialty care were made regularly and frequently. In most instances the advancements were made essentially by incorporation of expertise developed in Western countries through our specialists who had been trained in overseas centres of excellence (see Health Manpower Development Plan below). This made it possible for Singaporeans to benefit from developments such as cardiac surgery, renal dialysis, coronary care unit, and radiotherapy services in the '60s; organ transplants — starting with

kidney transplants, and microsurgery for the reattachment of severed limbs and digits in the '70s; *in vitro* fertilisation — the test tube baby — in 1983, and bone marrow transplant in 1985.

However, one of the most remarkable of these developments in the early years was home grown following research work done in Singapore and contextualised to our population's needs: the preventive strategy for kernicterus.

Kernicterus

Kernicterus is a condition where bilirubin, a yellow pigment from the breakdown of red blood cells, rises to levels that damages the brains of infants, resulting in death or permanent brain damage. In the early years, kernicterus was the commonest cause of death of newborn infants. Following research at the paediatric unit of the General Hospital, it was noted that infants with a deficiency of the enzyme, Glucose-6-Phosphate Dehydrogenase (G6PD), were prone to excessive breakdown of their red blood cells and were particularly at risk. A programme for prevention of kernicterus was unveiled in 1965. The scheme involved the testing for the presence of G6PD in every infant born at KKMH. Infants showing deficiency (absence or low amounts of G6PD) were kept in the hospital after birth for observation and for an exchange blood transfusion if this became necessary. As a result of this scheme, the deaths from kernicterus dropped from 29 in 1964 to 8 in 1965. Most of the deaths persisting after the introduction of the scheme were because parents insisted on taking their child home despite advice, or because they refused exchange transfusion.[6] This work was recognised internationally. As a result of this work, all newborns in Singapore are now screened for Glucose-6 Phosphate Dehydrogenase (G6PD) deficiency.

Health Services — The Latter Years

Many developments contributed to the transformation of the health of the people. Enhancements in the preventive and public health services led to better hygiene and sanitation, enabled clean water supply and delivered vaccination and health education to the people. The well-trained workforce, sound policies, and carefully formulated regulations which ensured high standards of practice, along with the economic success of the nation that enabled modern healthcare facilities to be built, and the restructuring of public healthcare institutions, also contributed to the transformation.

An observer of the development of Singapore's healthcare system would infer that certain principles were in place, many of which may not have been explicitly

stated as policies, but which appear to have guided the development of the system. These will be discussed in this section.

1. Expansion and Enhancement of Services

The rapid growth of the economy led to advances in all our healthcare services.

Preventive health services

Health education/health promotion

Health promotion enables people to exert better control of their lifestyle and life choices to achieve optimal health and helps build a healthy population. It is one of the core elements of the health system and is a service that must be revised and expanded regularly.[15]

In response to changing disease patterns over the years, the focus shifted from hygiene and infectious diseases to better nutrition and prevention of chronic diseases. Since the National Healthy Lifestyle Campaign in 1979, through population-wide programmes and programmes tailored for specific groups such as school children, workers or older adults, people have been encouraged to pursue a healthy lifestyle and have been kept informed of the dangers of habits such as smoking and an unhealthy diet. They have also been persuaded to take responsibility for their health — to exercise regularly, build mental resilience and, when appropriate, to go for screening for early detection and management of disease conditions such as hypertension and diabetes. Health services support these initiatives while the social environment is influenced through health promoting initiatives in schools, work places, and community organisations, as well as making healthier alternatives available in the marketplace.

The Health Promotion Board (HPB), a statutory board established in 2001, formed from the merger of various existing departments, has assumed the role of the main driver for national health promotion and disease prevention programmes. HPB implements programmes that reach out to the general population, as well as target groups of children, adults, and the elderly. These programmes include the National Smoking Control Programme, the Workplace Health Promotion Programme, the healthy dining programme, and the integrated screening programme for chronic diseases and some cancers (breast, cervix, and colon). It also administers the school health screening service and school dental service.

In 2013, the Ministry of Health launched an ambitious Healthy Living Master Plan in collaboration with public, private, and community-based agencies. This initiative aims to make healthy living the default choice for Singaporeans by 2020.

School Health Service

The School Health Service has continued to grow and remains largely free of charge. Because of its reach, it is one of the more important preventive services. Today, children in pre-school settings — in kindergartens and child care centres — are under its purview as well.

The School Dental Service has also grown in tandem with the other school health services, expanding its reach to secondary schools. The service, preventive and curative, is provided through in-school dental clinics, mobile dental clinics, and the School Dental Centre at the Health Promotion Board. Dental treatment is provided by dentists or dental therapists. The prevalence of cavities in the permanent dentition of school children has dropped to 23% in 2013.

Public health services

The need for improved integration of many of the Ministry of Health's public health services with other government agencies' programmes led to these services being taken over by related Ministries. The management of environmental health, including Public Health Engineering, Hawkers and Markets, Port Health, and Cemeteries and Crematoria, is now largely under the National Environment Agency (a statutory board of the Ministry of the Environment). Aspects of environmental health which include the management of animals and the sale of food are now under another statutory board, the Agri-Food and Veterinary Authority which is under the Ministry of National Development.

Only the Epidemiology and Disease Control function still rests with the Ministry of Health. While infectious diseases continue to be a significant concern, a large part of the work at the Ministry now includes the monitoring of non-communicable diseases which are the major burden of disease in Singapore. The public health specialists at the Ministry also oversee newer health issues such as performance management of our healthcare institutions and patient care quality assurance and safety.

Curative medical services

Curative medical services are provided by the acute care hospitals, primary care facilities (including outpatient services), and convalescence or rehabilitation facilities.

Acute care hospital services

As it did in the very early years, the state continues to play a dominant role, providing close to 80% of all acute care hospital services. (An account of the role of the private hospitals will be provided later in this chapter).

Public acute hospitals

Eight public hospitals provide acute care. Table 1.3 lists the public acute hospitals and their bed capacity.

Table 1.3. Public Acute Care Hospitals and Their Bed Capacities

Public Hospital Beds Available in 2013	
Singapore General Hospital	1600
KK Women's and Children's Hospital	830
Changi General Hospital	800
Tan Tock Seng Hospital	1400
Alexandra Hospital	350
Institute of Mental Health	2000
National University Hospital	990
Khoo Teck Puat Hospital	600

- **Singapore General Hospital (SGH) and Singapore Health Services (SingHealth)**

SGH began as the General Hospital, and was the nation's first acute care hospital. In the late 1970s, it began major redevelopment which was completed in 1981. It then took the name Singapore General Hospital (SGH) and has remained the largest general hospital, offering comprehensive tertiary care, except for paediatric services.

Today SGH functions as part of the Singapore Health Services or SingHealth Cluster. Its partner institutions include KK Women's and Children's Hospital, National Heart Centre, Singapore National Eye Centre, National Cancer Centre, National Neuroscience Institute, National Dental Centre, and nine (9) polyclinics.

- **Thomson Road General Hospital/Changi General Hospital**

The Thomson Road General Hospital, built in 1959, was Singapore's second general hospital. It was renamed the Toa Payoh Hospital. In 1999, it was re-sited in Simei as the Changi General Hospital. It continues to provide comprehensive tertiary services and serves the health needs of the population in the eastern part of Singapore.

- **Tan Tock Seng Hospital (TTSH)**

With a reduction in the incidence of tuberculosis in the early post independence years, TTSH reverted to providing general acute care. A new facility with 1211 beds was built on the grounds of the old hospital and opened in 2000. The campus includes the National Neuroscience Institute as a specialty centre and the Travellers, Health and Vaccination centre.[16]

Today TTSH is the main general hospital of the National Health Group cluster. The other healthcare institutions in this cluster include the Institute of Mental Health, National Skin Centre and nine (9) polyclinics.

- **The National University Health System**

The National University Hospital was the first new hospital to be built following independence. The hospital was completed in 1985 and was built as a University Hospital on the grounds of the National University of Singapore Campus to support the Medical School. It offers a comprehensive range of specialty services and has a number of specialty centres. It has been integrated with the medical and dental schools of the NUS and is now listed as the National University Health System (NUHS).

NUHS and SGH have been designated as Academic Medical Centres and pursue substantial research in addition to the clinical service and educational activities.

- **KK Women's and Children's Hospital**

The KK Women's and Children's Hospital began as the Kandang Kerbau Maternity Hospital which was built in 1927 for the care of obstetrics and gynaecological cases. In the 1960s, more than 35 thousand deliveries (more than 80% of all deliveries, nationally) took place annually, at the hospital. The hospital was listed in the Guinness Book of Records as the hospital with most births in a year with 39,856 deliveries in 1966.[8] It later underwent major redevelopment, incorporated a paediatric service, and was renamed the KK Women's and Children's Hospital. Today with increased affluence and increased affordability of private care, more than 60% of the approximately 40,000 deliveries annually take place in the private sector with about 10,000 deliveries at KK Women's and Children's Hospital.

- **Communicable Disease Centre/Middleton Hospital**

Middleton Hospital was built in 1907 as a hospital for the management of infectious diseases. It was renamed Communicable Disease Centre and was incorporated into TTSH in 1985.[16] Plans are now underway to build a National Centre for Infectious Diseases (NCID) on the campus of TTSH.

- **Institute of Mental Health (Woodbridge Hospital)**

Originally built in 1928 as the Woodbridge Hospital it was redeveloped as the Institute of Mental Health (IMH). IMH was completed in 1993 and is a specialty hospital for mental health.[17]

In 2008 a multi-agency National Mental Health Blueprint was launched. The clinical aspects of the programme including a community-based programme are managed by IMH.

- **Khoo Teck Puat Hospital**

This is the second hospital (not developed to replace an existing hospital) built following independence, with approximately 600 beds. It opened in the north of Singapore in 2010 as an acute care general hospital.

- **Alexandra Hospital**

Alexandra Hospital, which was built in 1935 as a military hospital, was taken over from the British in 1971 after the British Military withdrawal; and was converted into a general hospital for acute care.[17] For the past ten years or so it has been manned by staff who have been brought together to run the next hospital to be opened. In this way, the staff of the Khoo Teck Puat Hospital worked as a team even before the hospital was opened. The Alexandra Hospital was occupied by Jurong Health Services prior to the opening of Ng Teng Fong Hospital (run by Jurong Health Services staff) this year. Currently, the hospital is occupied by staff of Sengkang General Hospital while the hospital is being bulit. Another general hospital, Woodlands General Hospital, is at the planning stage.

Specialty centres

Specialty hospitals were already in existence at the time of independence. They included the KKMH (for obstetrics and gynaecological conditions), now KK Women's and Children's Hospital); Woodbridge Hospital (for psychiatric illness); Middleton Hospital for infectious diseases, and Middle Road Hospital (MRH) for skin and venereal disease. New specialty centres were built starting in 1988.

The first of these new specialty centres was the National Skin Centre built in 1988 to replace the Middle Road Hospital that was built in 1945.[17]

The National Blood Centre was also completed in 1988. It housed the Singapore Blood Transfusion Service and the Institute of Science and Forensic Medicine, which was previously known as the Chemistry Department.

The Singapore National Eye Centre was completed in 1990, followed by a series of national centres built on the grounds of the Singapore General Hospital (the National Heart Centre, National Cancer Centre and the National Dental Centre).

In 1999, the National Neuroscience Institute was established at the Tan Tock Seng campus. It now is part of the SingHealth Cluster and operates at both the Tan Tock Seng Campus and Singapore General Hospital Campus.[12]

Today, two specialty centres (University Heart Centre, University Cancer Centre) can be found in the National University Health System.

Private hospitals

Although the private sector had a role from the early days in the provision of tertiary care, it was not until after the opening of the Mount Elizabeth Hospital in 1979 that the private sector's role expanded. The Mount Elizabeth Hospital is Singapore's largest private hospital with a capacity of more than 300 beds. In the early days of the State, the growth of private hospitals was encouraged as an alternative source of medical care for citizens who were able to afford their charges.[11,18]

> "A further easing of the pressure on the resources of the government medical and health services is the growth of medical facilities in recent years in the private sector, both general practice and specialty services."
>
> Singapore MInistry of Health Report 1969

Approximately seventy percent (70%) of in-patients in private hospitals are Singapore residents. However, with the recent growth of the private sector and Singapore Medicine (see below), it has been necessary to moderate some of the growth of the private sector, because of concerns that it has been drawing on the manpower of the public hospitals. Table 1.4 shows the larger private hospitals and their bed capacity.

Table 1.4. The Bed Capacities of the Larger Private Hospitals

Private Hospital Beds Available in 2013	
Gleneagles Hospital	380
Mt Alvernia Hospital	300
Mount Elizabeth Hospital	500
East Shore Hospital	120
Raffles Hospital	380
Mt Elizabeth Novena	250
Thomson Medical Centre (mainly obstetrics)	190

Community hospitals

The Ang Mo Kio Hospital was Singapore's first community hospital and was built in 1993 as part of the State's effort to contain healthcare cost by providing hospital care in non-tertiary facilities. The hospital was part of the Singhealth Cluster from 2000 to 2002 at which point the decision was made to run the hospital as a convalescence-rehabilitation hospital and its administration handed over to a

Voluntary Welfare Organisation (VWO). There are three similar hospitals today run as convalescence-rehabilitation facilities by VWOs — Saint Andrew's Community Hospital, Ren Ci Community Hospital and Saint Luke's Community Hospital.

Primary care services (outpatient services)

The private sector continues to play a dominant role in this sector and continues to grow, taking about eighty percent (80%) of all primary care consultations. There are over 1400 private clinics offering primary care services. Most of these clinics are solo practices which have very few supporting services to enable care for the more complex cases to be undertaken at these clinics. This limitation coupled with payment for care being mainly out-of-pocket, has resulted in a disproportionate number of patients with chronic diseases being seen in the polyclinics (see below).

The state run OPDs and MCH clinics were also increased in number and capacity. Beginning in the 1980s, OPDs and MCH clinics (numbering 41) were consolidated into 16 polyclinics. We now have 18 polyclinics distributed throughout the island. Polyclinics provide a comprehensive range of primary care services including maternal and child healthcare, outpatient medical care, health education, immunisation, laboratory services, and pharmacy services. Some also provide dental, psychiatric, and rehabilitation services. Polyclinics provide twenty percent (20%) of primary care services overall but provide a disproportionately larger percentage of care for patients with chronic diseases. This is in part because care for chronic conditions is more expensive and, until recently, there have been no subsidies at private general practice (GP) clinics. Polyclinics are therefore inundated by large numbers of patients; and managing the more complex cases is a challenge because of the limited time available for consultations. Many such patients are referred to the specialist outpatient clinics, co-located with acute care hospitals for management, where care is generally of a subspecialty nature.

This has now been recognised as an untenable situation, especially considering the increasing longevity of Singapore's aging population, and the increasing burden of chronic disease. To address the situation and to expand both capability and capacity in the primary care sector, the Primary Care Master Plan was launched in 2011. Some of the key strategies in this master plan include: (i) portable state subsidies to off-set out-of-pocket payment, for patients who have been means-tested, so that they may see the neighbourhood GP instead of going to polyclinics that are currently inundated with patients; (ii) Family Medicine Clinics which are state-supported new models of private primary care clinic, with two or more GPs, and supporting services; (iii) Community Health Centres, which are facilities to support solo GP practices with ancillary services. These are recent developments.

With appropriate stewardship, the primary care services can be transformed so that more holistic comprehensive care can be provided at affordable prices for the community.

2. A Well-Trained Workforce

The state has also invested heavily in the training of the workforce so that those in need have the best people caring for them.

Undergraduate and postgraduate training

As a small nation with no natural resources it has been a policy across the whole of government to optimise our human capital. Heavy investments are made to provide excellent facilities and accomplished teachers for our universities, polytechnics, and other training facilities for healthcare professionals. Post-graduate programmes have also been developed.

Collaborations with external universities have been useful to quickly infuse and adapt innovative techniques into our teaching and learning cultures. During the last decade we partnered Duke University, USA, and Imperial College UK, among other universities, to set up our own new medical schools. Similar collaborations with external universities have been set up, where appropriate, for training other healthcare professionals, e.g. for the degree conversion course for nurses who have completed a diploma in nursing.

In addition to formal post-graduate training, healthcare professionals are provided with opportunities to train and hone their skills in specific areas of their specialty at some of the best healthcare facilities overseas under the Health Manpower Development Plan (HMDP). The HMDP which also allows experts to be brought to Singapore for short periods, has contributed immensely to the wealth of expertise in healthcare that now resides in our healthcare system.[19]

Accreditation of overseas schools

We have also welcomed healthcare professionals trained abroad, both citizens and foreigners, to join our healthcare workforce. To ensure maintenance of high professional standards, we review training schools for healthcare professionals in other countries and include good schools in the schedule of the legislation governing a specific healthcare professional group. Graduates of such schools, when offered employment by a healthcare institution accredited as a "learning institution," are able to practice locally, but remain under supervision for two or

more years. This period enables us to verify the healthcare professionals' competence and, when necessary, to help them achieve the required practice standards. After having completed the prescribed duration under conditional registration, the healthcare professional is given full registration and may thenceforth practice in any institution.

Service obligation

The service obligation introduced in 1978, now requires all graduates of our local medical and dental schools to serve in the public healthcare institutions for a period of time. The period depends on the course of study and citizenship and varies from 4–6 years. Junior specialists who have benefitted from a HMDP training programme, need to serve 2–3 years. Nurses and other healthcare professionals who receive scholarships or funding for their course, as many do, also have a service obligation to fulfil.

The service obligation ensures that the healthcare professionals who leave to work in the private sector, at the graduate or postgraduate level, are adequately trained. Additionally, it helps retain a significant proportion of healthcare workers in the public healthcare system. In 2013 close to 63% of doctors were in the public healthcare system.[20]

3. Restructuring Public Healthcare Institutions (HCIs)

Public Healthcare Institutions (HCIs) because they are heavily subsidised can become inefficient and wasteful.

The state began restructuring its HCIs, allowing a degree of autonomy, so that HCIs would have greater responsiveness to the needs of the population they served. They were also empowered to pursue strategies to optimise care and yet remain efficient and sustainable — to pursue corporate discipline while retaining the public service mission and ethos. The HCIs providing curative services were the first to be corporatised starting in 1985.

The Health Corporation of Singapore (now called Ministry of Health Holdings) was incorporated in 1987 as a holding company for this purpose. The Ministry commenced the restructuring program for its HCIs in 1988 after the concept was successfully tried out at the National University Hospital for 3 years — since 1985.[21]

National Skin Centre began operations in December 1988 as a restructured institution, followed by Singapore General Hospital in April 1989. Most of the remaining institutions followed and the last HCIs to be restructured were Alexandra Hospital and the Institute of Mental Health in 2000.

Restructuring enabled the hospitals to be more cost conscious and observe stricter financial discipline. The intent was to also minimise cost escalation.

Despite the significant autonomy for operations, the institutions remain wholly owned by the government. The Ministry continues to formulate health policies and guidelines and regulate both public and private healthcare institutions (HCIs). It also technically purchases services from the public HCIs by providing the subsidies for the services the HCIs provide for the public and nurtures a sense of public service ethos among the leadership of the restructured HCIs.

Restructuring enabled a degree of competition between the various public service providers and helped improve the services provided.

While the corporate culture, fiscal discipline, efficiency, and waste reduction improved, the government was conscious of the possibility that these targets were sometimes pursued by the healthcare institutions at the expense of public service. The public service function was sometimes latent or overshadowed. Competition may have contributed to some of these developments.

In 2000, the public HCIs were grouped into two clusters to encourage collaboration and also vertical and horizontal integration of services.[14]

In 2008, Regional Health Systems were started to encourage closer collaboration between regional providers and better opportunities to address existing gaps in regional health services.

HPB and HSA

Following the restructuring of the curative services, most of the remaining services at the Ministry, the public health / preventive services, were also restructured at the turn of the new millennium — in 2001, to encourage corporate discipline. The Training and Health Education Department was merged with School Health Service, the School Dental Service and the Nutrition Unit and formed into a statutory board, the Health Promotion Board.

The blood transfusion services, the scientific services and the pharmaceutical services including health product regulations were merged under a separate statutory board, the Health Sciences Authority.

4. Public Sector Remains Strong and Provides Leadership

Providing a benchmark for healthcare

In today's environment, where medicine is increasingly becoming bottom-line driven (two of our private hospitals are listed in the stock exchange), the public

sector provides leadership through its experienced healthcare professionals and plays an important role in preserving the ideals of medicine that include the concept of the healthcare profession being a vocation that is pursued primarily for the benefit of others. A "for-profit" approach may be in danger of creating demand for services which may not be justifiable on the basis of science or cost-effectiveness. As a provider of a significant proportion of healthcare, the public sector must remain vigilant to ensure that healthcare made available through its institutions is anchored in science and remains cost-effective. These institutions have the latest medical technologies and the public trusts them to provide care that is appropriate for their need. The public sector also provides research opportunities for new technology and procedures to be studied for effectiveness.

As the public sector healthcare facilities are almost exclusively, the training ground for healthcare professionals this ethos of service grounded in science and compassion and with attention to cost-effectiveness plays a vital role in inculcating the next generation of healthcare professionals with the right values.

It has been necessary for the public sector to remain dominant and progressive so that quality healthcare is accessible and affordable to the majority of the population. However, it has not been easy to retain staff and talent, and wages have had to be comparable to some extent with those in the private sector.

Manpower retention — Competitive wages

Because of a thriving private sector, especially for specialty services, it has been a constant challenge to retain good clinicians in the public sector to provide the necessary leadership and to also maintain the service standards in the public sector hospitals. Salaries are regularly reviewed to reduce disparities with that of colleagues in the private sector.

In 1984, the Consultation Fee Scheme (CFS) was introduced so that specialists could retain some of the fees earned when seeing private patients. Specialists who opted for this scheme were able to earn up to an additional 60% of their gross annual salary through this scheme.[22]

Many proceduralists, including specialists undertaking radiology, laboratory and other diagnostic examination or procedures, opted for this scheme. For non-proceduralists, the fixed specialist allowance (FSA) was increased.

The CFS has undergone numerous changes. Fees earned were allowed to reach up to 100% of the doctor's salary; and in a subsequent review, the cap to earnings was removed. Earnings by specialists in a department were pooled and weighted towards total work completed, which included care of subsidized patients.

In a subsequent review, specialists were allowed to surcharge up to 200% of the fees as listed in the Scheme of Charges and the surcharge was retained by the specialist. Some restructured hospitals went on to encourage specialists to do after-hours surgery and allowed them to retain most of the fees charged. With the restructuring of the public hospitals the consultation fee scheme was not implemented in the same form in all our public hospitals.

In 2012, it became clear that the direct link to income of doctors led to more after-hours surgery performed and there was concern that the ethos of public service was being eroded by the profit motive. A proposal to replace the CFS with a Service Quality Component that took into consideration other contributions of the doctor has been developed and will hopefully allow for some recalibration of the CFS.

The CFS brought about significant changes to the work attitudes of many specialists. More work was done, bringing benefits like reduced waiting time for elective surgery and procedures, but without careful calibration, the profit motive of some individual doctors will erode the public service ethos of the healthcare services.

However, it must be noted that many excellent clinicians have stayed on in the public sector despite the pay differential, for the meaningful work, collegiality and diversity of pursuits, e.g. as an educator or a clinician scientist, while still being a clinician.

5. High Standards of Service Through Policies and Regulations

High standards of healthcare services have been maintained by legislation and policies governing healthcare facilities and healthcare professionals. The Private Hospitals and Medical Clinics Act requires healthcare facilities to comply with facility standards and stipulates specific categories of healthcare professionals required to run these institutions. The legislation governing healthcare professionals lists the schools whose graduates are recognised for practice in Singapore. It also requires graduates to engage in continuing professional development activities such as attending a required number of lectures at courses or conferences in their specialty periodically, in order to be able to renew their practicing certificates.

Healthcare products in Singapore are carefully regulated, such that products are monitored for adverse events even after they have been registered. Also, when significant events are noted, necessary actions are taken and healthcare professionals are informed. In 2006, this policy led to the discovery of a contaminated eye care solution that triggered its recall, first from the local market and then eventually on a global scale.

6. Retaining Demand-Side Responsibility While Enabling Affordability

Heavy government healthcare subsidises at public healthcare institutions enable access to healthcare for all residents, but avoids creating a welfare state for health. Patients are expected to pay a part of the cost of healthcare services they use. For more expensive healthcare services such as inpatient treatment and, more recently, expensive outpatient treatments such as for drugs for cancers, the government has designed a personal health savings account — the Medisave, to enable patients to pay for their share of these services. The money from this account can also be used to purchase an insurance for catastrophic illness — the Medishield, and also an integrated plan (i.e. Medishield and private plan) for private care if the individual so desires. The funds in the Medisave account can also be used for the immediate family members' needs.

The government has also set up a fund, the Medifund, to help defray the cost for needy Singaporeans who are unable to pay for their share.

These financial schemes have evolved over the years and continue to be recalibrated regularly. For example, while every individual has access to subsidised inpatient care and can choose to use services at the B2 or C Class Wards (the two categories of subsidised wards), the quantum of subsidy has now been recalibrated and calculated based on the individual's financial standing. Previously, anyone could seek treatment in a C Class ward and get an 80% subsidy for the cost of treatment received. With the introduction of the inpatient means test, individuals who are financially well off (the top quintile in terms of income earned) will get a reduced subsidy of 65% instead of 80% when they elect to be treated in a C class ward and 50% instead of 65% when they choose a B2 class ward. Medishield is also being enhanced to Medishield Life, which offers both a higher amount of coverage and a life time coverage for all Singaporeans (including those with pre-existing illness).

The policies will continue to be refined in order to ensure affordability to patients and sustainability of the system. With new challenges new policies will need to be made and implemented.

7. Cost-Effective Healthcare

While allocation of resources for a specific intervention has many considerations such as need and equity, for many years now, whenever possible, a cost-effectiveness analysis is undertaken to assist in the decision.

An area where such analysis has been used with good outcomes has been in subsidy allocation for new drugs. When drugs are approved for subsidy by the state, it has to be clearly shown that the drug addresses a gap in the current therapeutic

armamentarium, and that the drug is cost-effective compared to existing drugs.[11] This cost-effectiveness analysis is undertaken by the Pharmacoeconomic Drug Utilisation Unit at the Health Sciences Authority and the analysis defines the cost associated with health gain, the latter usually expressed as quality adjusted life years.

When clinical practice guidelines are written, recommendations, especially for a specific new drug, consider similar cost-effectiveness analyses.

Increasingly, similar analysis is being done to allocate the limited healthcare resources for other areas such as medical devices.

With healthcare being increasingly commodified, suppliers of health services will continue to generate a demand through advertisements and claims of promises and hopes. While cost-effectiveness analysis is increasingly employed to guide decisions, it is not always practical to do this analysis and decisions need to be made taking into account other evidence.

8. Periodic Regular Review and Recalibration of Policies

Recognising that policies are only as good as the stewardship provided for implementation, policies are provided with resources to facilitate implementation and are monitored so that if necessary, adjustments to the policies can be made. Similarly, noting that the healthcare needs of the population or of specific groups of the population undergo change, the Ministry of Health undertakes periodic review of policies, regardless of whether they are thought to be succeeding or not. Feedback from monitoring and evaluation programmes contributes to this review, as does information on changes in the social environment, disease landscape, policies and programmes in other countries, local and international research studies, and advice of international healthcare bodies such as WHO. The Ministry has not been averse to fundamental changes in policies, e.g. the Family Planning and Population Board's policy of family size limitation (two children) was recalibrated to encourage families which could afford more children to have three or more; Singapore Medicine, initially conceived as concerted effort to encourage people from other countries to come to Singapore for medical care was moderated as its momentum may have resulted in more attention being paid to those from overseas seeking medical care than to our own residents. Today, while the private sector continues to pursue this policy of Singapore Medicine, public sector hospitals have put in restrictions to clearly emphasise citizens as their priority.

Conclusion

The transformation of the health of our population did not occur by accident nor was it a result of emulating another country's health system, as no one system will be

appropriate for our needs and situation. It was made possible by taking a long-term strategic view. It was made possible by the willingness to learn from the best and local innovation. It was made possible by searching out and painstakingly piecing together the best policies and methods for each individual concern and constantly reviewing and recalibrating policies. Some of the policies were not popular, such as the need to co-pay for care or the service obligation imposed on graduating doctors and dentists, but they have helped us build a sustainable health system and transform the health of our people.

References

1. *The World Health Report 2000 — Health systems: Improving performance.* World Health Organization, Geneva, Switzerland.
2. "Most Efficient Healthcare 2014: Countries." *Bloomberg second annual ranking of countries with the most efficient healthcare.* Available at: http://media.bloomberg.com/bb/avfle/rhpTqieX4Fuc. Accessed 10 Jan 2015.
3. Registrar-General of Births and Deaths, (2014) "Report on Registration of Births and Deaths 2013; Registry of Births and Deaths," *Immigration and Checkpoints Authority.* Singapore.
4. "Government Health Expenditure." *Singapore Health Facts*, Ministry of Health. Available at: https://www.moh.gov.sg/content/mohweb/home/statistics/Health_Facts_Singapore/Healthcare_Financing.html. Accessed 25 Dec 2014.
5. *Singapore Ministry of Health Report 1961*. Singapore-Malaya Collection, National University of Singapore Medical Library.
6. *Singapore Ministry of Health Report 1965*. Singapore-Malaya Collection, National University of Singapore Medical Library.
7. *Singapore Ministry of Health Report 1964*. Singapore-Malaya Collection, National University of Singapore Medical Library.
8. *Singapore Ministry of Health Report 1966*. Singapore-Malaya Collection, National University of Singapore Medical Library.
9. *Singapore Ministry of Health Report 1960*. Singapore-Malaya Collection, National University of Singapore Medical Library.
10. *Singapore Ministry of Health Report 1967*. Singapore-Malaya Collection, National University of Singapore Medical Library.
11. *Singapore Ministry of Health Report 1969*. Printer: Government Printing Office. Singapore-Malaya Collection, National University of Singapore Medical Library.
12. *Singapore Ministry of Health Report 1999*. Singapore-Malaya Collection, National University of Singapore Medical Library.
13. *Singapore Ministry of Health Report 1957*. Singapore-Malaya Collection, National University of Singapore Medical Library.
14. *Singapore Ministry of Health Report 1955*. Singapore-Malaya Collection, National University of Singapore Medical Library.

15. *Towards better healthcare — Main report of the Review Committee on National Health Policies*. (1992) Singapore-Malaya Collection, National University of Singapore Medical Library.
16. *Singapore Ministry of Health Report 2000*. Singapore-Malaya Collection, National University of Singapore Medical Library.
17. Edmund Wee, ed. (1994) *Pillars of Health*. Epigram Pte Ltd. ISBN number: 9971-913-44-5.
18. *Health — A crucial concern, Excerpts from Ministerial speeches on health 1980–1982*. Published by the Information Division, Ministry of Culture. Singapore-Malaya Collection, National University of Singapore Medical Library.
19. *Singapore Ministry of Health Report 1983*. Singapore-Malaya Collection, National University of Singapore Medical Library.
20. *Singapore Medical Council Annual Report 2013*.
21. *Singapore Ministry of Health Report 1988*. Singapore-Malaya Collection, National University of Singapore Medical Library.
22. *Consultation Fee Scheme; Singapore Ministry of Health Annual Report. 1984*. Singapore-Malaya Collection, National University of Singapore Medical Library.