# Progress in Obstetrics from 19th to 21st Centuries: Perspectives from KK Hospital, Singapore - the Former World's Largest Maternity Hospital

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**Abstract**

KK Maternity Hospital, Singapore was the former world's largest maternity hospital from 1950s to 1970s. This article presents the history of KK Maternity Hospital in Singapore, the changes in KK Hospital over the years from 19th century up to the 21st century and the last decades where the changes became more rapid.

## INTRODUCTION

Our generation at the edge of this new millennium has witnessed the rapid advance of new technologies. With this we saw rapid development and advancement in all aspects of our lives at home, at work & at leisure, and at a breathtaking pace, not experienced by or even dreamt of by our forefathers. The rapid advancement in technology is also felt in the medical industry and the obstetric speciality is not spared either from the relentless changes induced by the advancing technology. This article presents the history of KK maternity hospital in Singapore, the changes in KK Hospital over the years since 19th century up to the 21st century and the last decades where the changes became more rapid.

## HISTORY OF KK HOSPITAL, THE FORMER WORLD'S LARGEST MATERNITY HOSPITAL

Kandang Kerbau Hospital (KK Hospital), the birthplace of over 1.2 million Singaporeans, was the largest maternity hospital in the world from the 1950s to the early 1970s.[1] It was named after the district where it was located. The Singapore district around the crossroads formed by Serangoon Road, Selegie Road, Bukit Timah Road and Rochor Road was known in Malay as “Kandang Kerbau” (“Buffalo Enclosure”, because in the old days, there was a buffalo pen in the locality). In Teochew and Hokkien (dialects of spoken Chinese), it was known as “Tek Kah” and in Mandarin as “Zhu Jiao” (“below the clumps of bamboo”, because in the early days, clumps of bamboo grew on the hillocks in the district). The hospital, commonly known as “KK” or “Tek Kah” served as the national maternity hospital of Singapore from 1924 to 1997.

The old KK Hospital has a long tradition of service to the people of Singapore. It was first built in 1858 to function as a general hospital. In 1905, it expanded to accept female pauper patients from Tan Tock Seng Hospital and later housed female lepers and poor children. It eventually became the Pauper Hospital for Women and Children. On 1 October 1924, led by Professor J S English, the first Professor of Obstetrics and Gynaecology (O&G), KK Hospital was converted into a free maternity hospital with 30 beds. On that momentous first day, five babies were born – three Malays, one Chinese and one Japanese. A new block containing 120 beds was completed by 1934. In that year, there were 2, 575 births, a figure which continued to climb steadily over the years. Another new block was erected and opened in July 1940 bringing the total number of beds to 180. In that year 6,184 births were recorded.

During the period of Japanese hostilities in 1940-41, the Hospital became an Emergency General Hospital providing 500 beds. After the fall of Singapore and during the Japanese Occupation (1942-45), the hospital served as the Civil General Hospital and was known as Chuo Byoin (Central Hospital). Dr B H Sheares, who became Malaya's first local Professor in O&G in 1951 and the Republic of Singapore's Second President in 1971, was its Deputy Medical Superintendent then. After the war, KK Hospital remained the Civil General Hospital until 1 July 1946, when it resumed as the only O&G hospital serving the country.

The post-war years witnessed high birth rates, with the number of obstetric births increasing from about 10,000 in 1948 to a historic high of 40,000 in 1966 (Table 1).

Table 1: Number of Deliveries at the Maternity Hospital, Singapore

Year - Deliveries at Maternity Hospital, Singapore 1915 - 174 (Hospital sited at Victoria Street) 1916 - 195 1917 - 206 1918 - 221 1919 - 232 1920 - 342 1921 - 496 1922 - 466 1923 - 797 1924 - 688 (Moved to a new site at Kandang Kerbau) 1925 - 588 1926 - 753 1927 - 1,019 1928 - 1,304 1929 - 1,606 1930 - 1,882 1931 - 1,955 1932 - 2,146 1933 - 2,306 1934 - 2,575 1935 - 3,548 1936 - 4,707 1937 - 5,214 1938 - 5,551 1939 - 6,034 1940 - 6,184 1941 - 6,425 (only 300 in December) 1942 - 1,913 (Japanese Occupation) 1943 - 2,037 (Japanese Occupation) 1944 - 1,657 (Japanese Occupation) 1945 - 1,584 (Japanese Occupation) 1946 - 5,101 1947 - 7,802 1948 - 10,272 1949 - 10,928 1950 - 13,238 1951 - 13,582 1952 - 15,321 1953 - 17,958 1954 - 20,301 1955 - 22,813 1956 - 25,878 1957 - 29,280 1958 - 31,724 1959 - 33,709 1960 - 36,267 1961 - 36,590 1962 - 37,861 1963 - 39,436 1964 - 39,598 1965 - 38,849 1966 - 39,856 1967 - 37,924 1968 - 36,427 1969 - 31,255 1970 - 29,378 1971 - 30,022 1972 - 30,263 1973 - 28,903 1974 - 25,883 1975 - 23,003 1976 - 24,866 1977 - 22,181 1978 - 22,785 1979 - 23,547 1980 - 22,163 1981 - 22,993 1982 - 23,579 1983 - 21,097 1984 - 20,969 1985 - 21,625 1986 - 16,820 1987 - 13,572 1988 - 14,417 1989 - 12,291 1990 - 13,714 1991 - 14,730 1992 - 15,256 1993 - 15,694 1994 - 14,719 1995 - 14,719 1996 - 15,052 1997 - 15,681 (Moved to a new site at nearby Kampong Java) 1998 - 15,434 1999 - 15,753 2000 - 16,777 2001 - 14,924 2002 - 14,836

In 1955, a new Extension Wing, at Hampshire Road and linked to the old Wing across Buffalo Road, was added to cope with the demand (Photos 1-6). The main building of this New Wing which used to house the admission, two obstetric theatres and 3 floors of labour wards, witnessed a record of just over one million births from 1955 to 1997. This unique “one million babies” building of the New Wing (and also the old Wing of old KK Hospital) still stand today as part of the offices of Singapore's Land Transport Authority. Visitors can easily view this historical building, as the old (Old and New Wings) as well as the new KK Hospital are very accessible and are just adjacent to the Little India train station of Singapore's latest Mass Rapid Transit (underground subway) North East Line (which also occupies part of old KK Hospital's site). Perhaps no intact building in the world has witnessed as many obstetric deliveries as the main building of the New Wing of old KK Hospital.

**Figure 1**

Photo 1: Old Wing of old KK Hospital 1940s. Note the distinctive staircase railings outside the Old Wing buildings.

**Figure 2**

Photo 2: The main building of New Wing of old KK Hospital 1960-70s. Note outpouching greeen windows of the New Wing buildings.

**Figure 3**

Photo 3: View of old KKH from North East Line, Little India Train Station 2003

**Figure 4**

Photo 4: Another View of old KKH from North East Line, Little India Train Station across Tekka Lane. Both the Old Wing and New Wings buildings can be seen.

**Figure 5**

Photo 5: Old Wing of old KK Hospital 2003. Currently used as offices of Land Transport Authority of Singapore. At the foreground is a historical storyboard on KK Hospital unveiled by His Excellency, President S R Nathan, President of the Republic of Singapore on 22 March 2003. At the background on the left is the new KK Women's and Children's Hospital.

**Figure 6**

Photo 6: The New KK Women's and Children's Hospital 2002.

The record number of births or ‘birthquakes' earned KK Hospital consecutive entries in the Guinness Book of Records from the 1950s to the 1970s as the world's largest maternity hospital in the era where home deliveries were still common in many parts of the world. The 1975 edition of the Guinness Book of Records recorded ‘The largest maternity hospital in the world is the Kandang Kerbau Government Maternity Hospital in Singapore. It has 239 midwives, 151 beds for gynaecological cases, 388 maternity beds and an output of 31,255 babies in 1969 compared with the record

"birthquake" of 39,856 babies (more than 109 per day) in 1966.' Indeed it was the melting ethnicity pot of Singaporean women. It was also a vehicle and a powerful symbol of racial harmony where many women, irrespective of races, laboured and delivered their babies side by side. The 'new' Extension Wing of the old KKH, which opened in 1955, comprised the familiar Admission entrance, the Outpatient Clinics, the medical students' & house-officers' quarters, antenatal & postnatal wards and above all, the Labour wards. Known fondly as KK or Tekka, it was also a national focal point known to countless Singaporeans and their families as it was the humble birthplace of over a million Singaporeans.

KK Hospital also witnessed remarkable improvement in maternal and perinatal mortality rates, quite unmatched in the history of obstetrics of the world. The maternal mortality rate dropped dramatically from 760 per 100,000 births in 1930 to 7 per 100,000 births in 1987 and the perinatal mortality rate decreased from above 50 per 1000 births in 1940s to less than 5 per 1000 births in 1990s, achieving world class standards. KK Hospital was the centre of Singapore's pioneering feeder system of Maternal and Child Health Clinics (MCHC) with 66 MCHCs in 1964. Singapore was awarded the Kettering Shield for having the best Maternal and Child Health Service in the Commonwealth in 1955. It was also the centre of O&G and reproductive medicine research in South-East Asia and was world famous for research on trophoblastic disease (molar pregnancy) and prostaglandins (used for induction of labour). It was the birthplace of Asia's first IVF baby in 1983 and was Singapore's most important teaching and training centre for midwives and obstetricians & gynaecologists from 1924 to 1997.

The old KK Hospital being the world's largest maternity hospital had an unsurpassed wealth of clinical material. It became an international focal point and an important hub of O&G activities of the world. It was here that important research on molar pregnancies, prostaglandins, contraception and assisted reproductive techniques were performed and benefited the world greatly.

The activities and talents of the world converged at KK Hospital from the 1950s to 1970s. These influences included those from: the USA (Prof McKelvey, Britain (Prof English and expatriate members of the Royal College of Obstetricians and Gynaecologists); Taiwan and Japan (Dr HT Choo); Uganda (Prof Sultan Karim); Malaysia (notably from Penang); Australia; Sweden; Sri Lanka and other countries. Some of them returned to their country of birth or migrated elsewhere while others like SS Ratnam, Tow Siang Hwa, Lean Tye-Hin, SM Goon and HT Choo stayed and contributed even more.

On 1 April 1990, the KK Hospital ended its 132-year history as a government hospital and embarked on a new chapter in its history as a restructured hospital. O&G units at Alexandra Hospital and Toa Payoh Hospital were closed and transferred to KK Hospital. In 1997, KK Hospital moved to its new premises nearby at 100 Bukit Timah Road with 888 beds and was renamed KK Women's and Children's Hospital. Besides O&G, the new hospital assumed an additional role as the first Children's Hospital in Singapore, bringing together the paediatric services of the Singapore General Hospital, Tan Tock Seng Hospital and Alexandra Hospital. KK Women's Hospital opened its doors on 10 March 1997; while KK Children's Hospital admitted its first patient on 9 May 1997.

## THE SINGAPORE O&G ADVANCES

The practice of Obstetrics and Gynaecology (O&G) in Singapore has come a long way. The improvements of O&G care in Singapore, as evident in higher female life expectancy and lower maternal mortality & perinatal mortality rates, make Singapore one of the safest places in the world to be a woman and to have a baby. This process of improvement has over the years, produced a large pool of trained midwives, nurses, general practitioners and O&G specialists to serve our nation.

Singapore maternity care-providers evolved from the untrained traditional birth attendants "bidans" and midwives to trained and registered midwives, general practitioners and O&G specialists. In 19$^{th}$ century and the early years of the 20th century, home deliveries were the mode and family planning & antenatal care were not in the layman's vocabulary. At that time perinatal and maternal morbidity & mortality were high. Where previously a general practitioner (up to the 1960s) would usually take care of all aspects during pregnancy and delivery, there are now O&G specialists, and besides them other specialists like the neonatologist and obstetric anaesthetist to enhance the care of the mother and the baby.

Professor JS English and colleagues brought into Singapore (in the 1920s to 1940s), a proper system of control and training of the midwives, with a better understanding of the

principles of aseptic and antiseptic midwifery They also spread health consciousness amongst the expectant mothers, so as to avail themselves to the benefits of ante-natal and post-natal care, in the 1920s to 40s. The contributive roles played by general practitioners, including Dr SR Salmon of the Salmon Maternity Home and Dr Paglar of the Paglar Maternity and Nursing Home should not be forgotten.

In the 1940s to the 1960s, Professor BH Sheares and colleagues raised the standards of O&G care, medical student & postgraduate teaching and research, despite the lack of staff and resources. Professor Sheares imbibed modern and progressive O&G ideas readily. He introduced modern obstetric practice to Singapore and popularized the lower segment Cesarean section during the Japanese occupation period. Cesarean section is a routine and common procedure now and the current cesarean section rate (almost all of them are lower segment Caesarean section) is more than 20 % of the total deliveries in Singapore.

Professor SH Tow and Clinical Professors TH Lean & SM Goon further improved standards of antenatal and gynaecological care as well as O&G research in KKH in the 1960s. They were instrumental in obtaining local accreditation for MRCOG training, facilitating the training of more O&G specialists locally. Their good works were continued by pioneers like Dr YM Salmon, Dr HT Choo and Prof SS Ratnam from the 1970s onwards. Dr CS Oon was a pioneer in O&G specialist private practice from 1959. Despite its initial difficulty, the private O&G practice has progressed very rapidly over the last 40 years. More than half of the deliveries in Singapore are performed in the private sector and there are more O&G specialists in the private sector, with a ratio of 156 (private) to 77 (public) O&G specialists in 2001. The contributions made by our dedicated nursing community in Midwifery including Matron IL Aeria were crucial. The various midwifery schemes including the municipal and rural maternal and childcare system were started in 1910s and 1920s respectively. The domiciliary delivery & after-care and the KKH midwifery wards, introduced in the 1950s and 1960s, were manned by the midwives. They were essential in keeping maternal and perinatal mortality rates low, during the earlier era of high birth rates and overwhelming patient load. Placing the care of women and babies above self, the O&G pioneers' hard work and dedication have now become a source of inspiration and motivation to over 230 O&G specialists, 40 O&G trainee specialists and the O&G nursing community in Singapore currently.

## FROM THIRD WORLD TO FIRST WORLD

Improvements in maternal and perinatal mortality and standards of obstetric care of a country go hand in hand with improved socio-economic levels and female literacy. Therefore, the contributions of Singapore's former Prime Minister, Mr Lee Kuan Yew, and his government, during the 1950s to 1980s need to be recognized as well. Today, Singapore has one of the highest standards of living and female literacy in Asia and in the world.

Singapore doctors have opportunities for training and advancement and they have also easy availability of facilities, equipment and technical support. In addition, Singapore has a national population base where people are educated, socio-economically adequate and understood the need for early antenatal care. These assets have enabled the range of O&G services in Singapore to expand and the standard of care to improve markedly. With a better staffing ratio and training opportunity, our obstetric standards of care and service have improved tremendously.

The era of “harassed overworked stern midwife keeping watch over 6 labouring women in the same room, with many more waiting outside on the hard benches along the corridor” is gone forever. Singapore's obstetrics standards have even surpassed many countries in the West in terms of female life expectancy and maternal & perinatal mortality rates. Singapore has arrived from the Third World to the standards of the First World in obstetrics.

## SINGAPORE TIMELINE OF OBSTETRICS

This Obstetrics Timeline (Table 2) stretching from AD 1297 to 2003, chronicles the important events relating to obstetrics and gynaecology in Singapore. It juxtaposes the important events, achievements and milestones of Obstetrics of Singapore with the important national events. It keeps track of the setting up and the closure of various O&G departments and hospitals in the history of Singapore since 1865 where patients were admitted for gynaecological complaints and childbirth in the General Hospital at Kandang Kerbau District.

Table 2: The Singapore Timeline of Obstetrics

Year - O&G Event 1297 - The original seaport of Temasek was founded in 1297 as one of the 3 kingdoms of the trading empire of Srivijaya, Based in Palembang, southern Sumatra.

1365 - First reference to Temasek, "Sea Town" in the Javanese Nagarakretagama. By the end of the 14th century, the Sanskrit name, Singapura (Lion City), became commonly used. Births were attended by the Malay traditional birth attendants or 'kampung bidans' at home. 1819 - On 29 January 1819 Sir Stamford Raffles, Lieutenant-Governor of Java and employee of the British East India Company arrived and founded Modern Singapore. The population then consisted of 120 Malays and 30 Chinese. Treaty which allowed the British to establish a settlement was signed on 6 February 1819. The First General Hospital was a wooden shed built in the Cantonment for troops situated close to Singapore River, near Bras Basah Road and Stamford Road. 1821 - By 1821, separate hospital buildings were used for European soldiers, the sepoys and native paupers. The first junk arrived from Amoy in February 1821. 1822 - Raffles drew up a Town Plan to reorganise the settlement, resulting in the Town Planning Ordinances of 1822 and 23. 1824 - A policy of free trade together with Singapore's location attracted people from around the world. The first population census on 1 January 1824, when the total population was 10,683, including 3,317 Chinese, 756 Indians, 4,580 Malays and 74 Europeans. Treaty on 2 August 1824 ceded Singapore to the British (East India Company). 1826 - Singapore became part of British Straits Settlement (Singapore, Malacca and Penang) in 1826. 1844 - Tan Tock Seng Hospital was built 1847 - Singapore's first ether anaesthetic (to remove a splinter in hand) was given by Dr Robert Little on 2 August 1847. 1850 - There were 52 891 inhabitants in Singapore. 1858 - In 1858, the General Hospital (the fifth in the series of General Hospital since the founding of Singapore) was built at Kandang Kerbau District. The General Hospital was segregated into two sections - one section for the Europeans (the Seaman's Hospital) and the other for the locals (the Police Hospital). In 1865, returns of the sick in this General Hospital showed for the first time that patients were being admitted for gynaecological complaints and childbirth. 1860 - Singapore population had grown to 80,792. The Chinese accounted for 61.9 per cent of the number; the Malays and Indians 13.5 and 16.05 per cent respectively; and others, including the Europeans, 8.5 per cent. 1872 - Compulsory registration of births and deaths in Singapore was introduced in January 1872. In Britain, compulsory registration was already introduced in 1836. 1881 - With large influx of Chinese and Indian male immigrants the population swelled to 139,208. 1883 - The Alien ordinance imposed a monthly quota on migrants, which was restricted to men. Hence between 1883 and 1939, 190,000 female Chinese immigrants came to settle in Singapore. This helped equalized the gender ratio and formed the potential for the post-war 'baby boom'. 1888* - The first Maternity Hospital (8 beds) in Singapore opened at the junction of Victoria Street and Stamford Canal. The first patient was admitted on 2nd January 1889 and her baby was safely delivered. The first account of trained nurses in Singapore was in 1888, when the Maternity Hospital in Victoria Street employed Mrs Woldstein, a qualified midwife. 1894 - Maternal Deaths were first reported in 1894 in Singapore at the first Maternity Hospital 1905 - Female pauper patients from Tan Tock Seng Hospital were transferred to KKH. Subsequently, the hospital was also used to house female lepers and poor children. It eventually became the Pauper Hospital for Women and Children. 1905 - The Straits Settlements and Federated Malay States Government Medical School, the predecessor of NUS, was founded. The first batch of seven students graduated in 1910. 1907 - First recorded case of Caesarean Section performed in Singapore. 1908 - The Maternity Hospital at Victoria Street closed on 20th November 1908 and the new Maternity Block at the General Hospital at Sepoy Lines was completed and received patients from 1 Dec 1908. In 1908, the Midwives Bill was introduced. 1910 - In 1910, in response to concerns over the high infant mortality rate on the island, Mrs Blundell, a Municipal nurse, was appointed with the primary function of instructing non-European mothers in the proper care of their infants. This marked the official beginning of the Maternal and Child Health Service in Singapore. First regular course for Asian midwives was started. 1911 - Infant Mortality Rate fell below 300 per 1000 births. Dr Lee Choo Neo was the first Straits Chinese girl to obtain her Senior Cambridge Certificate and the first woman to qualify in medicine from the Medical School in 1919. 1914 - The old Maternity Hospital at Victoria Street was reopened in September 1914 as a Free Maternity Hospital of 12 beds. 1915 - The first Midwives Ordinance came into force. Maternity Hospital at Victoria Street had 174 deliveries. 1922 - Professor J S English, Singapore's first Professor of Midwifery and Gynaecology assumed the Chair on 26th February 1922. 1923 - The Midwives Ordinance 1923 established the Central Midwives Board in Singapore. In Britain, the Central Midwives Board was already established by Midwives Act which was passed in 1902 1924 - Kandang Kerbau Hospital was converted into a free maternity hospital. On 1 October 1924, Kandang Kerbau Maternity Hospital (KKH) was opened with 30 beds and 12 children's

cots. The hospital was led by Professor J S English, Singapore's first Professor of O&G. On that momentous day, five babies were born - three Malays, one Chinese and a Japanese. 1927 - Home visiting of mothers and newly born infants living in rural areas of Singapore (outside the Municipal) under the charge of Ida MM Simmons, Public Health Matron was instituted in 1927. KKH had 1,019 deliveries in 1927. 1929 - Dr Benjamin Henry Sheares graduated from the King Edward VII College of Medicine with LMS (Licentiates in Medicine and Surgery) in March 1929. 1932 - Maternal Mortality Rate was 750 per 100,000 births. Combined stillbirth and neonatal death rate was 108 per 1000 births. 1933 - In 1933, 2.5% of the patients admitted for delivery in KKH had antenatal care. One old building in KKH was pulled down and a block with 120 beds was erected. The building of the Third Class Block at KKH with new lying-in wards were opened at the end of September 1933 resulting in increased accommodation for patients. A flat on the top of this block was for the Assistant Medical Officer and another served as quarters (opened in 1934) for six medical students. Additional wards in the new buildings were opened in 1934. 1935 - The total number of births in KKH was 2575. 1936 - The Public Health Act and Midwives Act passed. 1938 - Free female immigration allowed, helping to end the disparity in numbers between the sexes. About half (5,551) of the 11,206 babies born in Singapore in 1938 were delivered at KKH. 1940 - Another block was built on the site of an old bungalow to give accommodation for the Ante-Natal Wards, the Labour Wards and some lying-in beds, bringing a total numbers of beds in KKH up to 180 when it opened in July 1940. Until the advent of the World War II, KKH remained a Free Maternity Hospital. All paying cases, both 1st and 2nd class, including all cases of gynaecological cases, were dealt with at the General Hospital at Sepoy Lines. 1942 - During the hostilities with the Japanese in World War II, the Hospital was converted into an Emergency General Hospital with 500 beds and used to treat casualties. Singapore surrendered to Japanese troops on 15 February 1942. It became known as Chuo Byoin (Central Hospital) during the Japanese Occupation and served as the Civil General Hospital for Japanese civilians and the local community. Dr Benjamin Henry Sheares was its Deputy Medical Superintendent then. 1945 - The Japanese surrendered on 5 September 1945 and Singapore was run by the British Military Administration until 1st April 1946. 1946 - On 1st April 1946, Singapore became a separate Crown Colony. The Maternity Wing of the General Hospital at Sepoy Lines was closed down and all O&G patients were transferred to KKH. KKH resumed its function as the only O&G Hospital in Singapore. 1947 - Infant Mortality Rate was 87 per 1000 births. Combined stillbirth and neonatal death rate was 106 per 1000 births. Maternal Mortality Rate was 290 per 100,000 births. In 1947, 62% of the patients admitted for delivery in KKH had antenatal care. 1948 - Dr Benjamin Henry Sheares became the first local doctor to hold the O&G specialist diploma of MRCOG. Professor J S English retired in May 1948. KKH had 10,272 deliveries in 1948. Perinatal Mortality Rate was above 50 per 1000 births. Maternal Mortality Rate was 240 per 100,000 births. 1949 - Family Planning Association of Singapore was registered by a group of Singapore women in July 1949. In November 1949, Mrs Constance Goh opened Singapore's first family planning clinic at her husband's medical clinic in North Bridge Road. 1951 - Dr Benjamin Henry Sheares became the first local to be appointed as Professor of O&G in University of Malaya in January 1951. KKH reorganized in 1951 into a two unit system, a university unit under Professor BH Sheares and a government unit under Dr AC Sinha. 1952 - The School of Midwifery was set up in 1952. 1953 - Laying of the Foundation Stone of new wing of KKH by Sir John Nicoll, Governor of Singapore on October 6 1953. 1954 - KKH had 20,301 deliveries in 1954. Singapore had 57,961 babies in 1954 with Perinatal Mortality Rate of 31.7 per 1000 births and Maternal Mortality Rate of 152 per 100,000 births. Domiciliary Aftercare Services were introduced to cope with the high demand for beds at KK Hospital in May 1954. 1955 - Opening of the New Wing and Out-patients Department of KKH by Lady Black, wife of Sir Robert Black, Governor of Singapore on 10th August 1955. There were a total of 266 Obstetric beds, 50 Gynaecological beds and 26 premature nursery beds. The New Wing included a Students' hostel which can accommodate 30 O&G students and 8 housemen. Singapore was awarded the Kettering Shield for having the best Maternal and Child Health Service in the Commonwealth in 1955. Domiciliary Delivery Services were introduced to cope with the high demand for beds at KK Hospital in August 1955. 1956 - The Bulletin of the Kandang Kerbau Hospital (the precursor of Singapore Journal of Obstetrics and Gynaecology (SJOG) began in March 1956 and the first editor was Prof Benjamin Henry Sheares. Application for RCOG accreditation by KKH was unsuccessful. Newborn nursery room created in KKH for sick newborns and managed by paediatricians (Dr Elaine Field and Dr Gwen Smith) from Singapore General Hospital on a roster basis. 1958 - KKH had 31,724 deliveries in

1958. Singapore had 63,460 babies in 1958 with Infant Mortality of 44 per 1000 births, Perinatal Mortality Rate of 29.0 per 1000 births and Maternal Mortality Rate of 79 per 100,000 births. Female life expectancy was 64 years. 1959 - Dr Oon Chiew Seng became the first gynaecologist (MRCOG) to go into private practice in May 1959. Singapore attained internal self-government on 3 June 1959. 1960 - Registration of the Obstetrical and Gynaecological Society as a section within the Singapore Medical Association on 7 September 1960 with Prof Benjamin Henry Sheares as its first president. Family Planning Association of Singapore launched the first large scale family planning campaign which lasted 3 months. 1961 - Women's Charter 1961 superseded non-Muslim family law systems applied in Singapore. Prof Sheares resigned for private practice and Dr Tow Siang Hwa was appointed acting Head of the University Unit. The maternal and child health services of the Municipal and the rural Singapore administered by the City and Government Health Departments respectively were integrated in 1961 as the Maternal & Child Health (MCH) Services within the Ministry of Health. Singapore's first Siamese twins (Karen and Kate) born at KKH were successfully separated on 12 December 1961 by Drs Yeoh Ghim Seng and J E Choo, at Singapore General Hospital. 1962 - The KKH O&G Government Department was organised into two Training Units, A and B, under Mr T H Lean and Dr S M Goon. 1963 - On 16th September 1963, Singapore, Sabah and Sarawak joined with Malaya to form the Federation of Malaysia. Training posts in KKH became recognized and accreditated by RCOG for MRCOG examinations. Three assigned posts of the Department of Obstetrics and Gynaecology of the University of Singapore were accorded full 24 months recognition, and 6 assigned posts of the Government Units were accorded 18 months recognition. 1964 - Racial riots in July and September 1964 placed heavy strains on KKH and staff who had to man it during the curfews. 1965 - Singapore was separated from Malaysia on 9 August 1965 and became an independent republic. 1966 - The Singapore Family Planning and Population Board, a government Statutory Board was inaugurated on 7 January 1966. Kandang Kerbau Maternity Hospital reached a peak of 39,835 deliveries in 1966 and held this record in the Guinness Book of Record till 1976. Singapore had 55,299 babies in 1966 with Perinatal Mortality Rate of 24.6 per 1000 births and Maternal Mortality Rate of 48 per 100,000 births. There were 6 O&G specialists (all MRCOGs) in Singapore. Prof Tow Siang Hwa became the first local to be awarded the RCOG William Blair Bell Memorial Lectureship. 1967 - Full recognition of 24 months' training in O&G at KK Hospital Government Units by RCOG 1968 - The Fourth Asian Congress of Obstetrics and Gynaecology was organized by the Obstetrical and Gynaecological Society in Singapore on November 1968. Mr Lean Tye Hin became the President of Asian Federation of Obstetrics and Gynaecology in 1968. KKH Domiciliary Delivery Service and Domiciliary Aftercare Service were terminated in 1968. In 1968 the first Abortion Bill was introduced and abortion was extended to cases deemed unsuitable for continuing pregnancy for family, social and economic reasons. 1969 - O&G Department in Thomson Road General Hospital (renamed Toa Payoh Hospital (TPH) in 1974) opened in 1969. Dr SS Ratnam was appointed Professor and Head of the University Unit. The Big Flood in Farrer Park and Serangoon area wreaked havoc in KKH on 10 December 1969. Abortion Bill and Voluntary Sterilization Act 1969 passed on 29 December 1969 in Parliament. 1970 - Induced Abortion became legal in Singapore and Voluntary Sterilisation Act came into effect on 20 March 1970. Female life expectancy was 68 years. 1971 - Dr Benjamin Henry Sheares became 2nd President of the Republic of Singapore on January 1971. The first ever sex-change surgery was successfully performed on a man in Singapore in July 1971. O&G Department in Alexandra Hospital (AH) opened in 1971.The KKH Anaesthesia department started in April 1971. The first local Master of Medicine (Obstetrics and Gynaecology) examination was offered with 3 successful candidates in 1971. 1972 - On 27 July 1972, the Constitution of the Obstetrical and Gynaecological Society of Singapore (OGSS) was registered and the society became an independent body. The Inaugural Meeting of the new society was held on 3 September 1972 and Professor S S Ratnam became the first President of the new society and 41 members present constituted the Founder Members of the new society. Laparoscopy was first demonstrated in KKH by Dr PC Steptoe in early 1972. The first ultrasound machine for O&G use was acquired in Singapore at Thomson Road General Hospital. Voluntary Sterilization (Amendment) Act 1972 passed in Parliament. 1974 - Termination of Pregnancy Authorization Board abolished and Abortion Law liberalized under Termination Of Pregnancy Act 1974. Voluntary Sterilization Act 1974 passed and under this act, decision to carry out treatment for voluntary sterilization rests with a registered practitioner acting with consent. Maternal Mortality Rate was 20 per 100,000 births. 1975 - The Nurses and Midwives Act enacted. In 1975, the

Anaesthetic Service started to decentralize and the Anaesthetic Unit at KKH became an independent unit that was solely dedicated to O&G. By 1975, Kandang Kerbau Hospital had 560 beds (372 for obstetric and 188 for gynaecological cases). In addition, there were 54 labour beds, 273 nursery cots and 191 special nursery cots. 'A' class constituted 5.3%, 'B' 15% and 'C' 79.7% of the beds. 1976 - The septic abortion rate after legalization fell to 34.2 per 1000 abortions in 1976 (from 75.1 in 1967). A total 22 full-time and 13 part-time MCH centres provided the full range of maternal and child health services. During the year, 5 MCH centres were closed. The new Marine Parade Polyclinic which opened is the first combined Outpatient Dispensary and MCH Centre. There were 58 O&G specialists in Singapore. Ultrasound machine was first installed in KKH. 1978 - The School of Midwifery (to give way to Bukit Timah Road Widening Scheme) was transferred to School of Nursing in SGH. Intensive care unit set up in KKH. 1983 - The birth of the first IVF (test-tube) baby in Asia 19th May 1983 in KKH 1985 - National University Hospital in Kent Ridge and its O&G Department opened. The main part of the University department of KKH shifted to NUH O&G Department in 1985 while the remaining university unit in KKH stayed until 1988. Prof SS Ratnam became President of the International Federation of Gynaecology and Obstetrics (FIGO) in 1985. 1986 - OGSS organized the successful 12th World Congress of Fertility and Sterility in Singapore. O&G Department of Singapore General Hospital opened. Dissolution of the Singapore Family Planning and Population Board on 30th June 1986 1987 - Singapore had 43822 babies in 1987 with Perinatal Mortality Rate of 9.1 per 1000 births and Maternal Mortality Rate of 7 per 100,000 births. Falling birth rate causes reversal of "stop at two" policy with "have three or more if you can afford it". Tax and maternity leave benefits introduced for third child. 1990 - On 1 April 1990, KKH ended its 132-year history as a government hospital and embarked on a new chapter in its history as a Restructured Hospital. O&G Services in TPH and AH were closed and transferred to KKH. There were 3 O&G departments created namely, Maternal Fetal Medicine (MF), Gynaecological Oncology and Urology (OU, formerly "A" unit) and Reproductive Medicine (RM formerly "B" Unit) to focus on subspecialty interests. First International Scientific Meeting of the Royal College of Obstetricians and Gynaecologists in Singapore and the Inaugural Singapore Lecture was held. Prime Minister Lee Kuan Yew awarded the Honorary RCOG Fellowship. There were 177 O&G specialists in Singapore. Female life expectancy was 77 years. 1991 - OGSS successfully organized one of the largest FIGO World Congress attended by 5,000 delegates (with 1,132 accompanying persons), who presented and discussed more than 2,000 papers. 1993 - KKH performed the first intrauterine blood transfusion for anemic baby (due to Rhesus disease) while in the mother's womb, in Singapore in November 1993. 1994 - OGSS organised the First Singapore Congress of Obstetrics & Gynaecology. Isolation and development of human stem cell lines from zona-free day 5 embryos was pioneered by Ariff Bongso and team at NUH O&G Department. Several of these human stem cell lines have been established and recognized by US government and National Institute of Health later in 2002 for federal research. Infant Mortality was 4.1 per 1000 births. Perinatal Mortality Rate was 5.1 per 1000 births. Maternal Mortality Rate of 6 per 100,000 births. Female life expectancy was 78.5 years. 1995 - The First OGSS RCOG/RACOG/ACOG Postgraduate Refresher Course in O&G was organised. Professor Ratnam retired as Head of the Department of Obstetrics and Gynaecology in July. 1995 and was succeeded by Professor S Arulkumaran. KKH launched Asia's first (and the first outside USA) O&G World Wide Web information service and became the first medical institution in Singapore to provide patient and public education on the Internet. 1996 - OGSS organised a charity drive in conjunction with the 1996 OGSS Annual Oration and raised $169,910 from its members for 3 Community Chest organisations, namely Association for the Educationally Subnormal Children (AESN), Movement for the Intellectually Disabled of Singapore (MINDS) and Rainbow Centre. Former President of Singapore Wee Kim Wee was the orator. The 1st under 500g baby to survive for 4 months outside the mother's womb in Singapore is well enough to leave home from KKH. 1997 - The paediatric medical services from three hospitals were centralized at KKH. KK Women's and Children's Hospital was born and housed in its new premises at 100 Bukit Timah Road, opposite old KKH, on the other side of Kampong Java Road. The KK Hospital Time Capsule was officially grounded on 30th July 1997 by Mr Yeo Cheow Tong, Minister for Health and Environment at the new KKH site. The Time Capsule preserves items of significance from the Hospital birthplace at 1 Hampshire Road. It will be unearthed in the year 2024 on the Hospital's 100th Anniversary as a maternity hospital. The Women's Hospital (452 beds) opened on 10 March 1997 and the Children's Hospital (382 beds) on 9 May 1997. Prime Minister Goh Chok Tong officially opened the new

898 bedded KK Women's and Children's Hospital on 10 Oct 1997. 1998 - There were 184 O&G registered specialists in Singapore. 1999 - The Department of General O&G (GOG) in KKH was created. The Singapore International Foundation O&G Missions to help improve O&G care in Myanmar (Yangon and Mandalay) was initiated. There were a total of 4 annual missions till 2002. 2000 - OGSS organised the XVIITH Asian & Oceanic Congress of Obstetrics & Gynaecology (AOCOG 2000). KKH accredited as a recognized training centre for fellows pursuing Certificate/Diploma in Gynaecological Oncology of the Royal Australian-New Zealand College of Obstetrics & Gynaecology. Female life expectancy was 80.0 years. Perinatal Mortality Rate was 5 per 1000 births. Singapore public healthcare delivery system was re-organised into two vertically integrated delivery networks, National Healthcare Group (NHG) and Singapore Health Services (SHS). 2001 - There were 233 O&G registered specialists in Singapore. Female life expectancy was 80.4 years. The 1st RCOG Part 2 examination course was held in January 2001 at KKH. This was the first occasion where RCOG has co-hosted an examination course in Asia to assist aspiring O&G trainees from the region. 2002 - OGSS celebrated the 30th Anniversary Year and launched a Public Awareness Campaign in O&G. Singapore government accepted the recommendations of the Bioethics Advisory Committee Singapore on Ethical, Legal and Social Issues in Human Stem Cell Research, Reproductive and Therapeutic Cloning on 17 July 2002. 2003 - Old Kandang Kerbau Hospital was marked as a Heritage Site by National Heritage Board, Singapore. The historical storyboard on KK Hospital was unveiled by His Excellency, President SR Nathan, President of the Republic of Singapore on 22 March 2003 and placed at the entrance of the Old Wing KK Hospital.

The first Maternity Hospital (8 beds) in Singapore opened at the junction of Victoria Street and Stamford Canal in 1888. The Maternity Hospital at Victoria Street closed on 20th November 1908 and the new Maternity Block at the General Hospital at Sepoy Lines was completed and received patients from 1 Dec 1908. The old Maternity Hospital at Victoria Street was reopened in September 1914 as a Free Maternity Hospital of 12 beds. On 1 October 1924, Kandang Kerbau Maternity Hospital (KK Hospital) was opened with 30 beds and 12 children's cots, replacing the Maternity Hospital at Victoria Street.

It records the progressive number of deliveries in the maternity hospital at Victoria Street and later in KKH, from 1915 with 174 deliveries, leading up to KKH being the world's busiest maternity hospital since the 1950s with a peak of 39,835 deliveries in 1966, a record which was maintained till 1975.

It traces the evolution of Singapore O&G health care providers from the untrained traditional birth attendants, the “bidans” and midwives to trained and registered midwives, general practitioners and O&G specialists. It shows the growth of the local O&G fraternity since Dr Benjamin Henry Sheares became the first local obstetrician to hold the specialist diploma of MRCOG (Membership of the Royal College of Obstetricians and Gynaecologists) in 1948. This has grown to 233 O&G registered O&G specialists in Singapore.

It documents the improvements of O&G care in Singapore through the increasing Female Life Expectancy and the decreasing Maternal Mortality Rate and the Infant Mortality Rate and later Perinatal Mortality Rate, over the years. The maternal mortality dropped dramatically (by 100 fold) from 750 per 100,000 births in 1932 to 7 per 100,000 births in 1987. The perinatal mortality decreased by more than 10 fold from above 50 per 1000 births in 1948 to 5.1 per 1000 births in 1994. Standards of maternal, perinatal and infant care are intimately related to socioeconomic factors and health care policies of the government.

## RAPID CHANGES OVER THE LAST DECADE OF THE MILLENNIUM

### OBSTETRICS

Within the short 10-year span, the obstetric specialty witnessed many changes in the way we practice obstetrics. The changes over the last decade are much more dramatic than all previous decades. The major advance in obstetrics namely ultrasound (pioneered by Ian Donald in 1958 in Scotland) only became routine and prevalent in the 1990s, changing the concepts & standards of care and protocols in many ways.

In this short span, KK Hospital witnessed the plastic Amniohook replacing the Kocher's forceps in performing ARM (artificial rupture of membranes) and plastic cups eg Kiwi cup with self inflate hand pump, replacing rubber (silicone) or metal cup in vacuum extraction. Reusable or autoclavable items (glass, metal or cotton material) are fast giving way to single-use paper or plastic disposable items eg gloves, syringes, paper towels and sterile drapes, gowns,

caps, paper masks with plastic shields, speculums, amniohooks, Kiwi vacuum cups, infusion bottles and vacuum blood collection tubes. Our nurses no longer need to powder the rubber gloves that were recycled, to pack glass syringes or to fold cotton towels in the back room of the labour ward. Automation brings changes in O&G practice. The Doptone & the CTG (cardiotocography – fetal heart rate monitor) machine (which in the 1980s and early 1990s were scarce items reserved for use according to priority and severity of cases) had almost completely replaced the Pinard fetal stethoscope. Each of the 32 labour rooms of KKH delivery suite has a dedicated CTG machine. Automated and calibrated drip infusion sets for titration of drip regimes in exact mils per minute instead of the inaccurate drops per minutes for oxytocin, salbutamol, antihypertensives, were introduced. Continuous pulse oximetry was introduced. Automatic blood pressure sets became common. No longer does the house officer need to sit by a severe preeclamptic taking blood pressure every 5 to 10 minutes manually.

Management of important conditions in the delivery suite has also changed tremendously. Up to the early 1990s, the drugs valium, Librium and Nepresol (Lib & Nep drip) were used in our standard protocol for the treatment of severe preeclampsia and eclampsia. In 1995, the Collaborative Eclampsia Trial showed that magnesium sulphate was superior to diazepam and phenytoin in the treatment of eclampsia.[2] This made the change towards the increasing use of magnesium. Anti-hypertensives have changed to sublingual Adalat and intravenous labetolol besides the usual Nepresol (hydralazine). Eclampsia, over the past 10 years has become very uncommon, through early antenatal care, optimum care and early delivery in preeclampsia. Similarly tocolytics for inhibition of labour have expanded from salbutamol (Ventolin) to GTN (nitric oxide donor) patches and Adalat.

Sultan Karim, who was the first O&G Research Professor of Singapore, was the first to successfully use prostaglandins for the induction of labour in 1968. The continued development of better and better prostaglandins pessary for induction of labour (eg Prostin) later made it popular in later half of 1990s. It reduced the need for us to struggle to rupture the membranes (for oxytocin induction) when the os was not favourable. The increasing popular use of prostaglandins was also in line with the research by Mary Hannah et al and review by Patricia Crowley that routine induction of labour after 41 weeks reduced perinatal mortality in the early 1990s.[3,4] One in five obstetric patients has Prostin induction in KK Hospital.

In the recent past, many have the opportunity during my training in the early 1990s to learn a variety of instrumental and assisted vaginal deliveries including Kielland's forceps delivery, assisted breech delivery etc. The trend today however, is that we are moving away from these difficult vaginal manoeuvres towards Caesarean section. Such well established techniques mastered by our pioneers, some of which have formed the artistic aspect of our profession may soon be lost. Even before the Term Breech Trial, vaginal breech delivery was becoming more selective and reserved for those which were clinically assessed to be unlikely to have feto-pelvic disproportion. The Term Breech Trial in 2000 revealed that for term breech births, elective cesarean section posed less risks than vaginal delivery and hastened the end for vaginal breech delivery.[5] Currently vaginal breech delivery are only a handful. The hospital's CS rate has increased from 16.9% in 1991 to about 24% in 2001 in KK Hospital. Except for rare circumstances, all were by lower segment cesarean section which healed very well. In fact one of us personally has never ever needed to perform a classical upper segment cesarean section in my career.

Similarly, the skin incisions in early 1990s were both midline vertical and lower transverse (Pfannenstiel). It was believed that the midline skin incision gave faster and better access. However it tended to heal poorly. In the late 1990s, performing a midline incision became uncommon. In KKH, even in a Crash (immediate) cesarean section, it is becoming routine to do a Pfannenstiel. A Pfannenstiel incision is also commonly performed even if there was a previous midline scar. Sutures used have evolved. Advancement in Material Sciences has given us stronger and better sutures like dexon, vicryl, monocryl and even staples. For episiotomy repair the familiar catgut is now replaced by vicryl. There is also now a trend of not closing up even the parietal peritoneum layer in the recent years as some research showed that it was of no benefit.[6]

## PRENATAL ULTRASOUND AND IMAGING

Most of all, ultrasonography have revolutionized obstetric practice, making deep seated changes. This was especially so in the 1990s when ultrasound machines not only increased in sophistication and resolution but also became more popular, less cumbersome, more portable and less costly. One of us (BC) recalled as the medical officer on duty that patients with vaginal bleeding in early pregnancy without much pain

was assessed clinically without a scan as ultrasound machines were scarce and not routine. In most patients, an appointment was made to return for an ultrasound scan in a scheduled list by a radiologist. In recent years, with the advent of less costly ultrasound machines with higher resolution and with training, it is becoming more of a routine practice to perform ultrasound in the first instance for such cases. We are thus able to better utilize the ultrasound for diagnosis of bleeding in early pregnancy to confirm intrauterine viability or to exclude ectopic pregnancy. The increase use of serum beta HCG and the increasing speed of the availability of results (similar to the speed of getting results for other blood tests eg tumour markers) helped a lot. The routine and prevalent use of ultrasound in the practice of O&G has reduced the incidence of ruptured ectopic pregnancy with gross hemoperitoneum and shock.

Since ultrasonography became available, it has become one of the most useful non-invasive tools in obstetrics, such as in the early detection of multiple pregnancy, a low-lying placenta, missed abortion, intra-uterine fetal death, fetal abnormality, fetal maturity, intra-uterine growth retardation and multiple pregnancy. Many fetal abnormalities (but not all given the diagnostic limitations of ultrasound), fetal presentation/number and baby gender are diagnosed antenatally and thus delivery is now less of a surprise. An occasional scan or indicated scan in the antenatal period began to be replaced by routine scans - dating, screening and growth scans in the late 1990s. It is conceivable in the near future that all clinic consultation rooms may be equipped with an ultrasound machine each just like most O&G consultation rooms were now equipped with BP set, stethoscope or even the doptone.

Today ultrasound has become an extension of our hands, our eyes and our ears. Clinical palpation skills (eg to assess presentation) has become less relevant in the face of the more definite diagnosis by the increasing ubiquitous ultrasound. It has also minimized our efforts in trying to interrogate our pregnant patient on the precise date of her last menstrual period, the regularity of her period and the date when her pregnancy was tested positive, the date of quickening so as to more accurately estimate her EDD. A simple dating scan done in the first trimester would suffice in most cases, eliminating intensive and sometimes frustrating clinical interrogation . Examination in OT for suspected placenta previa has disappeared.

Ultrasound examination is safe and useful in pregnancy but still the most important fact about ultrasound which every patient should know is that there are limitations i.e. false positives and false negatives. It cannot detect all anomalies, may not be conclusive & indeed may cause much anxiety. Additional tests like amniocentesis with its attendant risks may be offered to the patient, to give added information. Costs are also involved.

The maternal age criteria for amniocentesis have changed. It used to be that karyotyping (usually amniocentesis) was offered for woman 40 years of age to exclude chromosomal abnormalities. It was reduced to 38 years of age then to 37 and to 35. Later it has been recommended to offer based on the computer calculation of risks from serum screening (at around 16 weeks) of some serum factors (like AFP, E3 and HCG) in conjunction with age. Now Nuchal Translucency (NT) measurement test at 11 to 14 weeks to estimate risks has come into the picture. Besides routine offering of antenatal maternal serum screening for Down syndrome, the HIV test is an additional blood test in the past few years that is now routinely offered.

In contrast to ultrasound, X-rays which was used extensively in the past for estimation of fetal maturity, detection of fetal abnormalities or multiple pregnancy, pelvimetry in cases of difficult labour and localization of the placenta, was generally restricted to only one indication in the early 1990s. This was to assess for pelvic disproportion electively eg in breech presentation, the short primip less than 150 cm or patient with previous cesarean section through a lateral X-Ray pelvimetry. Even this last indication is now obsolete for the past few years.

## OBSTETRIC ANAESTHESIA

The pattern of obstetric analgesia and anaesthesia has changed. Obstetric epidural for labour pains are rare in the beginnings of 1990s (less than 5% in KKH). Now it is a common practice (about more than half of ‘primips' in labour are on epidural). With that and with continuous CTG monitoring, second stage can be longer and the “supposed norms” of second stage of labour of 1 hour for ‘primips' and half hour for ‘multips' no longer hold. Similarly regional anaesthesia (RA - spinal or epidural or combined) was rare in the early 1990s where general anaesthesia (GA) held sway. Now the vast majority of operations are under RA even in cases like placenta previa or preeclampsia. This poses challenges for obstetricians also (eg sometimes the abdominal muscles may not be as relaxed as in GA). The standard for an elective section is now RA so much so that

for a few patients who had morbid fear of being awake during the section, they had to 'bargain' quite hard for a GA with the anaesthetist.

## IMPLICATIONS OF HIGH PATIENT EXPECTATIONS

The medico-legal climate becomes more adverse, putting pressure on medical indemnity premiums of Singapore obstetric practice which rose from less than $1000 to about $10,000 per year within a decade. It is an odd irony that the higher the standards and the more efficient the services provided, the more our patients demand and complain (a sign that patient's expectations have increased tremendously, more than they can be satisfied). In contrast to earlier days, gratitude seemed to be scarce but complains abound. We are more likely to have an older patient who is grateful rather than a younger one. Perhaps now our younger & more 'educated' generation, is fussier, less tough, less stoic and less able to bear the rigours and uncertainty of labour or disease than the older generation. Doctors and nurses have to adapt to this changed pattern of patient behaviour and high (sometimes unduly high) expectations from patients. At the same time, many of us living in developed countries, as patients or other roles, must not inculcate a habit of complaints but must allow our gracious & courteous side to develop, even in trying circumstances of our fast paced world. A word of compliment or thanks would definitely encourage health care staff and boost tremendously the morale of busy staff in the public service to perform better. A positive side for our new generation of patients is that they are more likely to come in early to consult us before a disease becomes late or end stage.

The pregnant women in Singapore now have a wide choice of hospitals to select for delivery. Despite medical legal concerns, competition has heated up in private obstetrics.6 However KKH still maintains a commanding lead, delivering 36 per cent of babies in Singapore currently. The delivery of obstetric outpatient care in KKH has also kept in tandem with changing expectations. Obstetrics outpatient clinics in evenings and at weekends (Saturday & Sundays), hitherto unthinkable for a restructured (government related) hospital, is available since 1995. An interesting aspect is that more and more babies are delivered by doctors rather than midwives over the decade. In fact, with the increase of private patients in KKH, the majority of babies in KKH are now delivered by medical staff rather than midwives (the converse is true in UK National Health Service system).

## CODE GREEN – CRASH SECTION

The shifting of old KKH to the new KK Women's and Children's Hospital in 1997 allowed the establishment of a routine "Crash LSCS" protocol within our hospital in May 1997.[7,8] This is an unique system probably the first of its kind in the world. It uses a public announcement system within our large hospital to mobilise the team when an emergency cesarean section is required anytime of the day. Each team member is required to be aware of their own specific roles in such an emergency and to respond appropriately. Once a decision for an emergency cesarean section is made, a "code green" is activated via the telephone operator through a public announcement system within the hospital– eg "Attention, All Medical Staff. Code Green for Delivery Suite Bed 30". All team members receive the urgent message simultaneously as the audio announcement is broadcasted to all places and rooms of the hospital. This ensures the rapid assembly of all the necessary staff at the appropriate locations including the mobilisation of support midwives and personnel involved in the transfer of the patient to the operating theatre. In addition the theatre staff can begin the process of receiving the patient and preparing for immediate cesarean section.

## CONCLUSIONS

The progress in obstetrics from the 19th century to the 21st century has been remarkable and has dramatically reduced maternal and perinatal mortality. The changes over the last decade at the turn of our new millennium have been more rapid. It is important for obstetricians and midwives to adapt to these rapid changes and to continue to promote progress in all relevant areas of Obstetrics to improve obstetric care as we face the new challenges of the new millennium.

All photos are courtesy of Obstetrical & Gynecological Society of Singapore.

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