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

Mission to save lives

For 160 years, KKH has been making every life count by caring for, and treating women, unborn children and young patients with critical and complex medical conditions

By Teo Kuan Yee

In its mission to save patients' lives, KK Women's and Children's Hospital (KKH) is continually raising the bar in providing holistic and compassionate care for women and children. Through the decades, dedicated teams of multidisciplinary healthcare professionals have led the way in pursuing life-changing care. Some of the breakthroughs include:

Women's health

Optimising preconception health for women

The KKH Preconception Health Clinic was established to help women assess their health status before conceiving, and to prepare for a healthy pregnancy.

The clinic offers comprehensive tests to detect medical conditions that can potentially impact both mother and child.

KK Gynaecological Cancer Centre

Gynaecological cancers, such as endometrial, cervical and ovarian cancer, are among the top 10 most common cancers affecting women in Singapore today.

As one of the leading centres of care for women with gynaecological cancers, KKH's Gynaecological Cancer Centre provides comprehensive multidisciplinary treatment for more than 700 patients who are newly diagnosed with gynaecological cancers each year.

Embracing minimally invasive solutions for women's cancers

"With advancements in technology, we are able to perform minimally invasive surgery to benefit more women with gynaecological cancers, leading to improved recovery rates," says Associate Professor Timothy Lim, Head, Department of Gynaecological Oncology, KKH (below).

"We now perform minimally invasive surgical interventions for 35 to 40 per cent of our patients with cervical and endometrial cancer, compared to less than 10 percent a decade ago," he adds.

Since 2016, KKH has started offering minimally invasive sentinel lymph node biopsy using fluorescence guided imaging for patients with early stage endometrial cancer.

This reduces the risk of surgical morbidity, while enhancing patient safety.

In 2015, a patient with early stage cervical cancer successfully conceived

and delivered a healthy baby after undergoing a fertility-sparing radical abdominal trachelectomy in KKH.

Prof Lim (left) and nurse Nikki Wang (centre) are part of the team at KKH's Gynaecological Cancer Centre that works to save women's lives.



Intensive care

Neonatal intensive care

Every year, nearly 2,000 babies require intensive care or special care at KKH's Special Care Nursery and Neonatal Intensive Care Unit (NICU).

The NICU is equipped with MRI-safe incubators and offers dedicated facilities to provide extracorporeal membrane oxygenation (ECMO) — an external mechanical support for the heart — for babies with reversible cardio-respiratory failure.

It is also self-sufficient, housing facilities to perform major surgeries and procedures on newborn babies, and a dedicated neonatal-surgical unit for babies recovering from surgeries.

The NICU also introduced in Singapore, therapies such as lung surfactant in neonates with respiratory distress syndrome, High Frequency Oscillatory Ventilation (HFOV), Inhaled Nitric Oxide, ECMO and Whole Body Cooling, to improve outcomes for newborn babies.

Complex pregnancy

KKH provides care for about 12,000 women and their babies every year.

Round-the-clock care for urgent pregnancy-related complications

KKH's Urgent Obstetrics and Gynaecology Centre (O&G) provides round-the-clock urgent care for acute problems in early pregnancy such as abdominal pain and bleeding; as well as post-pregnancy conditions such as acute vaginal bleeding and severe pelvic or lower abdominal pain.

Complex surgery for the unborn child

In 2013, a multidisciplinary team successfully performed an ex-utero intrapartum treatment (EXIT) procedure on a fetus detected to have a large tumour obstructing the airway.

To ensure the baby would not suffocate immediately after birth, the multi-stage surgery involved performing a complex

caesarean section to partially deliver the baby, so as to allow continued oxygen supply from the umbilical cord until the baby's airways could be kept open and protected. Only then was the baby delivered.

EXIT is just one of the many time-sensitive, multi-stage surgeries performed at KKH, requiring highly skilled medical professionals and intricate multidisciplinary coordination between specialist teams.

"To save this baby, the EXIT delivery took days of preparation with six teams of medical specialties working as one," says team lead Professor George Yeo, emeritus consultant, Department of Maternal Fetal Medicine, KKH.

"Such a successful outcome for mother and baby is achieved through detailed planning, intensive preparation, and precise multidisciplinary collaboration. There can be no room for error in providing care for these special patients."

In 2015, KKH established a Fetal Surgery Suite, equipped to treat life-threatening complications affecting the unborn child.

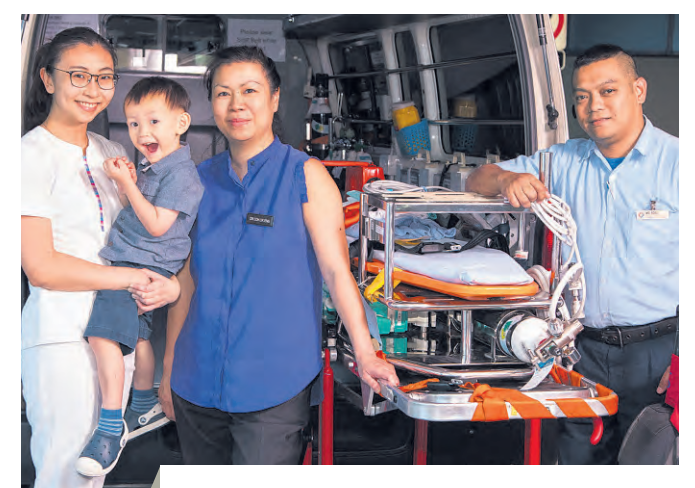
Emergency transport for critically ill children

The Children's Hospital Emergency Transport Service (CHETS) was started in 2004 to provide emergency transport to and from KKH, other local hospitals, and even overseas, for newborns and children with life-threatening health conditions.

This service is rendered by a team of doctors and nurses, who specialise in neonatal and paediatric intensive care, and are trained to transport critically ill children through all traffic conditions.

CHETS saved the life of Tan Sih-Fa, son of family physician Dr Tan Eng Chun, in 2014 when he started to have problems breathing within half an hour of his birth. A team arrived with a life-saving machine called the extra-corporeal membrane oxygenator (ECMO) to safely transport him to KKH.

For Dr Tan, CHETS had been crucial to his son's survival, as Sih-Fa's heart had stopped the night he was brought to KKH. Being on ECMO prevented lasting damage to the boy's brain.



Four-year-old Sih-Fa with Assistant Nurse Clinician Annabelle Zhang, Dr Loh Lik Eng and ambulance driver Mohd Rosli, members of KKH's Children's Hospital Emergency Transport Service (CHETS) team that saved his life in 2014.

Hope for women with high-risk pregnancies

Two months ago, 41-year-old Petsy Lim was overjoyed as she cuddled her newborn daughter, Wong Gao An. Her bundle of joy arrived after two failed pregnancies at other centres.

At the time, the doctors had suspected these could be due to a condition called cervical incompetence, but nothing was ever confirmed.

For her third pregnancy, Ms Lim took no chances, and sought out obstetrician and gynaecologist, Dr Shephali Tagore, head and senior consultant, Department of Maternal Fetal Medicine, KKH.

At about 14 weeks' gestation,

Ms Lim was admitted for an elective cervical cerclage to support her womb.

A cervical cerclage is a surgical procedure in which the cervix (neck of the womb) is stitched closed in order to prevent a miscarriage or premature birth.

Dr Tagore performed the procedure, and her team specialising in high-risk pregnancy monitored Ms Lim closely, together with nurses from Wards 72 and 82.

The cerclage provided Ms Lim much-needed support for her womb, and she later successfully gave birth to her first child, a healthy baby girl.



Ms Lim (far right) with Dr Tagore, whose expert intervention helped support her complex pregnancy and the successful birth of her baby Gao An.

KKH
160^{Years} OF LOVE

Building health, transforming the community

Through the years, KKH has improved the lives of women, children, families and the community, shaping the health of the nation

By Teo Kuan Yee

A household name, KKH is one of the leading tertiary referral centres for women's and children's health.

More than just a well-regarded institution, KKH establishes innovative care programmes that empower the community beyond the hospital. These strengthen community support for families, and optimise health for patients — because every woman and child is precious.



Ms Syahida (right), her husband, Mr Nor Ezham bin Abdul Razak, and their sons 'Eimran' and 'Eilman', with Prof Goh (left) and Ms Yan (bottom right).

Holistic support for mothers and babies

Since October 2014, KKH has led the Temasek Foundation Cares KIDS 0-3 Programme, partnering with AMKFSC Community Services with support from Temasek Foundation Cares. So far, nearly 150 children have been enrolled under the programme.

This home visitation programme aims to give opportunities for children from vulnerable families to develop their full potential.

From July 2016, the programme has received support from the Early Childhood Development Agency under the KidSTART pilot, and 150 more children are expected to benefit from this funding.

"By supporting the mother from pregnancy until the child is three years old, we are able to enhance the healthy adjustment of the family and optimise healthy growth and development for the child," says programme lead, Associate Professor Winnie Goh, senior consultant at KKH.

The programme provides integrated health and social support for mother and baby and develops close partnerships with community partners.

They include government and health agencies, child development and preschool centres, voluntary welfare organisations and family service centres.

Ms Syahida Abdullah Samad, 31, joined the programme on recommendation from her medical social worker, Ms Valerie Goh.

From the fourth day after her son's birth, Ms Syahida began to receive weekly home visits from a nurse.

After the eighth week, Ms Syahida began to receive visits from Ms Yan Zhen Ying, a community health visitor.

Guided by Ms Yan, Ms Syahida learned how to handle baby tantrums and to help her sons develop.

Her younger son, Nor 'Eimran Rifqi, was able to walk and pronounce short phrases by one year of age.

Going to the craft and playgroup classes at the KIDS 0-3 Centre also helped her two-year-old, Nor 'Eilman Muqri, conquer his stranger anxiety at school.



Mr Mohamad Shafiq (centre), Ms Mashitah (right), and their sons Aatif (front) and Aahli (left), with Dr Choo (back, left) and Ms Loke (back, right), who helped Aatif with his speech problems.

Supporting children with developmental needs

Singapore's community-based early detection and intervention programme for pre-schoolers with mild developmental needs — Mission I'mPossible — was born in July 2009, through a partnership with Lien Foundation and PAP Community Foundation.

"Over three years, Mission I'mPossible screened over 1,700 pre-school children, and provided family-focused learning support and therapy services to more than 300 at-risk pre-schoolers, to improve their readiness for mainstream education," says Associate Professor Mary Daniel, head and senior consultant at KKH's Department of Child Development. The successful pilot was adopted by the Ministry of Social and Family Development, and has been expanded into Development Support (DS) & Learning Support (LS) programmes, currently running in many pre-schools in Singapore.

Mr Mohamad Shafiq Mohamed Zin and his

wife Ms Mashitah Ibrahim were initially at a loss when their youngest son, Aatif, was screened and diagnosed with speech and language difficulties at the age of five.

As young parents, Mr Mohamad and Ms Mashitah had found it very challenging to engage Aatif.

Then the family met Dr Sylvia Choo, and speech therapist Amanda Loke, who encouraged and taught them creative therapies for Aatif that could also be carried out at home.

"Working with Aatif's parents to enhance his communication and learning has been an enriching experience for Amanda and I, as we witness their dedication and hard work, and resilience as a family," says Dr Choo.

Now eight years old, Aatif undergoes periodic follow ups with Dr Choo. Together with Aatif's family, the team continues to identify new ways to engage Aatif, and help him develop his full potential.

Nipping gestational diabetes in the bud

Singapore has one of the highest incidences of gestational diabetes mellitus (GDM) in the world, and recent KKH studies show that about 15 to 20 per cent of pregnant women in Singapore have GDM, which increases their risk of developing birth complications.

In line with the nation's war against diabetes, KKH has launched the Temasek Foundation Cares GDM Care programme to detect and provide care for women with GDM.

Assisted by Temasek Foundation Cares (TFC), the programme aims to benefit about 5,400 women with GDM and their families over a three-year period by providing routine screening and educational support to all expectant mothers in KKH.

Those with GDM will be provided a care plan to best manage the condition for mother and child.

Says Professor Tan Kok Hian, head and senior consultant, Perinatal Audit and Epidemiology Unit, Department of Maternal Fetal Medicine at KKH: "Children born from pregnancies affected by GDM are at higher risk of developing obesity and Type 2 diabetes later in life.

"Through early detection, timely intervention and close follow-up care through this structured care and education programme, we are closer to optimising prevention and management of diabetes and associated health risks for our future generations."

Last June, Singapore's Integrated Platform for Research in Advancing Metabolic Health Outcomes in Women and Children (IPRAMHO) was set up to conduct research towards lowering the risk of metabolic health issues such as GDM in future generations.

"Our goal is to revolutionise the way medical professionals and health systems engage with patients at risk, allowing us to develop evidence-based, effective, affordable and scalable interventions," says Prof Tan.



Prof Tan (right), with senior principal dietitian Dr Han Wee Meng (left) and Obstetric Day Assessment Centre nurse Asmira Mohamed Rahim (middle), are part of the multidisciplinary team that supports patients with gestational diabetes.



Building community psychosocial health and resilience

"Children and adolescents are very vulnerable to developing psychological and emotional difficulties following a traumatic event.

"Left unaddressed, the impact of trauma raises a child's risk of developing behavioural problems, among other potential emotional and psychological issues," says clinical psychologist Ms Lim Xin Yi, who heads KKH's Psychosocial Trauma Support Service.

In April 2014, KKH launched the Temasek Foundation Cares Kids in Tough Situations (KITS) programme with community partners and Ministry Of Education — making trauma-focused therapy more accessible to children and youth affected by traumatic events.

Under the programme, community and school-based therapists were trained to provide trauma-focused cognitive-behavioural therapy to these children in need.

The Stay Prepared Trauma Network for Children programme followed in July 2016. Its aim is to enhance psychosocial capabilities and resources upstream in Singapore's community through preventative and resiliency programmes.

KKH
160^{Years} OF CARE

The gift of new life

Experts at KKH's IVF Centre offer hope to couples wishing to conceive

By Hazel Tan

The In-Vitro Fertilisation (IVF) Centre at KKH, or KKIVF, is one of the leading fertility centres in Singapore with a full suite of expertise to help couples to conceive.

According to Associate Professor Tan Heng Hao, director of KKIVF, spontaneous pregnancy is always encouraged and preferred, but in some, this may be challenging or not possible.

He explains: "Infertility is a relatively common problem, affecting at least one in eight couples at some time in their lives. The good news is that it can often be assessed and appropriately treated. It is important to seek medical attention."

Patient-centric care

KKIVF has achieved consistent clinical pregnancy rates and safety profiles, comparable to internationally renowned centres.

"Drawing on the expertise of various medical and allied health specialties, KKH is able to provide holistic care for couples with a variety of medical conditions, and be a place of support for them.

In 2017, the hospital established the Recurrent Pregnancy Loss Clinic, which is run by specialists in reproductive medicine.



Giving patients the support they need: (Back row from left) operating theatre nurse Lok Hsiao Hui, KKIVF director, Prof Tan and embryologist Melinda Chan, with (front row from left) KKIVF nurse Tan Li Ying and administrative staff manager Lim Chet Ling.

KKIVF since 2012

Ovarian Hyperstimulation Syndrome (OHSS) is a debilitating medical condition which occurs when too many ovarian follicles develop in response to medications.

Though uncommon, it can be potentially life threatening. KKIVF has reduced the incidence of OHSS and maintained it at a low rate.

Significant improvements have also been made in the laboratory culture environment. The formation rates of blastocysts (five-day-old embryos) are comparable to international standards.

Leveraging this, KKIVF has embarked on actively transferring a single blastocyst for selected patients to reduce the probability of multiple pregnancies — associated with higher risks for mother and baby — while improving implantation and pregnancy rates. Multiple pregnancy rates have been on a downward trend since, a positive outcome.

A special delivery

To enable birthing mothers to receive more effective pain relief, KKH has developed a technology to customise the administration of epidural analgesia, known as the EPIVA infusion pump system.

EPIVA allows women in labour to determine the timing and frequency of their analgesic delivery, and self-administer the pain relief medication into the epidural space at the press of a button.

A clinical algorithm analyses the patient's pain relief needs based on her on-going analgesic demands, and automatically adjusts the epidural maintenance rate accordingly to meet her pain relief requirements.

This worked for 34-year-old

Madam Xie Xiaohong, whose pain was managed well enough for her to take a nap and watch television in the early stages of labour.

Being on EPIVA, Madam Xie was quite free of pain, and in control of when to administer more epidural medication — which helped her to remain calm throughout labour.

"Every year, about 5,000 women at KKH request for epidural pain relief for their childbirth pain," says Associate Professor Sng Ban Leong, director of KK Research Centre and head of KKH's Department of Women's Anaesthesia.

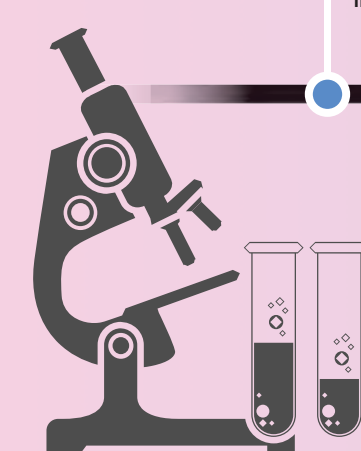
"Innovations like the EPIVA system help ease the pain and anxiety of childbirth."



Mdm Xie and her six-month-old son Darian, together with Prof Sng. The EPIVA infusion pump system that delivers personalised epidural pain relief during labour is shown.

MEDICAL MILESTONES

KKH's drive to provide dedicated care for its patients sees it push the boundaries of medical innovation and research



1950

Dr Benjamin Sheares pioneers a new technique to construct a vagina for women born without one, successfully resulting in pregnancies.

1983

Singapore's first test tube baby is delivered by Professor S. S. Ratnam.

2002

KK Gynaecological Cancer Centre is the Asian collaborator in a vaccine trial for human papillomavirus (HPV), a sexually transmitted infection that causes cervical cancer.

2012

KKH performs radical abdominal trachelectomy for a young woman with early-stage cervical cancer.

2015

The Fetal Surgery Suite for complex fetal treatments and surgeries opens.

• KKH breaks new ground with research on maternal-fetal health through the S-PRESTO study, a pre-pregnancy study in Singapore.

1965

All newborns are now screened for Glucose-6 Phosphate Dehydrogenase (G6PD) deficiency, thanks to the research of Professor Wong Hock Boon and Dr W.R. Brown on kernicterus, a type of brain damage that may occur when jaundice is left untreated.

1999

KKH develops a single investigative method using high-resolution ultrasound to diagnose biliary atresia in infants.

2007

KKH performs open heart microsurgery on a premature infant.

2013

• KKH's newly expanded neonatal intensive care unit opens.

• KKH develops the DIVA System, a fully-automated system that can better manage blood pressure in women undergoing caesarean section while under spinal anaesthesia.

2017

• KKH announces programmes to optimise detection for women with gestational diabetes mellitus.

• KKH launches Singapore's donor human milk bank programme to meet the breast milk needs of premature and sick babies.



Ms Tan and her three-month-old daughter (centre), with Prof Jerry Chan (right) and co-investigator Associate Professor Mariele Fortier (left).

Enhancing health outcomes for every birth

KKH is making strides on a pre-conception study to investigate the link between the health of mothers and that of their babies.

The S-PRESTO (Singapore pre-conception study of long-term maternal and child outcomes) was launched in June 2015 to examine how a woman's health, nutrition and mental state before pregnancy will influence her subsequent pregnancy outcomes.

A collaboration between KKH, Singapore Institute for Clinical Sciences (SICS) of the Agency for Science, Technology and Research (A*Star), and National University Health System (NUHS), S-PRESTO is the latest in a line of studies from the GUSTO (Growing Up in Singapore Towards healthy Outcomes) birth cohort study.

Says Associate Professor Jerry Chan, Principal Investigator, S-PRESTO and KKH Senior Consultant, Department of Reproductive Medicine: "The long-term goal is to develop effective approaches that can help to prevent metabolic diseases — ultimately enhancing health outcomes for every birth."

S-PRESTO study participant, Ms Tan Ying Ying, 29, mother of three-month-old Lara, shares this long-term view, having decided to participate in the study even before she got pregnant, to benefit others, and generations into the future.

KKH

160

Years

OF

RESEARCH

Advancing

Cures

for women and children

KKH is delivering breakthroughs in medical research that can have widespread benefits for patients

By Hazel Tan

Brain and solid tumours account for nearly 55 per cent of all childhood cancers in Singapore. “These can cause significant physical, psychological and social impact to children and their families,” says Dr Amos Loh, chairman of the VIVA-KKH Paediatric Brain and Solid Tumour Programme.

The programme was started in 2015 to pursue advancements in care for such cancers through clinical and translational research. Programme partners include the Viva Foundation for Children with Cancer and the renowned St Jude Children’s Research Hospital in the United States.

Dr Loh, who is also a consultant in the Department of Paediatric Surgery at KKH, says: “In order to make progress, it is essential for healthcare professionals to be able to pool insights, share clinical experience and build on one another’s discoveries.”

Cutting-edge technology is also being employed to characterise the type of tumours encountered.

For example, using the NanoString nCounter® platform, researchers are able to measure the relative amount of genetic “signal” that each tumour displays.

This helps the research team learn more about the tumour’s genetic structure and how it behaves.

“KKH cares for many children with brain

and solid tumours in Singapore. Harnessing St Jude’s knowledge and expertise, and with VIVA’s support, we are able to do far more by working collaboratively and in concert to combat the scourge of childhood cancer,” says Dr Loh.

It was this collaborative teamwork that saved the life of 10-year-old Hillary in 2016, when a swelling in her right cheek and jaw area began to rapidly increase in size in less than two weeks.

Laboratory tests resulted in a diagnosis of a malignant rhabdoid tumour of the salivary gland, which required intensive treatment, says Hillary’s primary physician, Dr Soh Shui Yen, senior consultant, Haematology/Oncology Service, KKH.

“There was a big multidisciplinary team looking after Hillary, consisting of specialists in pathology, radiology, ear nose and throat, plastic surgery, and dental and radiation oncology — all focused on one common goal of minimising the complications of therapy while giving her the best chance for a cure.”

Hillary is now in remission, with a clean bill of health during her medical evaluations in January.

Although the journey has not been easy, Hillary credits her family and the team of doctors, nurses and therapists who cared for her, helping her win the battle.



Cancer survivor Hillary (centre) celebrating her 10th birthday with (from left) Dr Loh, Dr Soh, Dr Francis Chin and Dr David Low.

CELEBRATING HERITAGE

From a humble General Hospital, KKH has evolved through the years to become an institution dedicated to taking care of women and children with complex medical conditions

1858-1865

Singapore's fifth General Hospital is built in the Kandang Kerbau area with two sections — the Seamen's Hospital for Europeans and the Police Hospital for locals. In 1865, the first patients for gynaecological conditions and childbirth are recorded.

1924

The Kandang Kerbau (KK) Hospital — a free maternity hospital — opens with 30 beds and 12 children's cots.

1955

KK introduces a domiciliary midwifery service to help women deliver safely at home. Complex cases are referred to KK for management.

1966

KK Hospital makes it into the Guinness World Records as the largest maternity hospital with 39,835 births.

1997

KK Women's and Children's Hospital (KKH) is built on its current premises at Bukit Timah Road and houses a Children's Hospital.

2007

The KKH Children's Cancer Centre opens.

2013

KKH's newly expanded neonatal intensive care unit opens.

2017

KKH launches Singapore's donor human milk bank programme to provide a ready supply of safe, pasteurised human breast milk for premature and sick babies.

KKH Celebrates 160 Years of Care for Women and Children

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