KK Women's and Children's Hospital
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CODE RED TO SAVE PREGNANT MOTHERS

KK Women's and Children's Hospital leads the way as the first hospital in Singapore to establish a dedicated resuscitation code for cardiac arrest in pregnant women.

To enhance emergency resuscitation for pregnant women, in March 2014, KK Women's and Children's Hospital (KKH) introduced a new dedicated resuscitation code for cardiac arrest in pregnant women, termed CODE RED.

In the event of a maternal cardiac arrest, CODE RED is activated through the hospital's code announcement system.

A multidisciplinary medical team trained in maternal resuscitation and obstetric emergency management swiftly assembles at the patient's location within the hospital. Armed with resuscitation and surgical equipment, the team assesses the patient and, if needed, performs a timely perimortem caesarean section to improve the chances of successful resuscitation.

"When a pregnant woman goes into cardiac arrest, the window of opportunity for intervention can be measured in a matter of minutes," says Dr Deepak Mathur, Consultant, Department of Women's Anaesthesia, KKH, who led the code implementation.

"CODE RED reduces the medical response time to caesarean delivery for effective maternal and neonatal resuscitation, helping to better survival and neurological outcomes for both mother and baby."

A multidisciplinary team demonstrates a CODE RED activation for maternal cardiac arrest.

Read about perimortem caesarean section on page 2

PERIMORTEM CAESAREAN SECTION FOR MATERNAL CARDIAC ARREST

Dr Deepak Mathur, Consultant, Department of Women's Anaesthesia, KK Women's and Children's Hospital

Perimortem caesarean section (PMCS) is increasingly emerging as a crucial intervention in the resuscitation of pregnant women in extremis or cardiac arrest, when conventional cardiopulmonary resuscitation (CPR) is failing.

Due to the anatomical and physiological changes that occur during pregnancy, resuscitation of a pregnant woman is challenging when compared to women who are not. A review of reported cases in medical literature suggests that delivery can dramatically improve maternal cardiac output (CO) in response to CPR, which may improve maternal and consequently neonatal survival and neurological outcomes.

On this basis, PMCS is now internationally recommended as a key intervention during the resuscitation of pregnant women in cardiac arrest beyond 20-weeks gestation.

A pregnant woman in cardiac arrest requires timely resuscitation by medical professionals who possess knowledge of the anatomical, physiological and pharmacological changes of pregnancy, and who are trained in obstetric emergency management.

The rationale for a PMCS is to minimise the effects of supine hypotension syndrome of pregnancy. The growing fetus within an enlarging uterus produces significant compression of the aorta and venae cavae when the mother is in supine position, especially beyond 20-weeks gestation. Thus the venous return to the heart, and consequently the stroke volume (SV) and CO are reduced.

At full term, the mother's SV and CO may be reduced by 30 to 40 percent while in supine position. In the event of a cardiac arrest, unresolved aortocaval compression may prevent restoration of the CO despite adequate CPR, especially since chest compressions during CPR can only produce a SV and CO of 30 percent of normal at best.

Based on current opinion, to circumvent aortocaval compression during resuscitation, CPR should be performed with the patient in a left lateral tilted position of around 27 degrees by using a wedge, or by mechanical displacement of the uterus.

If spontaneous circulation has not returned within four minutes of cardiac arrest despite CPR, the baby should be delivered by a PMCS. This should be accomplished within five minutes of cardiac arrest, to prevent hypoxic brain damage in the mother and neonate, and is best done at the patient's location to minimise delay.

Blood loss is minimal in established cardiac arrest and the only equipment required is a scalpel. Infection prophylaxis and haemostasis and completion of surgery can be performed at a more suitable location if the patient recovers.

INTERVENTION FOR MATERNAL CARDIAC ARREST AT KKH

KK Women's and Children's Hospital (KKH) is the first hospital in Singapore to induct a dedicated CODE RED for cardiac arrest in pregnant women into its resuscitation protocols.

This enables a multidisciplinary team trained in maternal resuscitation to arrive swiftly at the patient's location upon code activation.

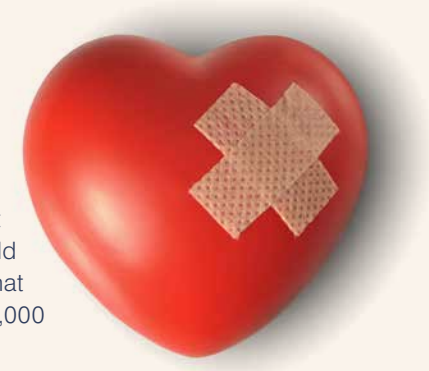
The team assembles bearing resuscitation and surgical equipment to decide upon and perform a timely PMCS for resuscitation, if needed, at any location within the hospital. To enable swift and coordinated medical intervention, the code is reinforced by specialised guidelines and rigorous simulation training in maternal resuscitation for all medical personnel involved.

While the global incidence of maternal cardiac arrest and the effect of PMCS on feto-maternal survival remains challenging to quantify, our experience of PMCS at KKH, when performed in a timely manner, is promising.

In the past 24 months, three patients presented with maternal cardiac arrest, of which two responded successfully to prompt resuscitation involving a PMCS. The introduction of CODE RED aims to further reduce the time to effective resuscitation and help to enhance feto-maternal survival and neurological outcomes after cardiac arrest.

A multidisciplinary team simulates a perimortem caesarean section for resuscitation during maternal cardiac arrest.

MATERNAL CARDIAC ARREST



Although the incidence of maternal cardiac arrest is rare, data from the Centre for Maternal and Child Enquiries (CMACE), United Kingdom, indicates that its incidence has increased from 1:30,000 to 1:20,000 pregnancies since the 2000-2002 triennium.

The aetiology of maternal cardiac arrest is multifactorial. Cardiac arrest in pregnancy may result from direct causes, such as eclampsia, haemorrhage, thromboembolism and amniotic fluid embolism; or indirect and unrelated conditions, such as cardiac disease, sepsis, malignancy and trauma. Diminished maternal cardiovascular and respiratory reserve usually leads to rapid deterioration during pregnancy, which can result in poorer outcomes.

Cardiac diseases are the leading cause of death in pregnancy in the developed world. These are attributable to preventable lifestyle changes in recent decades, such as obesity, smoking, older age at pregnancy, diabetes and hypertension, causing ischaemic heart disease and myocardial infarction.

General health measures for the prevention of cardiac disease include: weight management; cessation of smoking; active management of associated diseases such as diabetes and hypertension; and increasing knowledge of conditions in pregnancy that can lead to significant morbidity.

WARNING SIGNS OF MATERNAL CARDIAC ARREST

General practitioners and patients should have a low threshold for seeking early specialist review for conditions which predispose pregnant women to potential situations that lead to cardiac arrest.

These include:

- **Severe sepsis arising from genitourinary or respiratory infections**
- **Signs and symptoms suggestive of internal haemorrhage or genital tract bleeding**
- **Cardiovascular conditions presenting in pregnancy with symptoms such as chest discomfort or breathing difficulties**
- **Unexplained or significant headaches which should be considered serious unless proven otherwise**

In addition, several pre-existing conditions, such as heart disease or intracranial aneurysms, may decompensate during pregnancy, due to the physiological alterations that occur in a pregnant woman.

Dr Deepak Mathur completed his anaesthesia training in Aberdeen, Scotland and obtained a fellowship from the Faculty of Anaesthetists, Royal College of Surgeons in Ireland. His subspecialty training includes obstetric anaesthesia, with an interest in maternal resuscitation. In addition to his appointment as Consultant, Department of Women's Anaesthesia, KKH, Dr Mathur is also Adjunct Assistant Professor, Duke-NUS Graduate Medical School; Clinical Lecturer, Yong Loo Lin School of Medicine and Clinical Core Faculty Member for the SingHealth Anaesthesiology Residency Program.

A WELCOME CALL

Telemedicine helps hospital to care for patients at home

A telemedicine trial by KK Women's and Children's Hospital (KKH) to improve the management of chemotherapy-induced nausea and vomiting (CINV) is seeing positive physical and emotional outcomes for patients.

CINV is one of the most distressing and negatively perceived side effects of the drug-based cancer treatment. This is of particular concern for patients undergoing moderate and highly emetogenic chemotherapy. While patients are encouraged to seek medical advice and management for severe and uncontrolled CINV, failure by patients to recognise and seek help promptly can potentially delay clinical intervention, impacting their quality of life and experience of chemotherapy.

To help this vulnerable group of patients to better monitor and manage their CINV at home, a team of pharmacists from KKH's Oncology Pharmacy began a trial in July 2013 to reach out to 80 adult women patients receiving moderately and highly emetogenic chemotherapy for the treatment of breast or gynaecological cancers at KKH.

Currently underway, the trial involves a patient receiving a telephone call from a pharmacist on day one and day five after a chemotherapy session, over three courses of chemotherapy. During this time, the pharmacist assesses the incidence and severity of CINV experienced by the patient, and provides timely support, advice and intervention where necessary.

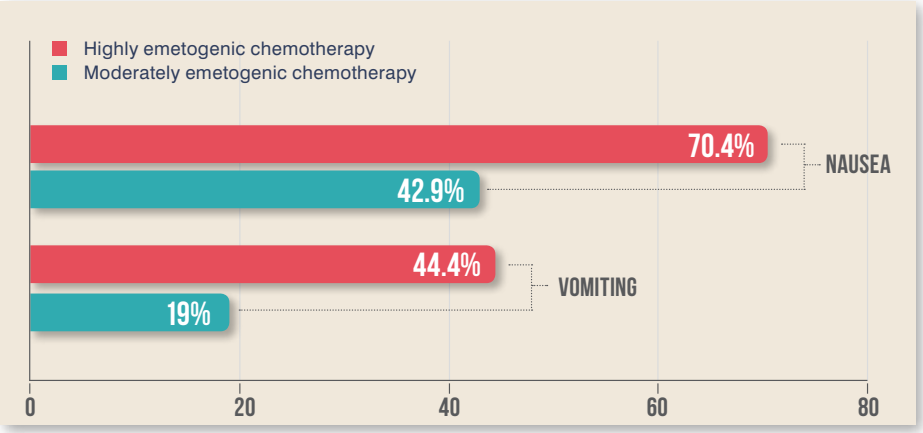
INTERIM RESULTS SHOW TRIAL IS EFFECTIVE AND REASSURING

Interim results in January 2014 revealed that of the 48 patients who collectively underwent 144 chemotherapy sessions, nearly twice the number of patients on highly emetogenic chemotherapy experienced nausea and vomiting compared to moderately emetogenic chemotherapy (Figure 1).

Pharmacists also found that a majority of patients (87.5%) sought advice on how to manage many other side effects of chemotherapy. The most common requests for advice included the management of constipation (40%), loss of appetite (35%), body pain (21%), bloating (19%), headache (17%) and diarrhoea (13%).

Through a patient feedback questionnaire, 96 percent of patients agreed that the advice provided by the pharmacists enabled them to better manage CINV at home. Some also shared that it was reassuring to have a healthcare professional call to check on them while they were at home.

Figure 1. Number of patients who experienced nausea and vomiting over three courses of moderately and highly emetogenic chemotherapy



Principal Clinical Pharmacist, Gail Chang, making a call to a patient at home after a chemotherapy session.

"The trial's interim results are valuable to help medical professionals understand the incidence and severity of chemotherapy-induced side effects experienced by our patients at KKH," said trial team leader and Principal Clinical Pharmacist, Gail Chang.

"This enables us to better help patients to manage CINV and other side effects at home, and take steps to improve their perceptions and experience of chemotherapy. Over the long term, this can positively influence treatment completion rates and ultimately our patients' clinical outcomes," she added.

"Telemedicine allows us to deliver not just clinical, but also emotional and social care to patients, beyond physical boundaries and at their point of need," said Chief Pharmacist at KKH, Irene Quay. "We aim to further investigate its use to improve accessibility of healthcare to a wider group of patients."

The Oncology Pharmacy is reviewing its current medication protocols to further reduce the incidence and severity of nausea and vomiting amongst patients undergoing chemotherapy. The trial is expected to conclude in July 2014.

ELECTROEJACULATION FOR FERTILITY PRESERVATION IN SICK CHILDREN

Dr Matthew Lau, Consultant, Department of Reproductive Medicine; Dr Ada Ng, Resident, Division of Obstetrics & Gynaecology; Dr Tan Heng Hao, Senior Consultant and Head, Department of Reproductive Medicine, KK Women's and Children's Hospital

Case Study: Fertility preservation through electroejaculation in a paediatric oncology patient

A pre-teen boy was diagnosed with a right intranasal low grade sarcoma at KK Women's and Children's Hospital (KKH) and was scheduled to undergo chemotherapy. As the cancer treatment bore the risk of reduced fertility, the patient was referred for fertility preservation by his paediatric oncologist.

The patient was first assessed by a paediatric endocrinologist to ensure puberty – and thus spermatogenesis – had begun, then by in vitro fertilisation specialists, to explain and offer sperm freezing for fertility preservation. Finally, the patient underwent an electroejaculation procedure under general anaesthesia to obtain motile sperm, which were subsequently frozen.

This is the first case of fertility preservation in a paediatric oncology patient in Singapore, where the use of electroejaculation for semen collection was timely and appropriate due to the patient's unprecedentedly young age.

ELECTROEJACULATION TO PRESERVE AND ASSIST FERTILITY

Electroejaculation is a procedure to induce ejaculation. It is classically used in patients who are unable to ejaculate due to spinal cord injuries secondary to neurologic disorders; traumatic injury; complications of surgery or anejaculation due to psychological reasons. The procedure involves the electrical stimulation of the nerves of the pelvis muscles, to cause erection and ejaculation.

Electroejaculation is useful as a method of obtaining sperm for fertility preservation, as the procedure has no reported major complications worldwide. It is also not contraindicated by age, provided spermatogenesis has begun. Two adult male patients who underwent electroejaculation in 2013 at KKIVF Centre, were able to retrieve sufficient samples for assisted reproductive technology (ART).

In recent years, advancements in oncology treatment for childhood cancers have resulted in improved survival rates, as high as 70 to 90 percent. Unfortunately, some cancer treatments, such as bone marrow transplant, radiation of the gonads or the brain, and some types of chemotherapy, may have the unintended side effect of reduced fertility or even sterility.

In male patients, sperm freezing for fertility preservation is recognised worldwide and offered as a clinical service. However, due to the young age of paediatric oncology patients, the use of electroejaculation for semen collection can be appropriate and timely for their developmental stage. This provides them the possibility of biological fatherhood in future, with ART.

This first case of successful electroejaculation for sperm collection from a pre-teen patient in Singapore bodes well for future cases warranting fertility preservation for paediatric patients.

MIND MATTERS

Managing challenging behaviour in children and adolescents with intellectual disabilities

Dr Radha Srikanth, Consultant, Department of Psychological Medicine (Child and Adolescent); Department of Child Development, KK Women's and Children's Hospital

An intellectual disability is defined as having an intellectual quotient of less than 70, accompanied by deficits in adaptive and social functioning originating at birth up to 18 years. The condition is common worldwide and studies have estimated the prevalence to be approximately one percent of the general population[1]. Significant proportions of children with intellectual disabilities display challenging behaviours.

Figure 1. Types of challenging behaviours in children with intellectual disabilities

CHILDREN WITH INTELLECTUAL DISABILITIES ARE MORE LIKELY TO HAVE CO-MORBIDITIES SUCH AS:

- An autistic spectrum disorder
- Attention deficit hyperactivity disorder (ADHD)
- A conduct disorder
- An emotional disorder
- A depressive disorder

CHALLENGING BEHAVIOURS

Children with intellectual disabilities can display different challenging behaviours. At KK Women's and Children's Hospital, the most commonly seen behaviours are aggression, non-compliance and self-injury. However, other behaviours also include rigidity, destruction of property, sexually inappropriate behaviours, shouting, screaming and excessive crying (Figure 1).

Of these challenging behaviours, self-injury and aggression can be the most bothersome and common causes of concern. Children with intellectual disabilities can display varying degrees of self-injury and aggression and these behaviours are more common in boys. Self-injury and aggression can be associated with psychological influences, learned behaviour, communication of needs, self-stimulation, physical distress and psychiatric disorders. They are commonly seen in genetic and metabolic conditions, such as Prader-Willi; Lesch-Nyhan; Cornelia de Lange; Smith-Magenis and Fragile-X syndromes.

Several factors are implicated in the aetiology of challenging behaviour, including the following:

- **COMMUNICATION DIFFICULTIES**
- **SENSORY PROCESSING ISSUES**
- **DIETETIC ISSUES**
- **TOILETING ISSUES**
- **MEDICAL FACTORS** (e.g. dental issues, constipation, infections, epilepsy and viral illness)
- **BEHAVIOURAL PHENOTYPES** (e.g. Prader-Willi, Lesch-Nyhan and Smith-Magenis syndromes)
- **NEUROCHEMISTRY** (e.g. opioids, serotonin and dopamine)
- **IATROGENIC ISSUES** (e.g. psychotropic medications and antiepileptics)
- **SOCIAL ISSUES** (e.g. lack of support and leisure activities)
- **PSYCHOLOGICAL ISSUES** (e.g. attachment and operant learning)
- **PSYCHIATRIC CO-MORBIDITIES** (e.g. ADHD, autism and mental illness)

DIAGNOSIS AND MANAGEMENT

When diagnosing challenging behaviours in children with intellectual disabilities, a detailed history of individual behaviours, including the antecedents and consequences, helps to ascertain the function of the behaviours and aids in the diagnosis. Behavioural management can be proactive and reactive, and includes addressing fatigue, avoiding task repetition, scheduling of activities, preventing aversive interactions between carer and child and addressing sensory needs[2, 3].

The use of medications to manage challenging behaviours is a contentious issue in the absence of a psychiatric disorder. However, several studies have identified benefits in the short-term use of the drug risperidone to aid in the management of severe aggression[4, 5, 6]. The use of selective serotonin reuptake inhibitors (SSRI) has also been found to be useful in mitigating severe self-injury. The use of medications must always follow, or be in conjunction with behavioural management approaches.

EARLY INTERVENTION IS IMPORTANT

For children with intellectual disabilities, early intervention is paramount to enable prevention and recovery from psychiatric disorders or challenging behaviour. Children who are diagnosed with genetic or other syndromes at birth, or during the neonatal period, should undergo regular assessment and intervention as appropriate.

Children who present with suspected intellectual or developmental delays, or any challenging behaviours during their routine developmental assessment, should be referred to a paediatrician for a full evaluation. This facilitates early intervention, such as parent training, referral to early intervention programmes and appropriate therapies, to achieve optimal outcomes for the child.

Children who are exposed to severe social disadvantage from a very early age may benefit from screening for delays, so problems can be identified and the right support provided to improve their quality of life. For older children aged seven and above with a diagnosed intellectual disability, any change in behaviour or deterioration in daily functioning will benefit from an initial evaluation by primary care physicians to rule out common physical ailments. If needed, the child should be referred for tertiary assessment and management.

References

1. Emerson E. (2001) Challenging Behaviour: Analysis and Intervention in People with Severe Intellectual Disabilities. Cambridge University Press, Cambridge
2. LaVigna GW, Willis TJ (1995) Challenging Behaviour: A Model for Breaking the Barriers to Social and Community Integration. Institute for Applied Behavior Analysis, Positive practices, Volume 1, Number 1
3. LaVigna, G. W., & Donnellan, A. M. (1986). Alternatives to punishment: Solving behavior problems with nonaversive strategies. New York, NY: Irvington Publishers
4. Allington-Smith. P. Mental health of children with learning disabilities. Advances in Psychiatric Treatment (2006) 12: 130-138
5. Stewart L. Einfeld -Systematic management approach to pharmacotherapy for people with learning disabilities. Advances in Psychiatric Treatment (2001) 7: 43-49
6. Research Units on Pediatric Psychopharmacology Aut, (2005). Risperidone Treatment of Autistic Disorder: Longer-Term Benefits and Blinded Discontinuation after 6 Months. Am. J. Psychiatry 162: 1361-1369

Dr Radha Srikanth graduated from the Tamil Nadu Dr MGR Medical University in India and completed advanced training in the psychiatry of learning disabilities and clinical neuropsychiatry in the United Kingdom. She is a member of the Royal College of Psychiatrists, UK. Dr Radha's areas of interest are in paediatric intellectual disabilities presenting with challenging behaviours or other mental, neurodevelopmental and neuropsychiatric disorders.

RECOGNISING AND MANAGING EARLY CHILDHOOD CARIES

Dr Chay Pui Ling, Registrar, Dental Service, KK Women's and Children's Hospital

Tooth decay in primary teeth, in a child younger than six years, is termed early childhood caries (ECC). An infectious disease, ECC is mainly caused by the bacteria streptococcus mutans, which metabolise fermentable carbohydrates, notably sugars, to produce acid – leading to mineral loss of the tooth.

The early stages of ECC are usually asymptomatic and characterised by changes in the appearance of the tooth structure. However, if the decay is allowed to progress, ECC can cause significant tooth discomfort and pain, as well as infection that can be localised to the gum, or be a cause of facial cellulitis. It can affect a child's ability to chew, sleep and perform well in school, and even adversely impact self-esteem.

Retaining the primary teeth is important to help hold spaces for the permanent teeth to erupt in better alignment. ECC can have long term effects as children with decayed primary teeth tend to have a higher risk of decay in their permanent teeth in future.

STAGES OF EARLY CHILDHOOD CARIES

Early decay

In the early stages of decay, white spot lesions can be visible on the teeth. These appear as chalky, dull opaque white areas on the teeth, near the gum line. At this early stage, it is still possible to reverse the decay process and prevent a cavity from forming.

Moderate decay

As the decay process and mineral loss from the teeth continues, yellow or brown cavitations start to develop.

Severe decay

Further decay progression leads to larger cavitations involving a larger area or more surfaces of the tooth. As the decay and bacteria progress towards the pulp or nerve of the tooth, infection of the tooth can manifest as a dental abscess, or "gum boil" on the gums around the tooth. A child may also complain of pain or swelling associated with the infected tooth.

Image source: Dr Travis Nelson DDS, MSD, MPH, Clinical Assistant Professor, Department of Pediatric Dentistry, University of Washington.

PREVALENCE

ECC is prevalent in Singapore, affecting up to 40 percent of preschool-aged children aged between three and six years. This trend is concerning from a healthcare perspective, as despite being a developed nation with fluoridated water supplies, the prevalence of ECC in our young does not seem to be decreasing as yet.

Despite having multiple risk factors, ECC is very preventable. Healthcare professionals who have frequent contact with infants and children play a pivotal role in facilitating early intervention. This includes early detection of dental decay, timely referral to seek dental care, and educating parents on the importance of healthy dental habits for their children.

RISK FACTORS

Risk factors of ECC include factors that can affect the bacterial microflora in the oral cavity, the type and availability of fermentable carbohydrates, the tooth structure and other factors.

RISK FACTORS ASSOCIATED WITH EARLY CHILDHOOD CARIES

Factors influencing bacteria microflora

- Poor oral hygiene
- Dental disease
- High streptococcus mutans count in parents or caregivers

Factors influencing type and availability of fermentable carbohydrates

- Frequent consumption of foods containing sugar
- Frequent snacks between meals
- On-demand feeding through the night beyond one year

Factors influencing tooth structure

- Defects in tooth enamel

Other factors

- Lack of fluoride exposure
- Lower socioeconomic status

PREVENTIVE MANAGEMENT

ECC is largely preventable by early examination, identification of individual risk factors, parental counselling on dental and dietary habits and initiation of preventive care procedures such as topical fluoride application by the dentist. All children should have their first dental visit when their first tooth erupts or no later than one year of age.

Healthy dental habits

Once a child's primary teeth have erupted, the teeth should be wiped with a clean wet towel or finger brushed twice daily. When more teeth have erupted, they should be brushed with a toothbrush twice daily. A pea-sized amount of toothpaste can be used once the child knows how to spit – usually around two years. A dentist can recommend an appropriate fluoridated toothpaste based on each individual child's caries risk. Brushing of teeth should be supervised up to the age of six years.

Parents and caregivers should also undergo regular dental examinations, have any cavities or gum disease treated, and practice good oral hygiene and dietary habits. This is because those who have high levels of streptococcus mutans in their saliva are more likely to infect their infants, for instance, through the sharing of food and utensils. The earlier the child is infected with these bacteria, the higher the child's risk of developing ECC.

Healthy dietary habits

Infants should be weaned off the milk bottle onto a sippy cup or cup with a straw by one year. They should not be allowed to fall asleep with a bottle containing formula milk, sweet drinks or juices in their mouth. A child at high risk of tooth decay should not be given sweet treats and drinks too often. It is important to note that it is the frequency, rather than the quantity of sweet treats, that influences the risk of ECC. Healthy alternatives such as fresh fruit, vegetables, wholegrain and dairy products, should substitute sugary foods such as sweets, cookies, or cake.

RESTORATIVE MANAGEMENT

When preventive efforts fail to arrest ECC, restorative treatment is indicated. These can include fillings, pulp treatment, stainless steel crowns and extractions of the affected primary teeth.

Treatment delivery can be challenging at times, due to the young age and lack of coping ability of children. In situations where restoration is not feasible or desirable, aggressive preventive measures may be implemented to limit decay progression. This can provide time for the child to mature and learn to cope with dental treatment.

In many cases, however, restorative care must be provided to prevent or alleviate pain and tooth loss caused by ECC. If a child is unable to cope with restorative treatment on the dental chair, or the treatment need is extensive, dental treatment under general anaesthesia may be required.

The paediatric dentists at KK Women's and Children's Hospital's (KKH) Dental Service specialise in oral care for infants and children, including those with special health needs.

For general enquiries related to the Dental Service at KKH, please email **ccrc@kkh.com.sg.** To make a dental appointment, please call **+65 6394 1521/8587.**

Dr Chay Pui Ling completed a Bachelor of Dental Surgery at the National University of Singapore. She further pursued and completed a Doctor of Clinical Dentistry at the University of Melbourne, Australia, with clinical training at the Royal Dental Hospital of Melbourne and The Royal Children's Hospital. Dr Chay's current interests include dental management of medically compromised children and children with special needs.

THE WAR ON ANTIBIOTIC RESISTANCE

Preserving antibiotic effectiveness for future generations

Valerie Seah, Antimicrobial Stewardship Pharmacist, KK Women's and Children's Hospital

Antimicrobials, in particular antibiotics, have revolutionised the practice of medicine ever since their widespread use in the late 1940s, saving countless lives and reducing morbidity for many when prescribed and taken correctly. However, with the widespread use of antibiotics, there has been a global rise and spread of increasingly antibiotic-resistant organisms, such as methicillin-resistant staphylococcus aureus and extended spectrum beta-lactamase-producing enterobacteriaceae[1].

Antibiotic drug resistance is a growing public health threat worldwide. New broad-spectrum antibiotics have been developed to counter the rise of these resistant organisms, but with limited success in the face of developing resistance. Infections caused by these antibiotic-resistant organisms can result in longer hospital stays and even deaths[2].

A key weapon in the war on antibiotic resistance, hospital antimicrobial stewardship programmes (ASPs) promote the judicious use of antimicrobials through optimal usage[3]. These programmes have proven to be effective in improving antimicrobial use and patient outcomes, as well as contributing significantly towards reducing the rates of antimicrobial-resistant organisms and healthcare-associated costs[4,5].

ANTIMICROBIAL STEWARDSHIP AT KKH

The KK Women's and Children's Hospital Antimicrobial Stewardship Programme (KKH ASP) was formally introduced in July 2011 to facilitate optimal therapy for patients requiring antibiotic treatment. The KKH ASP team comprises infectious disease physicians and antimicrobial stewardship pharmacists, who work to promote the judicious use of antimicrobials in a unique patient population of children and women with obstetric and gynaecological conditions.

To this end, the team employs a prospective-intervention-and-feedback strategy[3], performing daily reviews of selected antibiotics, in particular broad-spectrum antibiotics of the carbapenem class, during clinical rounds. The team then provides feedback to the hospital's medical teams to optimise patient care management. This includes patient-specific recommendations for alternative, targeted antibiotics which are as effective, but not as broad-spectrum in specific conditions. Such prospective intervention and feedback help to reserve the use of broad-spectrum antibiotics for medical conditions where they are absolutely necessary, and reduce the risk of antibiotic-resistance development.

At KKH, carbapenems are prescribed to treat serious infections for medical conditions such as sepsis, bloodstream infections and febrile neutropenia. To date, the KKH ASP team has reviewed more than 450 prescriptions for carbapenems, largely for paediatric haematology, oncology, neonatology and obstetrics and gynaecology patients. The team has also developed empiric antimicrobial guidelines for the paediatrics, obstetrics and gynaecology disciplines, to reinforce the provision of safe care to patients in the hospital.

The KKH ASP performs an important educational function, regularly revising and updating evidence-based guidelines for the use of antimicrobials in specific infections and various conditions in the hospital, as new data becomes available. The team also holds regular educational talks for the hospital's staff to disseminate information on new observations and share recommendations for care management.

COMMUNITY ANTIMICROBIAL STEWARDSHIP

Antibiotics are prescribed in hospitals and in the community, so the way they are used today for individuals will have an impact on their effectiveness for others in the future. For instance, unnecessary or inappropriate use of antibiotics will increase risks of the acquisition and spread of antibiotic-resistant infections.

Common ways that antibiotics can be misused include:

- **Consuming antibiotics prescribed for someone else** – taking antibiotics that are not appropriate for a person's condition can delay correct treatment.
- **Not completing the full course of antibiotics as prescribed** – stopping antibiotics too soon can result in some bacteria surviving, which then has the potential to cause a re-infection. As the surviving bacteria may have developed resistance to the antibiotic, stronger antibiotics, that may have more side effects, may be needed to treat the new infection. The antibiotic-resistant bacteria can also spread in the community.
- **Consuming antibiotics for viral infections, such as the common cold or flu** – antibiotics are used to treat bacterial infections, and are not effective against viral infections such as the common cold, most sore throats and the flu.

Antimicrobial stewardship is a collective effort, not only by prescribers to limit prescription of antibiotics to infections where they are useful, but also by the community to use antibiotics exactly as prescribed for specific conditions and to understand that antibiotics are not necessary for viral infections such as the common cold or flu. This collective effort is critical to preserve antibiotic effectiveness, as well as to minimise the impact of bacterial resistance for future generations.

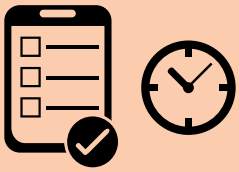
PRACTICE TIPS FOR APPROPRIATE ANTIBIOTIC USE

When patients ask for antibiotics to treat viral infections:

SHARE THE FACTS

Explain that bacterial infections can be cured by antibiotics but viral infection CANNOT be cured by antibiotics.

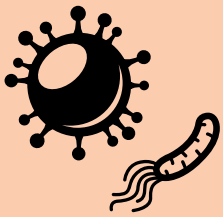
Explain that treating viral infections with antibiotics to prevent bacterial infections does not work.



ENCOURAGE ACTIVE MANAGEMENT OF THE ILLNESS

Explicitly plan treatment of symptoms with patients.

Describe the expected course of time the illness will take to resolve and tell patients to come back if the symptoms persist or worsen.



EXPLAIN THAT UNNECESSARY ANTIBIOTICS CAN BE HARMFUL

Inform patients that based on the latest evidence, unnecessary antibiotics CAN be harmful, by promoting resistant organisms in them and in the community.

BE CONFIDENT WITH THE RECOMMENDATION TO USE ALTERNATIVE TREATMENTS

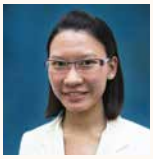
Prescribe analgesics and decongestants, if appropriate.

Emphasise the importance of adequate nutrition and hydration.

Adapted from print material on careful antibiotic use from the Centers for Disease Control and Prevention, United States, the national public health institute. http://www.cdc.gov/getsmart/campaign-materials/info-sheets/child-practice-tips.pdf

References

1. Antimicrobial Resistance, Centers for Disease Control and Prevention, http://www.cdc.gov/drugresistance/about.html.
2. Tzouvelekis LS, Markogiannakis A, Psichogiou M et al. Carbapenemases in Klebsiella pneumoniae and other Enterobacteriaceae: an evolving crisis of global dimensions. Clin Microbiol Rev 2012; 25: 682-707
3. Dellit TH, Owens RC, McGowan JE et al. Infectious Diseases Society of America and the Society for Healthcare Epidemiology of America guidelines for developing an institutional program to enhance antimicrobial stewardship. Clin Infect Dis 2007; 44: 159-177
4. Nowak MA, Nelson RE, Breidenbach JL et al. Clinical and economic outcomes of a prospective antimicrobial stewardship program. Am J Health-Syst Pharm 2012; 69: 1500-1508
5. Patel D, Lawson W, Guglielmo BJ. Antimicrobial stewardship programs: interventions and associated outcomes. Expert Rev Anti Infect Ther 2008; 6: 209-222



Valerie Seah graduated from National University of Singapore with a Bachelor of Science in Pharmacy. Valerie's current interests include paediatric infectious diseases and antimicrobial stewardship.

FOR THE ENDURING BENEFIT OF EVERY CHILD

On 22 February 2014, the medical community came together to support the launch of the Tan Cheng Lim Research and Education Fund, named in honour of Singapore's longest-serving paediatrician in public healthcare.

Senior Minister of State for Health, Dr Amy Khor, said, "I am glad to know that the Tan Cheng Lim Research and Education Fund has been set up, and the funds raised will be used to further the cause of paediatric research and education in Singapore. (This is) a fitting tribute to a man who has dedicated his life to providing both excellent clinical care and mentorship. May future generations of students and paediatricians rise to this challenge, to uphold and emulate the values that he stands for."

Professor and Mrs Tan Cheng Lim present a commemorative book to Senior Minister of State for Health, Dr Amy Khor, during the launch of the Tan Cheng Lim Research and Education Fund.

"Paediatric medicine exists to save the lives of precious children who are ill, and is often a source of support and hope for parents during a time of helplessness and devastation.

While paediatric medicine has come a long way in our lifetime, through the fund, we hope to make a start towards securing the future of our children's health beyond what we can do in one lifetime – for the enduring benefit of every child."

Professor Tan Cheng Lim
Emeritus Consultant, Haematology/ Oncology Service, KKH

SUPPORT PAEDIATRIC RESEARCH AND EDUCATION

To make a gift towards the Tan Cheng Lim Research and Education Fund, please complete the donation form enclosed in this issue of Special Delivery. You can also contact Christine or Xian Hui at **+65 6394 2329 / 8439**, or email **development@kkh.com.sg**.

ABOUT PROFESSOR TAN CHENG LIM

Answering the first of many calls to duty in 1973, Professor Tan Cheng Lim served as President of the Singapore Paediatric Society, and subsequently helmed the paediatrics department at Alexandra Hospital (1974-1977), Singapore General Hospital (1977-1997) and KK Women's and Children's Hospital (KKH) (1997-1999). He then took on the role of educator-mentor and administrator as Associate Dean at KKH from 2004 to 2012.

Throughout 50 years of service in public healthcare, Prof Tan has helped to lay the foundation for the evolution of clinical practice, education and research in paediatric medicine, and provided much-needed mentorship, immense clinical knowledge and wise counsel to countless young clinicians specialising in paediatric care.

Prof Tan is currently Emeritus Consultant, Haematology/ Oncology Service at KKH's Department of Paediatric Subspecialties. He is also Adjunct Professor, Yong Loo Lin School of Medicine and Duke-NUS Graduate Medical School, Singapore.

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