



**10<sup>th</sup> KKH Scientific Meeting 2019**

# **Patient-Centric Care: Precision Medicine and Personalised Care**

11 and 12 October 2019 (Friday and Saturday)

KKH Training Centre, Level 1, Women's Tower



## **Programme & Abstracts**



# 10<sup>th</sup> KKH Scientific Meeting 2019

## Patient-Centric Care: Precision Medicine and Personalised Care

*11-12 October 2019*

*KKH Auditorium (Training Centre), Level 1, Women's Tower*

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Ms Annie Choo (Programme)

Ms Nicole Lee (Abstracts)

Mr Rancel Shao Liang Ang (Abstracts)

Ms Shaista d/o Arif (Abstracts)

#### *Trade & Exhibition*

Ms Murni Pokol

## FOREWORD

Dear colleagues and friends,

2019 marks yet another milestone year for KK Women's and Children's Hospital, as we continue our journey in academic medicine and hold our 10<sup>th</sup> KKH Scientific Meeting.

We have come a long way and grown from strength to strength since we organised our first Scientific Meeting in 2005. Over the years, KKH has made many breakthroughs and contributions to improving the health of women and children. Initiatives include the launch of the KK Human Milk Bank, introduction of a novel technique for women undergoing mastectomy, establishment of national standards for management of neonatal jaundice, establishment of Singapore's first Integrated Platform for Research in Advancing Metabolic Health Outcomes in Women and Children (IPRAMHO) and development of rapid genomic sequencing in the diagnosis of rare diseases in critically ill children. Other than highlighting some of the hospital's scientific achievements at this year's conference, we have also brought to the fore the roles played by our Nursing and Allied Health colleagues in the support provided to caregivers in their caregiving journey.

The evolution of future medicine lies in the personalisation of medical care. Genomic medicine is at the spearhead of improving clinical management, and holds the promise of unprecedented impact in the fields of oncology, rare, undiagnosed and unknown diseases. This year's conference is, hence, aptly themed 'Patient-Centric Care: Precision Medicine and Personalised Care'.

In conjunction with this year's Scientific Meeting, the SingHealth Duke-NUS Academic Medical Centre is launching its new Genomic Medicine Centre. The Centre will establish clinical care pathways to manage patients across disciplines and institutions in SingHealth, enabling standards in the provision of genetics driven care across SingHealth and the holistic care of patients and their families.

It is our privilege to have Mr Edwin Tong, Senior Minister of State, Ministry of Law and Ministry of Health, join us and grace our event as well as the launch of the SingHealth Duke-NUS Genomic Medicine Centre, with his presence. The Genomic Medicine Centre, as a primary partner for the National Precision Medicine initiative, will facilitate close collaboration between the health system and the Ministry of Health to catalyse and accelerate clinical implementation pilots.

Indeed, exciting days await us. This Scientific Meeting would not have been possible without the dedication and great assiduousness shown by the Organising Committee, ably led by Dr Tan Ee Shien and Dr Serene Thain with Dr Yeo Joo Guan as Scientific Chair. With a line-up of topics spanning infant to child health and women's health, I am certain that there will be much that will appeal to all conference participants.

I wish you all a fulfilling and enriching time!

Warm regards,



**Associate Professor Ng Kee Chong**  
Chairman, Medical Board

## MESSAGE FROM THE ORGANISING CHAIRPERSONS

Dear colleagues and friends,

On behalf of the Organising Committee, we extend a warm welcome to each and every one of you to the 10<sup>th</sup> KKH Scientific Meeting 2019!

The theme of this year's meeting is 'Patient-Centric Care: Precision Medicine and Personalised Care'. This year's conference shines the spotlight on leveraging the advances in genomics, science and technology in the provision of precise and personalised care to patients. In our day-to-day work, we see KKH staff from different disciplines coming together to deliver the best medical care possible for our patients and this is reflected in the multidisciplinary nature of our symposia sessions. The two-day conference will encompass two plenary, six symposia sessions, three workshops and a debate on the increasing popularity and use and benefit of social media in the provision of medical care.

A total of 166 abstracts have been accepted this year, with the bulk of the abstracts being submitted for Clinical Research, Nursing Research and Allied Health Research.

The patient engagement journey has taken on a more crucial role in today's healthcare landscape. In recognition of this, we have invited and are privileged to have patients joining us at the conference to share their first-hand accounts. Some of the symposia sessions are also focussed on the patient and caregiver experience.

We wish to thank our speakers for taking the time to engage the conference participants in an exciting day of learning. We also wish to thank our sponsors for their generosity and support. Last but not least, our heartfelt thanks to the members of the Organising Committee for all their hard work in putting this wonderful meeting together!



**Dr Tan Ee Shien**  
Chairperson, Organising Committee  
10<sup>th</sup> KKH Scientific Meeting 2019



**Dr Serene Thain**  
Co-Chairperson, Organising Committee  
10<sup>th</sup> KKH Scientific Meeting 2019

## FACULTY

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**Dr Ang Chung Yen**

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PerkinElmer Singapore Pte Ltd

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Director, SingHealth Intellectual Property  
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Head, Emerging Services and Capabilities Group  
Integrated Health Information Systems (iHIS), Singapore

**Ms Chole Chu**

Executive, SingHealth Intellectual Property  
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Vice President, Business Digitization  
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Senior Manager, Medical Technology Office  
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Occupational Therapist  
AWWA Community Integration Service, Singapore

## FACULTY

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Assistant Director  
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Senior Consultant, Emergency Medicine

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**Ms Zhou Li**

Nurse Clinician, Nursing Specialist Services  
Division of Nursing

## 10 October 2019 (Thursday) – Pre-Conference Workshop on Innovation

Venue: Lecture Theatre

Time	Programme	Speakers
2.00pm	Introduction	Assoc Prof Derrick Chan Wei Shih Research Director, KK Research Centre Head and Senior Consultant, Neurology Service, KKH Director, Clinician Innovator Track, Office of Academic and Clinical Development Deputy Director (Education), Medical Technology Office, SingHealth
2.05pm	Opening address and launch of Health Services Innovation and Development Grant 2019	Assoc Prof Ng Kee Chong Chairman, Medical Board, KKH
2.15pm	Sharing journey	Assoc Prof Sng Ban Leong Head and Senior Consultant Department of Women's Anaesthesia, KKH Ms Cynthia Lim Advanced Practice Nurse Children's Emergency, KKH
2.35pm	Design thinking and medtech considerations	Ms Fiona Loke Senior Manager, Medical Technology Office, SingHealth
2.50pm	Innovation from organisation transformation's standpoint	Dr Leo Kee Hao Assistant Director, Office for Service Transformation, SingHealth
3.05pm	Data analytics in innovation	Ms Goh Bee Keow Senior Manager, Data Analytics Office, KKH
3.20pm	IT challenges in healthcare innovation	Mr Chua Chee Yong Director, Emerging Services and Capabilities Group Integrated Health Information System (IHIS) Head, IT Strategy and Planning Ministry of Health (MOH), Singapore
3.35pm	Innovation funding pathways	Assoc Prof Derrick Chan Wei Shih Research Director, KK Research Centre, KKH
3.50pm	Protecting intellectual property	Ms Chole Chu Executive, SingHealth Intellectual Property, SingHealth
4.05pm	Tea break	
4.15pm	Panel discussion	
4.45pm	Closing address	Dr Eileen Lew Director, Medical Innovations and Care Transformation Deputy Chairman, Division of Clinical Support Services Senior Consultant, Department of Women's Anaesthesia, KKH

## 11 October 2019 (Friday): Main Conference (Day One)

Venue: KKH Auditorium

Time	Programme	Speakers
9.00am	Welcome address by Organising Chairperson	Dr Tan Ee Shien Chairperson, 10 <sup>th</sup> KKH Scientific Meeting 2019 Head and Senior Consultant, Genetics Service, KKH
9.05am	Opening remarks by Chairman, Medical Board KKH programmes through the life cycle	Assoc Prof Ng Kee Chong Chairman, Medical Board, KKH
9.30am	Opening address by Guest of Honour	Mr Edwin Tong Senior Minister of State, Ministry of Law and Ministry of Health, Singapore
9.40am	Launch of the SingHealth Duke-NUS Genomic Medicine Centre	
9.50am	Genomic sequencing and personalised medicine	Dr Saumya Shekhar Jamuar Head, SingHealth Duke-NUS Genomic Medicine Centre Senior Consultant, Genetics Service, KKH
10.10am	<b>Plenary 1</b> Precision cell therapy in paediatric haematology/oncology	Prof Leung Wing Hang Director, Research, SingHealth Duke-NUS Transplant Centre Senior Consultant, Haematology/Oncology Service, KKH
10.40am	Tea break and poster viewing	Venue: Women's Tower Podium, Level 1

<b>Symposium 1</b> Paediatric Oncology <i>Chairperson: Prof Leung Wing Hang, Director Research SingHealth Duke-NUS Transplant Centre Senior Consultant, Haematology/Oncology Service, KKH</i>		Venue: KKH Auditorium
11.10am	Paediatric haematology/oncology: A patient's experience	
11.30am	Preclinical models and novel biomarker discovery for paediatric solid tumors	Dr Amos Loh Deputy Director, KK Research Centre Senior Consultant, Department of Paediatric Surgery, KKH
11.50am	Pathology in precision oncology	Assoc Prof Kenneth Chang Head and Senior Consultant Department of Pathology and Laboratory Medicine, KKH
12.10pm	Proton therapy for paediatric CNS tumours	Dr Looi Wen Shen Associate Consultant, Division of Radiation Oncology, NCCS
12.30pm	Neurocognitive evaluations and psychosocial supportive care for children and young people with cancer	Dr Lois Teo Head and Senior Principal Psychologist, Psychology Service, KKH
12.50pm to 1.50pm	Lunch, poster viewing and poster competition	Venue: Women's Tower Podium, Level 1
<b>Symposium 2</b> Fetal medicine: From womb to world <i>Chairperson: Dr Thia Wee Hong Edwin, Deputy Head and Senior Consultant, Department of Maternal Fetal Medicine, KKH</i>		Venue: Lecture Theatre
11.10am	Bart's hydrops: A mother's experience	
11.30am	The inverted pyramid of prenatal care	Dr Serene Thain Associate Consultant, Division of Obstetrics and Gynaecology, KKH
11.50am	Fetal therapy and surgery	Dr Anju Bhatia Staff Physician, Department of Maternal Fetal Medicine, KKH
12.10pm	Advancing the frontiers of fetal gene therapy	Prof Jerry Chan Senior Consultant, Department of Reproductive Medicine, KKH
12.30pm	KK Human Milk Bank: Giving premature babies the best start in life	Dr Chua Mei Chien Head and Senior Consultant, Department of Neonatology, KKH
12.50pm to 1.50pm	<b>Lunch symposium (Sponsored by Sanofi-Aventis)</b> Common hereditary lysosomal storage diseases	
	Treatable common lysosomal storage diseases	Dr Ngu Lock Hock Consultant in Clinical Genetics and Inherited Metabolic Disorders, Hospital Kuala Lumpur
	The spectrum of mucopolysaccharidosis	Dr Lin Hsiang-Yu Associate Professor in Department of Paediatrics, MacKay Medical College, New Taipei City
<b>Symposium 3</b> Nursing and Allied Health <i>Chairperson: Dr Huang Fang, Assistant Director of Nursing, Division of Nursing, KKH</i>		Venue: Conference Room 1 and 2
11.10am	The patient experience - Gynaecology patient	
11.30am	Pre and post-operative dietary optimisation for gynaecology patients	Ms Cheryl Au Senior Dietitian, Nutrition and Dietetics Department, KKH
11.50am	Sentinel lymph node biopsy in gynaecological cancers	Dr Wang Junjie Consultant, Department of Gynaecological Oncology, KKH
12.10pm	APAE clinic	Ms Wei Na Nurse Clinician, Division of Nursing (APN Office), KKH
12.30pm	Rehabilitation for gynaecology patients	Ms Barbara Wee Senior Physiotherapist, Physiotherapy Department, KKH
12.50pm to 1.50pm	<b>Lunch symposium (Sponsored by PerkinElmer)</b> Tandem mass spectrometry - A simple and rapid solution for the newborn screening for inborn errors of metabolism	Dr Ang Chung Yen, PhD Senior Application Scientist, PerkinElmer
		Venue: KKH Auditorium
1.50pm	<b>Plenary 2</b> Metabolic health in women and children - The IPAMHO experience	Dr Ang Seng Bin Head and Senior Consultant, Family Medicine Service, KKH

## Symposium 4

Personalised medicine in women's health

Chairperson: *Dr Ieera Aggarwal, Consultant, Department of Gynaecological Oncology, KKH*

Venue: KKH Auditorium

2.20pm	The role of pre-implantation genetic screening (PGS) and pre-implantation genetic diagnosis (PGD) in reproductive medicine	Dr Sadhana Nadarajah Senior Consultant, Department of Reproductive Medicine, KKH
2.45pm	Personalised medicine in anaesthesiology	Assoc Prof Sng Ban Leong Head and Senior Consultant, Department of Women's Anaesthesia, KKH
3.10pm	Personalised management of gynaecological cancer	Dr Lim Sheow Lei Visiting Consultant (Senior Medical Oncologist) Department of Gynaecological Oncology, KKH
3.35pm	The role of genetics in the development of therapeutics for osteoporosis	Dr Ang Seng Bin Head and Senior Consultant, Family Medicine Service, KKH
4.00pm	Tea break and poster viewing	Venue: Women's Tower Podium, Level 1

## Symposium 5

Caring for children with autism/medically complex children and their caregivers – Care transitions and caregiver burnout

Chairperson: *Dr Sylvia Choo, Senior Consultant, Department of Child Development and Ms Zeng Yan Yi, Advanced Practiced Nurse, Division of Nursing, KKH*

Venue: Lecture Theatre

2.20pm	Growing up with autism spectrum disorder: A social and developmental perspective	Ms Gwen Chng Autism Resource Nurse, Department of Child Development, KKH
2.35pm	A social and developmental perspective of autism spectrum disorder across the lifespan	Dr Koh Hwan Cui Senior Psychologist, Department of Child Development, KKH
3.00pm	A caregiver journey of transition to adult care for medically complex patients	Ms Wong Wanlin Senior Medical Social Worker, Medical Social Work Department, KKH Ms Zhou Li Nurse Clinician, Division of Nursing Nursing Specialist Services, KKH
3.20pm	Transitioning rehabilitation care for medically complex patients from hospital to community	Ms Maheswari Vellaichamy Senior Physiotherapist, Physiotherapy Department, KKH Ms Stacy Tan Man Ling Senior Speech Therapist, Speech-Language Therapy Service, KKH Mr Joseph Acuna Tamos Occupational Therapist, AWWA Community Integration Service
3.40pm	Caregiver burnout/fatigue and respite care	Ms Wong Wanlin Senior Medical Social Worker, Medical Social Work Department, KKH Ms Melanie Kwan Senior Music Therapist Child Life, Art and Music Therapy Programme (CHAMPs), KKH
4.00pm	Tea break and poster viewing	Venue: Women's Tower Podium, Level 1

## Symposium 6

Improving patient experience

Chairperson: *Ms Irene Chan, Director, Office of Patient Experience, KKH*

Venue: Conference Room 1 and 2

2.20pm	The patient experience eco-system	Ms Irene Chan Director, Office of Patient Experience, KKH
2.45pm	Patient-reported outcome measures (PROMs) Patient-reported Experience Measures (PREMs)	Assoc Prof Ng Kee Chong Chairman, Medical Board, KKH Mr John Wong Senior Manager, Office of Patient Experience, KKH
3.10pm	Community acquired pneumonia (CAP) - Value driven care (VDC): Patient reported experience measures (PREMs)	Dr Biju Thomas Senior Consultant, Respiratory Medicine Service, KKH
3.35pm	Certis Living Lab in KKH	Mr Fuji Foo Vice President, Business Digitalization (Certis Technology) Ms Poh Ju Peng Solution Architect (Certis Technology)
4.00pm	Tea break and poster viewing	Venue: Women's Tower Podium, Level 1

Venue: KKH Auditorium

4.30pm	<b>Debate</b> The increasing popularity and use of social media has been of benefit to the provision of medical care	Moderator Adj Assoc Prof Shahdadpuri Raveen Ishwardas Senior Consultant General Paediatrics and Adolescent Medicine, KKH
5.30pm to 6.00pm	Award presentation and closing ceremony	

## 12 October 2019 (Saturday): Main Conference (Day Two)

Time	Programme	Speakers
<b>Workshop 1</b> Genetics education for physicians (maximum 50 participants)		Venue: KKH Auditorium
8.30am to 12.30pm	This interactive workshop focuses on the application of a wide range of genetic tests and practical pre- and post-test counselling in daily clinical work	<p><b>Dr Ting Teck Wah</b> Consultant, Genetics Service, KKH</p> <p><b>Dr Edwin Thia</b> Deputy Head and Senior Consultant Department of Maternal Fetal Medicine, KKH</p> <p><b>Ms Breana Cham</b> Principal Genetic Counsellor, Genetics Service, KKH</p> <p><b>Ms Lim Jiin Ying</b> Senior Genetic Counsellor, Genetics Service, KKH</p> <p><b>Ms Sylvia Kam</b> Genetic Counsellor, Genetics Service, KKH</p>
10.30am	Tea break	
<b>Workshop 2</b> Grief and bereavement: A person and family centric journey of care (maximum 30 participants)		Venue: Conference Room 1
8.30am to 1.00pm	<ul style="list-style-type: none"> <li>- Theoretical framework of grief and bereavement</li> <li>- Supporting the families and its impact on healthcare workers</li> <li>- Skills in managing grief</li> <li>- A parent's perspective</li> <li>- Our transforming journey of bereavement care in KKH</li> </ul>	<p><b>Dr Sylvia Mun</b> Assistant Director, Allied Health Office, KKH</p> <p><b>Ms Ang Lee Beng</b> Master Medical Social Worker, Medical Social Work Department Chair, KKH Bereavement Support Committee, KKH</p> <p><b>Ms Majella Irudayam</b> Principal Medical Social Worker, Child Development Department Co-Chair, KKH Bereavement Support Committee, KKH</p> <p><b>Ms Irene Chan</b> Director, Office of Patient Experience, KKH</p> <p><b>Dr Komal Tewani</b> Consultant, Palliative Medicine, Department of Gynaecological Oncology, KKH</p>
10.30am	Tea break	
<b>Workshop 3</b> Illusions of perfect communication (maximum 24 participants)		Venue: Conference Room 2
8.30am to 1.00pm	<p>Recognise different styles of communication and identify which style is the most suitable for a given scenario</p> <ul style="list-style-type: none"> <li>- Use effective communication to improve understanding and build rapport with others</li> <li>- Appreciate the role of body language and tone of voice in an effective communication</li> </ul>	<p><b>Dr Rajeswari Kathirvel</b> Consultant, Department of Obstetrics and Gynaecology, KKH</p> <p><b>Dr Serena Koh</b> Associate Consultant, Department of Obstetrics and Gynaecology, KKH</p> <p><b>Dr Suzanna Sulaiman</b> Senior Consultant, Department of Obstetrics &amp; Gynaecology, KKH Faculty from Department of Obstetrics and Gynaecology, KKH Supported by Office of Patient Experience, KKH</p>
10.30am	Tea break	
<b>KKH Centre Grant (CG) Research Networking Session</b>		Venue: Lecture Theatre
9.00am	Opening address	<b>Assoc Prof Ng Kee Chong</b> Chairman, Medical Board, KKH
9.15am	Introduction	<b>Assoc Prof Derrick Chan Wei Shih</b> Research Director, KK Research Centre, KKH
9.30am	<p>Breakout sessions</p> <ul style="list-style-type: none"> <li>- Nutrition/Metabolic</li> <li>- Brain/Cognition/Acquired Brain Injury</li> <li>- Genomics/Pharmacogenomics</li> <li>- MedTech</li> </ul>	
10.30am	Tea break	
10.50am	Sharing by groups	
11.50am	Closing	<b>Assoc Prof Derrick Chan Wei Shih</b> Research Director, KK Research Centre, KKH

## SPEAKER PROFILE

### **Dr Ang Seng Bin**

*Head and Senior Consultant*

*Family Medicine Service*

*KK Women's and Children's Hospital, Singapore*

Dr Ang Seng Bin is the Family Physician, Senior Consultant, Head of Family Medicine Service and Head of Menopause Unit of KK Women's and Children's Hospital. Dr Ang has been active in undergraduate and post-graduate teaching and has several teaching appointments which includes Director (Family Medicine Development) of Family Medicine Academic Clinical Programme, Associate Program Director of Singhealth Family Medicine Residency Program, Faculty for the Fellowship program of the College of Family Physician Singapore, Physician Faculty for the Singhealth O&G residency program, Adjunct Assistant Professor in O&G, Paediatric as well as family medicine clerkship for the Duke-NUS Medical School. He is also an Adjunct Clinical Associate Professor for School of Public Health, Curtin University (Australia). His research interests includes osteoporosis, menopause, sexual health, healthcare innovations as well as dermatology. Dr Ang has been an active member of various societies. He currently a member of the Board of Trustees, International Menopause Society, President of Asian Federation of Osteoporosis Societies, Council Member of Asia Pacific Menopause Federation, President of Menopause Research Society (Singapore) and Vice-President of Osteoporosis Society Singapore.

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### **Ms Cheryl Au**

*Senior Dietitian, Nutrition and Dietetics Department*

*KK Women's and Children's Hospital, Singapore*

Cheryl graduated with a Bachelors of Nutrition and Dietetics from Deakin University, Melbourne, Australia. She has been working as a clinical dietitian for 10 years at various acute hospitals. She has a special interest in oncology and women and children's health. She is currently involved in the care for oncology patients and patients with type 1 diabetes at KK Hospital. She enjoys swimming, tennis and cooking in her spare time.

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### **Dr Sharron Bennett**

*Director, SingHealth Intellectual Property*

*Singapore Health Services Pte Ltd, Singapore*

Sharron joined SHIP in January 2018. She was formerly at the National Health Innovation Centre Singapore (NHIC) which funds the development of early stage medtech and biopharma technologies towards a commercial endpoint. Before joining NHIC, Sharron was a Business Analyst in the Innovations team at the Wellcome Trust, London where she was responsible for the due diligence and project management of applications under their translational schemes. Sharron was also involved in the Medical Engineering initiative jointly funded by the Wellcome Trust to establish translational centres of excellence in the UK. Prior to this, Sharron spent six years at King's College London where, as the Senior Technology Transfer Manager, she had responsibility for large stakeholder programmes in addition to the technology transfer activities (such as licensing, spin out company formation) across the biomedical fields and clinical schools at King's. During this time, Sharron also led a UK Department of Trade & Industry funded initiative aimed at promoting best practice in IP management and commercialization of healthcare innovations from the NHS Trust setting. She also established and led a pan-London research tools initiative (comprising seven London-based academic institutions) designed to commercialise academic research tools. Sharron holds a Ph.D from the University of Sydney and an Investment Management Certificate from the UK Society of Investment Professionals.

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### **Dr Anju Bhatia**

*Staff Physician*

*Department of Maternal Fetal Medicine*

*KK Women's and Children's Hospital, Singapore*

Dr Anju Bhatia is a Staff Physician currently working with Department of Maternal Fetal Medicine, Division of Obstetrics & Gynaecology at KK Women's and Children's Hospital, Singapore. She graduated in India (MBBS), obtained postgraduate training and received doctorate degree (MD in Obstetrics & Gynaecology) from Lady Hardinge Medical College, University of Delhi in 1993. She obtained MRCOG (UK) in 2010. She has keen interest in the subspecialty of Maternal Fetal Medicine, joined the department in 2012. She is an integral member of fetal medicine team. She is the part of teaching faculty of Yong Loo Lin School of Medicine, National University of Singapore, Duke -NUS Graduate Medical School and Lee Kong Chian School of Medicine. She is actively involved in teaching residents, midwives, sonographers as well as genetic counsellors

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**A/Prof Derrick Chan Wei Shih**

*Research Director, KK Research Centre  
Head and Senior Consultant, Neurology Service  
KK Women's and Children's Hospital, Singapore*

Dr Derrick Chan is a paediatric epileptologist, Deputy Director (Education) for the SingHealth MedTech Office and Director of the SingHealth Clinician Innovator Development Programme. He trained in epileptology and neurophysiology at Great Ormond St Hospital, London, Royal Children's Hospital Melbourne and the Hospital for Sick Children, Toronto and set up the paediatric epilepsy programme and leads the paediatric neurology unit at KKH. He has multiple A\*STAR BioEngineering Programme Grants for projects in MedTech Innovation projects in computer vision seizure detection and EEG analysis. He is Principal Investigator of an NMRC-funded study of the pharmacogenomics of drug reactions with carbamazepine to validate rapid pharmacogenomic HLA-B\*1502 testing in-vitro diagnostic kits and their implementation and has been involved in clinical innovation for over 10 years.

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**Ms Irene Chan**

*Director, Office of Patient Experience  
KK Women's and Children's Hospital, Singapore*

Irene Chan started her healthcare career after graduating from Oxford University with a Master of Science in Management Studies specialising in Industrial Relations. She has more than 20 years of healthcare management experience that spans from tertiary to community care including public, private and non-profit healthcare institutions. Some of the organisations that Irene have worked in include Mount Elizabeth Healthcare Holdings, KK Hospital and Assisi Hospice. She is currently the Director of the Office of Patient Experience at KK Hospital. She also co-chairs the SingHealth Patient Experience Council and the KKH Patient Experience Council. Irene advocates for an integrated approach towards patient and staff experience in bringing healing to healthcare. She has been invited to speak at local and overseas conferences.

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**Prof Jerry Chan Kok Yen**

*Senior Consultant  
Department of Reproductive Medicine  
KK Women's and Children's Hospital, Singapore*

Dr Chan is a NMRC Senior Clinician Scientist and senior consultant at Dept of Reproductive Medicine and KKIVF. His research interest is in Reproductive Medicine, Fetal Cell and Gene Therapy, Fetal Immunology, and Life Course Epidemiology. He has been continuously funded by the NMRC and other bodies since his return to Singapore in 2005.

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**A/Prof Kenneth Chang Tou En**

*Head and Senior Consultant, Department of Pathology and Laboratory Medicine  
KK Women's and Children's Hospital, Singapore*

Dr. Kenneth Chang is senior consultant paediatric pathologist and Head of Department, Department of Pathology and Laboratory Medicine at KK Women's and Children's Hospital in Singapore. He is Adjunct Associate Professor at Duke-NUS Medical School, Academic Vice-Chair, Clinical Service Transformation in the SingHealth Duke-NUS Pathology Academic Clinical Programme, and Director, SingHealth Tissue Repository and Advanced Molecular Pathology Laboratory. He is Principal Investigator in the VIVA-KKH Paediatric Brain and Solid Tumours Programme. Currently, he is also a Council Member in the International Paediatric Pathology Association, and plays a role in outreach to paediatric pathologists in the Asia-Pacific region.

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**Ms Gwen Chng Yan Ling**

*Senior Staff Nurse, Department of Child Development  
KK Women's and Children's Hospital, Singapore*

Chng Yan Ling is a Senior Staff Nurse (SSN) in Department of Child Development (DCD). She graduated from Diploma in Nursing in 2005. SSN Chng is one of the pioneer nurses being trained to perform developmental screening competently on the children newly referred to DCD. Besides screening, she provides excellent support to doctors in their daily clinic sessions. Over the years, she has grown passionate in providing more delicate and personalized support to families of special needs. She went through a panel of interview with Senior Management and has been selected successfully to be the first Autism Resource Nurse (ARN) in DCD. To date, approximately 800 families have benefited from ARN support and this role has empowered and provides better job satisfaction.

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**Mr Chua Chee Yong**

*Director, Emerging Services & Capabilities Group  
Integrated Health Information Systems (IHIS), Singapore  
Head, IT Strategy and Planning, Ministry of Health (MOH) Singapore*

Mr Chua helms the Emerging Services & Capabilities Group at IHIS and is concurrently the Head of IT Strategy and Planning with the Infocomm Division, MOH. He handles the strategic planning, steering, investment and portfolio management of health IT development to support Singapore's Health Care vision of 'Better Health, Better Care and Better Life'. With IHIS, Mr Chua also oversees and manages engagement with ministries, research institutions and industry partners, both locally and globally, to facilitate opportunities for collaboration and identify innovative solutions for the healthcare ecosystem. Mr Chua also holds leadership positions in several committees including: (a) National Precision Medicine SC – Member & Enabling Platforms Workgroup – Co-Chair, (b) National Research Strategy Committee – Member, (c) AISG Management Committee – Member, (d) Ren Ci ITSC – Member, (e) NUS Business Analytics Council – Member. Prior to his current appointment, Mr Chua was a Managing Director for a global IT consulting firm, Accenture. He also held several leadership positions in various industries, dealing with clients in the Asia Pacific region. He has led many large-scale IT consulting and implementation projects, assisting government agencies and regional Multi-National Corporations (MNCs) in streamlining their IT systems.

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**Dr Chua Mei Chien**

*Head and Senior Consultant, Department of Neonatology  
KK Women's and Children's Hospital, Singapore*

Dr Chua Mei Chien is a Senior Consultant and Head, Department of Neonatology and Director, KK Human Milk Bank in KK Women's and Children's Hospital (KKH). Her special area of interest is in neonatal nutrition, breastfeeding and the impact of nutrition on long-term health. She has led in efforts to develop multidisciplinary, evidence-based protocols for nutritional management of preterm infants. She is the principle investigator of a number of industry –sponsored as well as investigator initiated clinical trials. Her latest publication in the Annals of Nutrition and Metabolism is entitled "Asia Pacific Consensus on Perinatal Nutrition and Breastfeeding". A breastfeeding advocate, Dr Chua is Chairperson of the hospital's Baby Friendly Hospital Initiative (BFHI) committee and has successfully steered KKH to achieve baby friendly accreditation in June 2014 and March 2017. She is the current President of the Association for Breastfeeding Advocacy (Singapore). Dr Chua represents the hospital in the Sale of Infant Foods Ethics Committee Singapore (SIF ECS) as well as the National Medication Safety Committee as the chairperson of the KK Medication. Dr Chua is the recipient of a number of awards including the National Excellent Service Award (EXSA) – Gold Award in 2006, KKH Service from the Heart in 2007 for excellence in patient care, SingHealth Long Service award in 2016 and Singapore Health Quality Service Awards - Silver Award in 2017. She was awarded the 10 years Long Service Award from the Ministry of Health in 2018 in recognition of her contribution to SIF ECS. Her latest achievement is the establishment of Singapore's first donor human milk bank programme in August 2017 for which she was awarded the SingHealth Excellent Award-Distinguished Team award in 2019.

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**Ms Chole Chu**

*Executive, SingHealth Intellectual Property  
Singapore Health Services Pte Ltd, Singapore*

Chole joined SingHealth Intellectual Property in January 2015. Prior to this, Chole worked for Intellectual Property Intermediary (IPI) Singapore where she identified problem statements and business needs of client companies and worked to provide tailored technology solutions. She also supported technology matching projects across medtech and biopharma, where she used business intelligence to pair companies which had complementary commercial objectives. Chole's time with IPI Singapore deepened her interest in technology commercialization and built her expertise in the marketing of early stage innovations. Chole holds a Bachelor of Science (Honours) in Biological Sciences from Nanyang Technological University.

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**Ms Goh Bee Keow**

*Senior Manager, Data Analytics Office, COO's Office  
KK Women's and Children's Hospital, Singapore*

Ms Goh Bee Keow, Senior Manager, is the Head Of Data Analytics Office (DAO) under COO's Office at KK Women's and Children's Hospital (KKH). She represents KKH at Singhealth in cluster analytics related initiatives. Bee Keow is instrumental in setting up DAO in 2016, which constitutes of a core team and decentralized domain expert analysts, to build up data analytics culture and data science capabilities in the hospital. She leads her team to perform data analysis including creating meaningful visual analytical dashboards for enabling and supporting data driven decisions. Bee Keow is responsible for establishing data governance policy together with PDPA secretariat, KKRC and IHIS. She is also responsible for MOH value driven outcomes projects in KKH. Her areas of interests includes applied data visual analytics, data science, operations research, process and systems optimization.

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**Dr Saumya Shekhar Jamuar**

*Head, SingHealth Duke-NUS Genomic Medicine Centre, Singapore  
Senior Consultant, Genetics Service, KK Women's and Children's Hospital*

Dr Saumya Jamuar is a Clinical Geneticist at KKH, serves as the Lead PI of the Singapore Childhood Undiagnosed Disease Programme and is the Clinical Director of the Institute of Precision Medicine, Singhealth Duke-NUS Medical School. He is also the founding head of the SingHealth Duke-NUS Genomic Medicine Centre. He completed his Genetics Fellowship at the Harvard Medical School Genetics Training Program and worked as a post-doctoral fellow in Christopher A Walsh lab in Harvard Medical School. He is actively involved in research, has presented at both local and international meetings and has published in top tier journals including *The New England Journal of Medicine* and *Nature Genetics*. His research areas include rare genetic disorders, dysmorphology, skeletal dysplasia, and neurodevelopmental genetics. He was awarded the Young Investigator Award at the American Epilepsy Society meeting and is the recipient of the 2015 Singhealth Outstanding Young Researcher Award, and 2018 Singhealth Outstanding Publish Award.

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**Dr Koh Hwan Cui**

*Senior Psychologist, Department of Child Development  
KK Women's and Children's Hospital*

Hwan Cui has 10 years of experience working as a psychologist with preschoolers with developmental, emotional and/or behavior difficulties, in the Department of Child Development, KK Women's and Children's Hospital. She is trained to help parents use positive behavior management strategies to reduce children's challenging behaviors, and to use supportive parenting strategies to treat children's anxiety problems. She provides assessments to diagnose autism spectrum disorder (ASD), and also other neurodevelopmental conditions such as dyslexia and intellectual disability. She provides consultation for parents to teach and support their child with ASD or special learning needs, including making choices for schooling and to help ease their children's transition to primary schooling. Hwan Cui has a PhD in psychological research from the University Of Sheffield, United Kingdom, and investigated visual perception in children with ASD for her doctoral thesis. She has published research relating to ASD and screening for developmental problems in young children. She is currently working on a project on timely identification of developmental problems in toddlers. Hwan Cui obtained her professional training as a clinical psychologist through the Master of Psychology (Clinical) course at the National University of Singapore, and is a registered psychologist in Singapore.

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**Ms Melanie Kwan**

*Senior Music Therapist  
Child Life, Art and Music Therapy Programme (CHAMPs)  
KK Women's and Children's Hospital, Singapore*

Ms Melanie Kwan, Senior Music Therapist at KKH, has close to two decades worth of experience with medical music therapy. She has served a range of populations, from helping babies born prematurely to regulate by simulating a womb-like sound environment and facilitating their bonding with parents through infant-directed lullaby singing, to supporting patients at the end of life with relationship closure and creation of musical legacies, to motivating the rehabilitation of persons living with debilitating or chronic medical conditions from disease, accident, or trauma. An active advocate for the profession of music therapy, Ms Kwan served as the founding secretary of the Association for Music Therapy, Singapore, and two terms as president. A doctoral student at Temple University, Ms Kwan's research interests range from the resiliency of patients and how to promote hope and courage in managing anxiety and pain. She has collaborated a local polytechnic on the development of a range of prototypes including a music therapy cart and wireless music activating system for upper limb rehabilitation. Ms. Kwan has participated in medical mission trips in Africa and around the region to promote music therapy.

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**Prof Leung Wing Hang**

*Director, Research, SingHealth Duke-NUS Transplant Centre, Singapore  
Senior Consultant, Haematology/Oncology Service, KK Women's and Children's Hospital, Singapore*

Professor Wing Leung is Chair of the TCL-CCF Distinguished Professorship in Paediatric Oncology and the Director of Paediatric Bone Marrow Transplant and Cellular Therapy Centre, SingHealth Duke-NUS Paediatrics Academic Clinical Programme. He is Senior Consultant in Paediatric Haematology Oncology Services at KK Women's and Children's Hospital, and Director, Research, SingHealth Duke-NUS Transplant Centre. Previously, he was the Chair of the Department of Bone Marrow Transplantation and Cellular Therapy at St. Jude Children's Research Hospital and Vice President of Clinical Development at Miltenyi Biotec. Prof. Leung obtained his medical degree from the University of Hong Kong and a Ph.D. from the Johns Hopkins University. He is a diplomate certified in general pediatrics and in pediatric hematology-oncology by the American Board of Pediatrics. Prof. Leung has a major research interest in the biology of human natural killer cells and memory T cells, specifically the clinical applications in HLA-mismatched transplantation and chimeric antigen receptor therapy. His research received continuous funding from the National Institutes of Health. He served as a member in the NCI Study Section, NHLBI BMT-CTN Protocol Review Committee, and Journal of Clinical Oncology Editorial Board. He is an elected member of the American Society for Clinical Investigation.

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**Ms Lim Rong Xiu Cynthia**

*Nurse Clinician, Children's Emergency  
KK Women's and Children's Hospital, Singapore*

Lim Rong Xiu, Cynthia is an Advanced Practice Nurse in Children's Emergency. She graduated from Masters in Nursing in 2013 and attained APN licence in 2015. She started her APN journey as a Resident Nurse in 2010. As a Resident Nurse at that time, it has given her great insight and foresee that nurses can actually practice on top and beyond their licence for better patient care. As such, she is determined to pursue to become as an Advanced Practice Nurse. She is the Co-Chairperson of Nursing Education & Development Council. The council was developed in 2011. It defines, implements, evaluates, and maintains educational standards that promote professional growth, development, and ongoing clinical competency for staff.

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**Dr Lim Sheow Lei**

*Visiting Consultant, Department of Gynecological Oncology  
KK Women's and Children's Hospital, Singapore  
Senior Consultant Medical Oncologist, OncoCare Cancer Centre, Singapore*

Dr Lim Sheow Lei is a Senior Consultant Medical Oncologist at OncoCare Cancer Centre. Her clinical expertise includes the treatment of gynaecological cancers, such as cancer of the ovary, uterus, cervix and vulva. Prior to joining OncoCare, Dr Lim was a Senior Consultant Medical Oncologist at the Department of Gynaecological Oncology at the KK Women's and Children's Hospital (2008 – 2018) specializing in the treatment of gynaecological cancers. She was also an Adjunct Associate Professor at DUKE-NUS Medical School and visiting consultant at the National Cancer Centre. She is currently a Visiting Consultant at KK Hospital and has been an Executive Committee Member of the GyneCologic Cancer Group Singapore (GCGS) since 2018. She was the chairperson of the Singapore Cancer Network (SCAN) committee that developed the first local guidelines for the medical management of gynaecological cancers.

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**Dr Leo Kee Hao**

*Assistant Director, Office for Service Transformation  
Singapore Health Services Pte Ltd, Singapore*

Dr Leo Kee Hao is currently an Assistant Director with the new Office for Organisational Transformation (OOT), SHHQ. He is actively involved in planning, designing and implementing various new initiatives to nurture a vibrant innovation culture in SingHealth. Dr Leo has many years of experience in leading and managing multi-disciplinary research teams for rehabilitation and assistive technology projects. In addition, prior to joining SingHealth, he assisted in the establishment and management of a multi-million dollars research institute during which he designed and ran various programs such as the Research Fellowship Program, Student Innovation Challenge, rehabilitation research seed grant, etc. to promote collaboration between clinicians, engineers and scientists in rehabilitation research.

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**Dr Lin Hsiang-Yu**

*Associate Professor, Department of Paediatrics  
MacKay Medical College, New Taipei City*

Hsiang-Yu Lin, MD, is Associate Professor at the Department of Medicine, MacKay Medical College, New Taipei City and the MacKay Junior College of Medicine, Nursing and Management, Taipei, Taiwan, as well as the Director of the Division of Genetics and Metabolism, Department of Pediatrics, MacKay Memorial Hospital, Taipei, Taiwan. Upon receiving his medical degree from the School of Medicine, Taipei Medical University in Taipei, Taiwan, Dr. Lin did his residency at the Department of Pediatrics at both the Taipei City Hospital and the MacKay Memorial Hospital in Taipei, Taiwan. He received his clinical fellowship from the Department of Pediatrics (Genetics and Metabolism Section) at MacKay Memorial Hospital in 2006, before obtaining his PhD from the Institute of Clinical Medicine, National Yang-Ming University, Taipei, in 2012. Dr. Lin has received numerous honours for his clinical and laboratory research work, including the Young Investigator Presentation Award at the 212<sup>th</sup> Scientific Meeting of the Taiwan Pediatric Association, as well as the Professor Chung-Lin Chen Pediatric Research Scholarship Foundation "Pediatric Attending Physician Best Thesis of the Year", both in 2012, the SI-YUAN Internal Medicine Research and Development Foundation "Internal Medicine: Best Thesis of the Year" in 2015, and Professor Chen Yuan-Tsong Travel Award for the young scientist with outstanding research work at the conference of the 12<sup>th</sup> Asia-Pacific Conference of Human Genetics (Chen Travel Award) in 2017. In 2018, Dr. Lin's medical team got "2018 Symbol of National Quality (Taiwan): Silver Award" on the topic of "Holistic Medical Care for Mucopolysaccharidoses". In addition, Dr. Lin has published over 100 scientific papers in peer-reviewed journals, including the *Medicinal Research Reviews*, *Scientific Reports*, [Journal of the American College of Cardiology](#), *Circulation-Cardiovascular Genetics*, *Orphanet Journal of Rare Diseases*, *Journal of Inherited Metabolic Disease*, *Molecular Genetics and Metabolism*, *Developmental Medicine & Child Neurology*, and the *American Journal of Medical Genetics Part A*.

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**Dr Amos Loh Hong Pheng**

*Deputy Director (Research), KK Research Centre  
Senior Consultant, Department of Paediatric Surgery  
KK Women's and Children's Hospital, Singapore*

Dr Amos Loh is a senior consultant surgeon with the Department of Paediatric Surgery at KK Women's and Children's Hospital Singapore, and Assistant Professor with Duke NUS medical school, with a clinical practice and academic research focus in paediatric surgical oncology. He trained in paediatric surgical oncology at St Jude Children's Research Hospital in Memphis, TN, and went on to do his research fellowship in the lab of Michael Dyer. He presently serves as Deputy Research Director, KK Research Centre, and Deputy Vice Chairman (Research) and Chairman, Philanthropy Committee, SingHealth Surgery ACP. Since 2015, he has led the VIVA-KKH Paediatric Brain and Solid Tumour Programme – a strategic collaboration between KK Hospital, the VIVA Foundation for Children with Cancer, and St Jude Children's Research Hospital, Memphis TN. His areas of interest are clinical and translational research in paediatric solid tumours. In particular, he is interested in the development of models of paediatric solid tumors for preclinical testing of novel treatments, as well as the discovery of biomarkers for prognostication and therapeutic stratification of paediatric solid tumours, particularly neuroblastoma, osteosarcoma, and paediatric renal tumours.

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**Ms Fiona Loke**

*Senior Manager, Medical Technology Office  
Singapore Health Services Pte Ltd, Singapore*

Fiona is a Senior Manager at the SingHealth Medical Technology Office (MTO), a one-stop point of contact for collaborators and companies to work with SingHealth clinicians on early-stage to mature medtech innovation projects. Fiona started her career in software engineering, creating intelligent systems for the defence industry, and also launched a new business initiative in healthcare informatics. In 2011, Fiona joined the inaugural batch of Singapore Stanford Biodesign (SSB) Fellows and completed a year-long program in medtech innovation at Stanford University and in Singapore. After graduation, she became a consultant to A\*STAR, where she managed a medtech commercialization project involving a multi-site clinical trial. She also consulted for Covidien (now Medtronic) in business landscaping and innovation strategy, and for the Singapore General Hospital (SGH) before joining SingHealth full-time. For the past few years, Fiona has held an appointment with the newly-rebranded Singapore Biodesign (SB) program as Co-Curriculum Head in curriculum guidance and teaching roles, where she co-conducts Biodesign training seminars with other SB trainers. Fiona is a named co-inventor on 3 medical devices with 5 granted patents internationally, leading to 2 products reaching commercial maturity. She holds B.S. and M.S. degrees in electrical engineering from Stanford University.

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**Dr Looi Wen Shen**

*Associate Consultant, Division of Radiation Oncology  
National Cancer Centre Singapore, Singapore*

Dr Looi Wen Shen is an Associate Consultant in the Department of Radiation Oncology, National Cancer Centre of Singapore. Dr Looi earned my medical degree at the National University of Singapore in 2008 and completed his radiation oncology training in the National Cancer Centre of Singapore in 2017 after his final year as Chief Resident. He is a Fellow of the Royal College of Radiologists (UK) and the Academy of Medicine, Singapore. He treats paediatric cancers and adult urologic and sarcoma tumours.

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**Dr Sadhana Nadarajah**

*Senior Consultant  
Department of Reproductive Medicine  
KK Women's and Children's Hospital, Singapore*

Dr Sadhana Nadarajah has been the Head of Adolescent Gynaecology Unit in KKH since 2008. She was also the Director of KKIVF, the largest IVF centre in Singapore from 2012 to 2016. She is presently a Senior Consultant in the Department of Reproductive and has been practising Fertility Specialist since 2002.

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**A/Prof Ng Kee Chong***Chairman, Medical Board**KK Women's and Children's Hospital, Singapore*

Dr Ng is currently the Chairman Medical Board and Senior Associate Dean of KKH. A paediatric emergency physician by training, he did a 1-year HMDP fellowship in Paediatric Emergency Medicine from 1998 to 1999 at the Hospital for Sick Children in Toronto, Ontario, Canada. Dr Ng previously served as Chair of the KKH Emergency Preparedness Committee from 1997 to 2016 and was Head of Children's Emergency from March 2005 to 2016. He was Chairman of the Division of Medicine from July 2012 and concurrent Chair of the Singhealth Academic Clinical Program (Paediatrics) till April 2017. He also served as the first Campus Director of Medical Innovation & Care Transformation (MICT) in KKH from 2015 to 2018. Since 2011, Dr Ng has been a member of the International Liaison Committee on Resuscitation (ILCOR) Pediatrics Taskforce & is currently a member of the MOH National Trauma Committee and Vice President of the Singapore Resuscitation & First Aid Council (SRFAC) of the Ministry of Health. Dr Ng is also currently a member of the International Consortium on Health Outcome Measurements (ICHOM) Overall Pediatric Health (OPH) workgroup. An Adjunct Associate Professor with the Duke-NUS Graduate Medical School, Yong Loo Lin & Lee Kong Chien Schools of Medicine at National University of Singapore and Nanyang Technological University respectively, Dr Ng is also currently a member of the Residency Advisory Council (Paediatrics) in the Ministry of Health. Dr Ng has led various regional outreach teams to teach paediatric resuscitation using the train-the-trainer framework in Cambodia, Laos, Myanmar and in China and is also the current President-Elect of the College of Paediatrics & Child Health, Academy of Medicine, Singapore.

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**A/Prof Sng Ban Leong***Head and Senior Consultant, Department of Women's Anaesthesia**KK Women's and Children's Hospital, Singapore*

Dr Sng Ban Leong is the Head and Senior Consultant at the Department of Women's Anaesthesia at KK Women's and Children's Hospital and Academic Vice Chair (Research) in Singhealth Anaesthesiology and Perioperative Sciences Academic Clinical Program. He is an Associate Professor at Duke-NUS Medical School. He has obtained several grants including the NMRC Clinical Scientist Award, NMRC Clinical Trials Grant, NMRC Transition Award, NHIC Innovation to Industry (I2I) and NHIC Innovation to Develop (I2D) Grant. Ban Leong is a Core Faculty and Clinician Scientist Residency Track Mentor with the Singhealth Anaesthesiology Residency Program (SHARP). His research interests include postsurgical and childbirth pain, innovative vasopressor, epidural and intravenous analgesia delivery system.

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**Ms Stacy Tan Man Ling***Senior Speech Therapist**Speech-Language Therapy Service, Rehabilitation Centre**KK Women's and Children's Hospital, Singapore*

Ms Stacy Tan is a Senior Speech Therapist at the Speech-Language Therapy Service, Rehabilitation Centre, at KK Women's and Children's Hospital. She has been working with children with communication and swallowing disorders since 2010. She specializes in clinical and instrumental assessments of swallowing and the intervention and management of children with complex feeding and swallowing disorders.

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**Dr Lois Teo***Head and Senior Principal Psychologist, Psychology Service**KK Women's and Children's Hospital*

Dr Lois Teo, Head & Senior Principal Psychologist, has been with KK Women's & Children's Hospital Psychology Service since 2006, having also done clinical attachments at National University Hospital, Singapore General Hospital and Tan Tock Seng Hospital. Lois has a doctorate in clinical psychology, and specializes in working with children and adults who present with complex emotional, behavioural and mental health conditions. Lois enjoys spending her free time with family and friends, and playing classical music on the piano, violin and pipe organ.

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**Dr Serene Thain**

*Associate Consultant, Division of Obstetrics and Gynaecology  
KK Women's and Children's Hospital, Singapore*

Dr Serene Thain is an Associate Consultant at the Department of Maternal-Fetal Medicine, KK Women's and Children's Hospital, Singapore. She currently sits on the council of the O&G Society of Singapore (OGSS) as well as the council of the College of O&G, Singapore (COGS). She is also the member representative for the Singapore International Representative Committee of the Royal College of O&G (RCOG). Dr Thain graduated from the National University of Singapore in 2010 and obtained her Membership of the Royal College of Surgeons (Edinburgh) in 2013 and Membership of the Royal College of Physicians (UK) and Master of Medicine in Internal Medicine in 2014. In November 2015, she was admitted as a Member of the Royal College of Obstetricians and Gynaecologists (UK) and awarded the MRCOG Prize Medal for emerging as the overall highest scoring candidate, as well as the 4th Asia-Oceania Congress of Obstetrics and Gynaecology Gold Medal for the M.Med (O&G) examinations. She went on to pursue further subspecialty training in the field of Obstetric Medicine, of which she trained under Professor Catherine Nelson-Piercy and Professor Catherine Williamson at Guy's and St Thomas' Hospital in London. She believes strongly in achieving the best possible outcome for both mothers and their babies through optimisation of their health and medical conditions in the pre-pregnancy, antenatal and postpartum period.

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**Ms Maheswari Vellaichamy**

*Senior Physiotherapist, Physiotherapy Department  
KK Women's and Children's Hospital, Singapore*

Ms Vellaichamy Maheswari is a senior Physiotherapist, at KK Women's and Children's Hospital (KKH), Singapore. She has been with the institution for the past 12 years. Her areas of interest include Cerebral Palsy and Down Syndrome. Since 1998, she has been working with Paediatric outpatient and inpatient services. She is the section lead for both the paediatric inpatient and outpatient neurological rehabilitation services. In addition, she has initiated multi-disciplinary services in complex movement disorders clinic and CP Ortho clinic services. She is currently working closely with Paediatric Homecare Services, Paediatric Complex Care Service and Paediatric Neuro rehabilitation services. Ms Maheswari holds a bachelor degree in physiotherapy and certification in Neuro Developmental Treatment, Theratogs and Splinting and Casting. She has over 20 years of experience in treating children from birth to 18 years of age with a variety of diagnoses including prematurity, developmental delays, congenital, neurological and orthopaedic conditions. Her expertise in the management of congenital foot deformities and work closely with orthopaedic team in the correction of foot deformities.

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**Dr Wang Junjie**

*Consultant, Department of Gynaecological Oncology  
KK Women's and Children's Hospital, Singapore*

Dr Wang Junjie is a Consultant gynaecologist in the Department of Gynaecological Oncology, KK Women's and Children's Hospital. In 2018, he was awarded the prestigious HMDP scholarship for overseas surgical training in Switzerland and France. His training topic was "Sentinel lymph node mapping in gynaecological malignancies". In the year he was overseas, he received training in the use of sentinel lymph node mapping in endometrial, cervical and vulvar cancer. He has also written and published several research papers and book chapter on the use of ICG and sentinel lymph node mapping in gynaecological cancers.

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**Ms Barbara Wee**

*Senior Physiotherapist, Physiotherapy Department  
KK Women's and Children's Hospital, Singapore*

Barbara is a Senior Physiotherapist in the Department of Physiotherapy, KK Women's & Children's Hospital. She received her Bachelor in Physiotherapy from the University of Melbourne in 2009 and was a co-author of a chapter on returning the elderly to pre-morbid function after colorectal surgery in the book publication "Colorectal Cancer in the Elderly". With her six years of experience working with the O&G team in KKH Physiotherapy Department, Barbara has developed a strong interest in lymphedema management and the rehabilitation for gynae-oncology patients. A strong believer in inter-professional collaboration, she was a key driver in the establishment of ward-based exercise therapy for patients undergoing treatment for gynaecological cancers.

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**Mr John Wong**

*Senior Manager, Office of Patient Experience  
KK Women's and Children's Hospital, Singapore*

John Wong is the Senior Manager in KKH Office of Patient Experience. He leads the Data Intelligence and Best Practices Team, who is responsible for the reporting and analysis of Patients Reported Experience Outcome Measures (PREMs) and the collaboration with stakeholders in KKH and external parties (namely Amazon Web Services & Disney) to improve patient care and experience. John is also the co-lead for SingHealth Centre of Expertise team - Patient Experience Data Analytics, which promotes the analysis of PREMs, the development of data analytics staff within OPE domain and the sharing of best practices within SingHealth. Prior to joining KKH, John was the APAC Customer Assurance Lead for Energizer, where he was managing customer recovery and technical support to retail customers, OEMs and MNCs like Apple, Microsoft, Dyson, Hon Hai and etc. John is experienced in quality assurance, operations, data analytics, supplier audit and market/field audit. John holds a Bachelor in Mechanical Engineering (Honours) from Lancaster University (UK) and a MBA from National University of Singapore.

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**Ms Wong Wanlin**

*Senior Medical Social Worker, Medical Social Work Department  
KK Women's and Children's Hospital*

Wong Wanlin is a Senior Medical Social Worker at KK Hospital's Medical Social Work Department. She graduated from National University of Singapore with a Bachelor of Social Work degree and has been working as an MSW in KKH for 7.5 years. She is currently managing the Paediatric Homecare Portfolio since 2015 and is part of the Complex Homecare Multidisciplinary Team working with medically complex patients and their families. Apart from the Homecare portfolio, she was also previously managing the ENT, Gastroenterology and Nephrology portfolios. She completed her 6 weeks HMDP attachment entitled – "Providing Coordinated Multidisciplinary Care for Children with Medical Complexity from Birth to Early Adulthood" with 2 Paediatric hospitals in Canada from June to July 2019 together with the Complex Homecare Team comprising of the doctor, homecare nurse, dietician and physiotherapist. With the knowledge and skills gained from the HMDP, she continues to work closely with the Complex Homecare Team to enhance the coordination of care and transition for patients with medical complexity.

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**Ms Zhou Li**

*Nurse Clinician, Division of Nursing  
KK Women's and Children's Hospital, Singapore*

Zhou Li is a Nurse Clinician in the Paediatric Complex and Homecare Services Team. She has been working with the Homecare Team for past 6 years, teaching caregivers and coordinating in the discharge process and post-discharge follow up. She is also actively teaching internal staff and community partners regarding care of patients with medical complexity. Prior to joining the Homecare Team, she had been working in CICU for 9 years. She obtained her degree in nursing in 2002 and obtained advance diploma in adult and Paediatric critical care nursing in 2009.

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## ABSTRACTS: PRE-CONFERENCE WORKSHOP ON INNOVATION

### Sharing Journey - Innovation in Women's Anaesthesia

**A/Prof Sng Ban Leong**  
*Head and Senior Consultant*  
*Department of Women's Anaesthesia*  
*KK Women's and Children's Hospital*

The talk is a sharing session of the development of an epidural delivery system (EPIVA epidural pump system) at Women's Anaesthesia KKH. Novel epidural delivery system techniques aim to improve pain relief while reducing adverse outcomes. The road map of device development will be discussed (conceptualisation, prototyping, pre-clinical, clinical, regulatory approval, product launch, post-marketing surveillance). Clinical evaluation essential to regulatory development, with the clinician role in literature search, clinical investigation and providing the clinical evaluation report will be discussed. The role of clinician leadership, regulatory development, translation to clinical practice and challenges of medical technology will be covered.

### Sharing Journey - Training Roadmap for Registered Nurses

**Ms Lim Rong Xiu Cynthia**  
*Nurse Clinician, Children's Emergency*  
*KK Women's and Children's Hospital, Singapore*

The sharing journey is about the development of a Training roadmap for Registered Nurses at KK Women's and Children's Hospital. This project aims to harmonize all training programs so as to ensure that Registered Nurses can reach the top of their potential by using an easily accessible system.

The innovation process involves data gathering, stakeholders' engagement, brainstorming and solution development.

The result was cost-effective, user-friendly, self-serviced and easily accessible system providing a one-point access system via links that will direct users to all the required information, now posted on KKH intranet.

### Design Thinking and MedTech Considerations

**Ms Fiona Loke**  
*Senior Manager, Medical Technology Office*  
*Singapore Health Services Pte Ltd, Singapore*

Innovation requires creativity, inspiration and great ideas, but bringing great inventions into clinical practice also takes intense due diligence, rigorous technical development and clinical as well as commercial de-risking. This session provides an overview of the medtech innovation process from unmet need to real-world solution, based on the proven Stanford Biodesign methodology.

### Innovation from Organisation Transformation's Standpoint

**Dr Leo Kee Hao**  
*Assistant Director*  
*Office for Service Transformation*  
*Singapore Health Services Pte Ltd, Singapore*

Like many healthcare systems in advanced economies, SingHealth is progressively transforming into a value-based care delivery system. Innovation in healthcare plays a crucial role in achieving the quadruple aims of a value-based healthcare system. With the establishment of the new Office for Organisational Transformation along with high level councils that consist of senior leaders from across all SingHealth institutions, SingHealth is embarking on an exciting journey to synergise efforts and resources throughout the cluster to nurture an innovative culture. Current pain points along our innovation journey are being addressed as well as new facilities, programs, funding support and processes are being designed to accelerate and facilitate a smooth innovation process.

## Data Analytics in Innovation

**Ms Goh Bee Keow**

*Senior Manager*

*Data Analytics Office, COO's Office*

*KK Women's and Children's Hospital, Singapore*

Data analytics involves a series of data processing to provide meaningful insights for making effective and efficient decisions. Following the onset of digitization and technological advancements, the amount of data generated has been growing exponentially. How does data analytics enable and complement innovation? How does big data contribute to the use of data analytics in stimulating innovation?

## IT Challenges in Healthcare Innovation

**Mr Chua Chee Yong**

*Director, Emerging Services & Capabilities Group*

*Integrated Health Information Systems (IHIS), Singapore*

*Head, IT Strategy and Planning*

*Ministry of Health (MOH) Singapore*

The speaker will outline the key IT challenges piloting and scaling innovation in Singapore healthcare systems. He will share some key learnings from the "seeker", "solver" and "funder" perspectives

## Innovation Funding Pathways

**A/Prof Derrick Chan Wei Shih**

*Research Director, KK Research Centre*

*Head and Senior Consultant, Neurology Service*

*KK Women's and Children's Hospital, Singapore*

Innovation frequently requires funding to bring ideas from unmet need to the clinical front line. The funding landscape for innovation is blossoming and many opportunities exist in terms of project and talent funding. Along with the training programmes available, these are catalysts for innovation in SingHealth. The various types and levels of funding and some of the requirements for a successful funding pitch will be shared.

## Protecting Intellectual Property

**Ms Chole Chu**

*Executive, SingHealth Intellectual Property*

*Singapore Health Services Pte Ltd, Singapore*

The drive, expertise and creativity of our clinicians and researchers to meet unmet clinical problems often results in ideas and inventions that can improve patient care or the healthcare system. SHIP was established to support SingHealth clinicians and researchers achieve healthcare impact by working with them to protect and bring their ideas to market. We do this by protecting intellectual property (using through patenting), licensing to strong commercial partners and we support spin out companies based on SingHealth intellectual property. SHIP supports across a broad spectrum of activities including translational funding applications, intellectual property strategies and marketing technologies to industry partners.

While each innovation requires a tailored approach to commercialization, the protection of the intellectual property is often the important starting point. We will explore the ways of protecting intellectual property and the role of SHIP in supporting in the patenting and commercialisation process.



Dr Saumya Shekhar Jamuar

*Head*

*SingHealth Duke-NUS Genomic Medicine Centre, Singapore*

*Senior Consultant, Genetics Service*

*KK Women's and Children's Hospital, Singapore*

Genomic Medicine is a rapidly evolving specialty in clinical medicine that deals with patients and families with genetic diseases. Genetic diseases can range from monogenic diseases where mutations in one gene lead to a disease (e.g. Marfan syndrome), to complex genetic diseases where mutations in multiple genes lead to disease (e.g. cancer, diabetes), to pharmacogenomics, where the presence of certain genetic variants predisposes an individual to adverse drug reaction (e.g. *HLA-B\*57:01* allele and carbamazepine toxicity).

Currently, SingHealth institutions have formed multi-disciplinary teams within each institution to manage the very complex nature of these diseases. However, recognising the complexity of genetic diseases, the Ministry of Health, Singapore, recently promulgated the Standards for the provision of clinical genetic/genomic testing services and clinical laboratory genetic testing services as Code of Practice to all licensees, highlighting the need for an even more integration between the SingHealth institutes to deliver a highly specialised Genomic Medicine service to ensure high quality and uniform clinical care.

The SingHealth Duke-NUS (SD) Genomic Medicine Centre breaks away from the traditional hospital structure and focuses on patient-centered, disease-based care. Under this new care model, we envision that patients will receive holistic, integrated care from a spectrum of healthcare professionals, including clinicians, genetic counsellors, nurses, working together as a team to provide the best care for each patient. This new set-up will enhance opportunities for coordination of care between different specialist teams, facilitate improvements in care processes and promote closer collaboration, ultimately generating new opportunities for research that impacts clinical care.

We envision SD Genomic Medicine Centre to be a global leader in delivering state-of-the-art clinical care with use of advanced genomic technologies to improve patient diagnostics, provide personalised therapeutics and improve healthcare outcomes.

## ABSTRACTS: PLENARY

### PLENARY 1 | Precision Cell Therapy in PAediatric Haematology / Oncology

**Prof Leung Wing Hang**

*Director, Research*

*SingHealth Duke-NUS Transplant Centre, Singapore*

*Senior Consultant, Haematology/Oncology Service*

*KK Women's and Children's Hospital, Singapore*

Despite general improvement in cancer care, childhood cancer remains the leading cause of death in children younger than 15 years of age. Many survivors of childhood cancer suffer from chronic health conditions as late sequelae of cancer treatment. In recent years, precision medicine and cell therapy have greatly improved patient care in paediatric haematology and oncology. Specifically, precision medicine improves diagnostic accuracy, our basic understanding of pathogenesis, prognostication, identification of biomarkers, monitoring of treatment response, and selection of targeted therapy. Cell therapy uses distinct mechanisms of cancer-cell killing; therefore, it can be used to cure cancers that are resistant to radiation and chemotherapy. Furthermore, cell therapy has non-overlapping side effects with those of conventional treatment, thus it can be combined with surgery, radiation and chemotherapy, serving as the fourth pillar of cancer therapy. Some contemporary cell therapies require only one cell infusion and may improve the patient's quality of life by shortening the duration of treatment. In this lecture, Prof Leung will outline the limitations and barriers of cell therapy in the past, and then describe promising new approaches in precision cell therapy for paediatric haematological and oncological disorders. Discussion will include donor selection based on improved knowledge in immunogenetics, newer graft engineering biotechnologies, as well as gene-modified immune effector-cell therapy.

### PLENARY 2 | Metabolic Health in Women and Children – The IPRAMHO Experience

**Dr Ang Seng Bin**

*Head and Senior Consultant*

*Family Medicine Service*

*KK Women's and Children's Hospital, Singapore*

IPRAMHO is a unique collaborative centre grant proposition where both Singapore public primary health care providers (SHP & NGHP) have come together to work with KKH, the largest tertiary and main referral center for Paediatrics, Obstetrics and Gynaecology in Singapore on a national scale platform of collaborative metabolic health & health service research in women and children, aligning with RIE2020.

IPRAMHO initiative allows SHP, NHGP, and KKH to leverage on the scientific knowledge gleaned from past NMRC supported cohort studies like GUSTO & NORA, in order to best translate the evidence and implement effective clinical practice. It is also an integrated research platform to develop very upstream & effective preventive interventions in these populations. IPRAMHO will help to reduce the risks of T2DM, obesity and other metabolic complications in life which is crucial for Singapore where diabetes and obesity is becoming prevalent and a huge challenge for our society.

Currently IPRAMHO is involved in many seed metabolic projects and has also created model of care for gestation diabetes. It has also facilitated 6 guidelines/consensus on metabolic health in Singapore and Asia Pacific region and has also created an investigator network in Asia.

## Preclinical Models and Novel Biomarker Discovery for Paediatric Solid Tumors

**Dr Amos Loh Hong Pheng**

*Deputy Director (Research), KK Research Centre*

*Senior Consultant, Department of Paediatric Surgery*

*KK Women's and Children's Hospital, Singapore*

In our efforts to advance the treatment of paediatric solid tumours, we have developed and used personalized models to facilitate individualized treatment selection for patients, and studied novel biomarkers to better distinguish the true prognostic potential of patients with these rare and heterogenous tumours.

For patients with neuroblastoma, we developed a system to generate individualized cell cultures from surgical tumour specimens. Early-phase cultures were developed which recapitulated the cytological and molecular features of the original patient tumours. Cell numbers could be expanded in an accelerated manner, generating sufficient quantities before patient relapse and progression events occurred. Cells predominantly expressed the mesenchymal-type gene expression signature characteristic of the more aggressive tumour cell subpopulation. In-vitro cytotoxicity to standard-of-care chemotherapeutics cyclophosphamide and topotecan corresponded with individual patient response, demonstrating the potential of this platform for personalized real-time prediction of chemotherapy response.

Wilms tumor demonstrates significant differences in epidemiology, histology and treatment outcomes among races, but the molecular basis for this is unclear and is not currently used to stratify patients' treatment. We compared the incidence of a recently-established molecular risk marker for Wilms tumor – loss of heterozygosity (LOH) of 1p and 16q – among Asian and non-Asian patients, having first adapted the standard genotyping assay for archival formalin-fixed paraffin-embedded specimens. We found that despite similar rates of lymph node metastasis and LOH, Asian patients had fewer unfavorable histology tumors, lower-stage disease, and better survival outcomes. Our findings question the role of LOH of 1p and 16q as a risk biomarker in Asian patients. The bases for these differences and implications on treatment strategy for these patients are now the subject of our further study.

## Pathology in Precision Oncology

**A/Prof Kenneth Chang Tou En**

*Head and Senior Consultant, Department of Pathology and Laboratory Medicine*

*KK Women's and Children's Hospital, Singapore*

The pathologist's role in cancer diagnostics is gradually evolving from one of rendering a subjective morphology-based diagnosis, to comprehensive multimodality interrogation of molecular abnormalities of the cancer specimen to identify mutations that are both entity-defining and predictive for specific targeting drugs. In this talk, we will cover the evolution of this process, where we stand in KKH pathology, and how pathology diagnostics may change in the future.

## **Proton Therapy for Paediatric Central Nervous System Tumors**

**Dr Looi Wen Shen**

*Associate Consultant, Division of Radiation Oncology  
National Cancer Centre Singapore, Singapore*

Radiation therapy is an integral component in the multimodal management of central nervous system tumours. There is no doubt about the antitumour efficacy of radiation therapy. However, its efficacy must be balanced against the cost of long-term side effects due to the irradiation of normal tissue, including the surrounding brain. These side effects may have a considerable impact on the physical, neuropsychological and emotional well-being of paediatric cancer survivors. Indeed, the use of radiation therapy for paediatric central nervous system tumours has declined in the past decades due to these concerns.

Most radiation therapy is currently delivered in the form of x-rays. Advancements in delivery techniques such as highly conformal radiotherapy and intensity-modulated radiotherapy have led to more conformal dose distributions that reduce the amount of normal tissue receiving the prescription dose of radiotherapy. However, the drawback of x-ray radiation therapy is that the beams inherently continue to deposit dose beyond the target volume in the normal tissues. The surrounding normal tissue is thus exposed to a low and intermediate dose bath. Proton beam therapy, on the other hand, has a unique property of depositing most of its dose into the target and stopping thereafter, thus reducing this dose bath. Proponents of radiotherapy have long argued that this will lead to reduced long-term effects in survivors. However, opponents have often argued that the purported benefits of reducing this dose wash are largely theoretical without clinically meaningful data to support this.

Fortunately, proton therapy has become more available over the years, which has generated clinically meaningful data to support the use of proton therapy over x-ray therapy. The evidence suggests that proton therapy indeed reduces late toxicity related to cognition and endocrine effects. The benefits also extend to a reduction in the rate of second malignant neoplasms and improvements in quality of life of survivors. This talk will discuss proton therapy in paediatric central nervous system tumours and the evidence for its superiority in terms of side effects in paediatric brain tumours.

## **Neurocognitive Evaluations and Psychosocial Supportive Care for Children and Young People with Cancer**

**Dr Lois Teo**

*Head and Senior Principal Psychologist, Psychology Service  
KK Women's and Children's Hospital, Singapore*

Children with cancer and their families face many challenges and adjustments in their lives related to the impact of treatment and in managing a severe illness. Treatment can last from months to years, which can mean long stays in hospital; and therefore being away from home, siblings, friends and school. Side-effects from the cancer and its treatment may also cause the child to be unwell, inactive and their nutritional status becoming suboptimal. All this affects a child's development, academic, social and emotional well-being. With medical advancement, the survivor rates for childhood cancers have greatly improved. However, the consequences of treatment present substantial long-term health, neuropsychological and psychosocial concerns (i.e. late effects) for children and their families. Negative psychosocial outcome such as depression, anxiety, post-traumatic stress disorder and reduced quality of life are some examples of the psychosocial needs and support for this population that has been often overlooked and still in its early phases locally. Also, children and young people react psychologically to a diagnosis of cancer and the subsequent treatment depending on their developmental stage. Therefore, the need for psychosocial support varies greatly among the paediatric population, and interventions need to be individually tailored to meet their needs. In view of all these challenges faced by the child and the family, support is required from multiple healthcare professionals.

This presentation will focus on an overview of the neuropsychological late effects and psychosocial impact arising from the treatment of paediatric cancer, as well as the barriers in providing psychosocial care locally. Current interventions and future opportunities for standards of psychosocial care for children with cancer and their families will also be discussed.

## The Inverted Pyramid of Prenatal Care

**Dr Serene Thain**

*Associate Consultant*

*Division of Obstetrics and Gynaecology*

*KK Women's and Children's Hospital, Singapore*

The current and most common approach to prenatal care, involving visits at 16, then at 24 and 28 weeks, fortnightly thereafter until 36 weeks and then weekly until delivery, was established almost a century ago by the Ministry of Health in the UK. The increased frequency of visits in the late 3<sup>rd</sup> trimester implies that most obstetric complications occur towards the later part of pregnancy and that adverse outcomes cannot be predicted earlier in pregnancy. This may have been true for pregnancy care a century ago – but science has since evolved greatly. We are now able to detect or predict many adverse obstetric outcomes right from the outset of the first trimester with the help of scientific advances, through the combination of maternal characteristics, history, biochemical markers and ultrasound markers that help with risk stratification. The Fetal Medicine Foundation therefore proposed in 2011 that the traditional pyramid of care should be inverted with the main emphasis placed in the first rather than the third trimester of pregnancy. Going one step further, we propose that perhaps the largest and most important top of the inverted pyramid should be that of pre-pregnancy planning, counselling and optimisation of health prior to conception, so as to minimise the potential risks and adverse outcomes in pregnancy.

## Fetal Therapy and Surgery

**Dr Anju Bhatia**

*Staff Physician*

*Department of Maternal Fetal Medicine*

*KK Women's and Children's Hospital, Singapore*

Profound advances have been made in the fields of prenatal diagnosis and fetal intervention during last 3 decades. Advances in fetal imaging and diagnosis including ultrasonography and MRI have allowed clinicians to accurately identify complex anomalies prenatally and stratify their severity. Data that has been accrued over the past years gives expectant families accurate outcomes so they can make informed decisions about the pregnancy and delivery plans.

Fetal intervention for congenital anomalies has evolved from a mere concept to a medical specialty. Improvements in minimally invasive techniques and in the understanding of fetal physiology have allowed for more successful and less invasive interventions for fetal diseases in utero. Intervention has been offered for a variety of fetal diseases, including structural abnormalities, cardiac arrhythmias, fetal metabolic diseases, and abnormalities of the placental vessels or membranes. Many of these diseases would be lethal without treatment like TTTS while some (eg, spina bifida or hypoplastic left heart syndrome) are not necessarily lethal postnatally, but efforts to treat them in utero have been offered with the goal of improving long-term outcomes for the child.

Results from early experiences with fetal therapy generated a movement away from anatomic repair of congenital anomalies to physiologic manipulation of the developmental consequences (e.g., the shift from in utero repair of the CDH defect to balloon tracheal occlusion to promote lung growth). Techniques used in fetal intervention have also evolved from maximally invasive (e.g., open hysterotomy) to more minimally invasive techniques, such as fetal endoscopy, and image-guided percutaneous procedures.

KK Women's and Children's Hospital has evolved over the decades, since its founding in 1858, into regional leader in Obstetrics, Gynaecology, Paediatrics and Neonatology. We focus on comprehensive care for patients and their unborn child. Our Fetal Therapy program offers advanced diagnostic and therapeutic options for medical and surgical treatment of the unborn child. We have years of experience using invasive fetal management as well as minimally invasive techniques to deliver the best outcomes.

## **Advancing the Frontiers of Fetal Gene Therapy**

**Prof Jerry Chan Kok Yen**

*Senior Consultant*

*Department of Reproductive Medicine*

*KK Women's and Children's Hospital, Singapore*

(Abstract not available at time of publication)

## **KK Human Milk Bank: Giving Premature Babies the Best Start in Life**

**Dr Chua Mei Chien**

*Head and Senior Consultant*

*Department of Neonatology*

*KK Women's and Children's Hospital, Singapore*

The influence of early nutrition on long term health (nutrigenetics) is increasingly being recognised. Mother's own milk (MOM) is the best nutrition for her baby with rare exceptions. Feeding preterm infants with human milk, including pasteurised donor human milk (PDHM), improves feed tolerance and reduces the risks of necrotising enterocolitis (NEC) and sepsis in this vulnerable population. This is attributed to the immunological and bioactive components in human milk. Nutritional components, known as immunonutrients, also modulate the intestinal digestive and barrier function, bacterial colonization, and host immune defence.

The KK Human Milk Bank was established to provide a safer alternative to formula feeding for premature and sick babies admitted to the neonatal intensive unit (NICU) who have inadequate MOM.

From the time of its launch on 17 August 2017 to 30 June 2019, the milk bank processed an average of 14L of donor milk and dispensed 3.5L of PDHM daily. Majority of the 483 donors recruited were Chinese (86%) and had delivered full term babies (84.7%). The median volume of donation per donor was 6L (0.13-90L).

PDHM was prescribed for 1039 recipients from KK Women's and Children's Hospital (KKH), Singapore General Hospital and the National University Hospital; of whom 90% were born premature at less than 35 weeks gestation. 56% of the recipients were Chinese, 29% Malays, 10% Indians and 5% of other races. The median duration of PDHM usage was 7 days (1-145days) and the median volume utilised was 1.9L (0.05-240L). Exclusive human milk feeding in the NICU in KKH increased from 20% to 90% and exclusive feeding with mother's own milk increased to 40%. The incidence of NEC was reduced from 5.8% to 1.1%.

In conclusion, the establishment of the donor human milk bank, which reinforces the importance of breastfeeding, has resulted in increased utilisation of human milk in the NICU and more importantly the provision of MOM. PDHM is well accepted in our local population with improved health outcomes in the vulnerable population of preterm infants

## SYMPOSIUM 2 | Fetal Medicine: From Womb to World

### Treatable Common Lysosomal Storage Diseases

Dr Ngu Lock Hock

*Consultant in Clinical Genetics and Inherited Metabolic Disorders  
Hospital Kuala Lumpur, Malaysia*

(Abstract not available at time of publication)

## SYMPOSIUM 2 | Fetal Medicine: From Womb to World

### The Spectrum of Mucopolysaccharidosis

Dr Lin Hsiang-Yu

*Associate Professor  
Department of Paediatrics  
MacKay Medical College, New Taipei City*

(Abstract not available at time of publication)

## SYMPOSIUM 3 | Nursing and Allied Health

### Pre- and Post-Operative Dietary Optimisation for Gynaecology Patients

Ms Cheryl Au

*Senior Dietitian  
Nutrition and Dietetics Department  
KK Women's and Children's Hospital, Singapore*

Poor nutritional status has been associated with increased postoperative morbidity and mortality in surgical patients. Among Gynae-Oncology patients, the prevalence of malnutrition is approximately 20% at time of diagnosis.

In the state of increased metabolic demands caused by a chronic illness, the body's existing nutrient stores are compromised. If increased nutrient needs are not met from dietary or therapeutic sources, the patient may experience an impaired immune response, impacting treatment outcomes such as increasing the risk of postoperative complications. Thus, nutrition optimization is important in improving patients' survival and quality of life.

Optimal nutrition care in Gynae-Oncology patients includes nutrition screening, assessment and intervention. Nutrition screening helps to identify patients at high risk for malnutrition such that the appropriate nutritional care can be provided in a timely manner. Nutrition assessment involves a holistic consideration of the patients' nutrition status, incorporating anthropometric measurements, physical examination (recognising signs of malnutrition), weight history, symptoms, food intake and activity level.

Nutrition intervention is important for reducing malnutrition and optimizing treatment outcomes. Post-operative nutrition challenges include treatment related side effects, meeting nutritional needs, food aversions, poor social support and inadequate resources. Individualised nutrition intervention is crucial for patients' treatment recovery. This includes nutrition optimisation from oral, enteral or total parenteral nutrition and the appropriate use of oral nutrition supplements.

In addition, nutrition status may be optimized by enhanced recovery protocols, which incorporate multiple modalities to quicken return of bowel function and nutrition in post-surgical patients. A number of randomised trials on early feeding as having oral intake of fluids or food within the first 24 hours after surgery have been performed in gynae-oncology patients. Beneficial effects may include accelerated return of bowel activity, reduced length of stay, reduced complications rates related to wound healing, anastomotic leaks, and pulmonary complications.

## **Sentinel Lymph Node Biopsy in Gynaecological Cancers**

**Dr Wang Junjie**

*Consultant*

*Department of Gynaecological Oncology*

*KK Women's and Children's Hospital, Singapore*

Minimally invasive surgery has gained widespread acceptance in the field of gynaecology. It has been shown that oncologic procedures such as pelvic and para-aortic lymph node dissection can be performed safely and effectively using a minimally invasive technique. The excellent integration between near-infrared platforms and minimally invasive surgery represents the cornerstone of a new era in gynaecological oncology. Although sentinel lymph node mapping has been a topic of interest for 15 years in uterine malignancy, it was only first considered as an acceptable alternative to a systematic lymphadenectomy by international guidelines in 2014. The adoption of indocyanine green as a tracer has substantially accelerated the acceptance of this approach. This transition from systematic lymphadenectomy to sentinel lymph node biopsy parallels that in breast cancer surgery, and could ultimately achieve a smaller and more focused surgical procedure providing important pathological information in every patient at the cost of acceptable morbidity. By identifying the first lymph node draining the tumour, lymphatic mapping with SLN biopsy allows to reduce the morbidity associated with a complete lymphadenectomy and to improve detection of metastatic detection through ultrastaging protocols and identification of alternate sites of lymphatic drainage.

## **An Advanced Practice Nurse (APN) Led Assessment and Education Clinic – APAE Clinic**

**Ms Wei Na**

*Nurse Clinician*

*Division of Nursing*

*KK Women's and Children's Hospital, Singapore*

Working in Gynaecology-Oncology ward for many years, we have observed how our patients and their loved ones gone through cancer diagnosis and cancer treatment journey. The burden of the cancer disease is profound for cancer patients and their family. Surgical intervention is the major treatment modality for gynaecological oncology patients. There are many factors can affect the surgical outcomes, mainly are patient factors and healthcare team factors.

Time constraint during consultation can potentially affect the accuracy of information exchange between doctors and patients. Studies have concluded limited understanding of diagnosis and treatment will cause psychological distress, poor compliance and unsatisfactory outcome.

To fulfill Gynecological Cancer patient's unmet needs, stratify operation risk, enhance preoperative preparation and prevent postoperative complication, an APN-led Preoperative Assessment and Education (APAE) Clinic for gynecological-oncology patients was initiated in KK Women's and Children's Hospital Gynecological Cancer Center in December 2014.

An evaluation study on APAE was done by APN Dr Huang Fang. It was to compare the length of stay (LOS), along with to capture referrals to and from APAE clinic and patient satisfaction. It was a convenience sampling, descriptive design study, 196 patients' data was collected pre-APAE and another 196 patient's data was collected Post-APAE.

The results were very heartening. Mean LOS was shortened from 8.5 days to 5.8 days, wound infection rate decreased from 10.6% pre-APAE and 4.6% post-APAE. Incoming referrals to APAE was up to 92% by the third month, and 22.7% of the patients needed medical referrals and about 15.2% referred to medical social worker for care issues and/or financial issues. APAE clinic also achieved 100% patient satisfaction in various aspects, including patient and family knowledge improvement, pre/post- care explanation and co-ordination of care.

Moving forward, we hope to extend the service to patients scheduled for major gynaecological operation in other clinics.



## **Rehabilitation for Gynaecology Patients**

**Ms Barbara Wee**

*Senior Physiotherapist*

*Physiotherapy Department*

*KK Women's and Children's Hospital, Singapore*

Exercise can impact a person's life significantly, in areas such as cancer prevention or pre-treatment optimisation. It can be used as an adjunct during cancer treatment and to improve quality of life during survivorship or in palliative care. Studies reported strong evidence demonstrating improvements in cancer-related fatigue, strength, physical fitness and emotional well-being amongst patients who exercise. Those who participated in physical activities were also found to tolerate treatment side effects better. However, while healthcare providers recognised these benefits of exercise, they may not be equipped or confident to advise or prescribe exercise as medicine during the patient's journey through coping with cancer.

Cancer-related fatigue is a major side effect of cancer and its treatment. Patients reporting such fatigue often present with reduced lower limb strength and higher risk of falls. While patients may agree with the importance of exercise during treatment, fatigue remained one of the top barriers to them starting or adhering to exercise.

A physiotherapist-led ward-based group exercise programme may be a possible way to introduce exercise and its benefits to patients, their caregivers and other healthcare co-workers.

## **Tandem Mass Spectrometry – A Simple and Rapid Solution for the Newborn Screening for Inborn Errors of Metabolism**

**Dr Ang Chung Yen**

*Senior Application Scientist*

*PerkinElmer Singapore Pte Ltd, Singapore*

(Abstract not available at time of publication)

## **The Role of Pre-Implantation Genetic Screening (PGS) and Pre-Implantation Genetic Diagnosis (PGD) in Reproductive Medicine**

**Dr Sadhana Nadarajah**

*Senior Consultant*

*Department of Reproductive Medicine*

*KK Women's and Children's Hospital, Singapore*

The use of Preimplantation Genetic Diagnosis and Pre Implantation Genetic screening in IVF treatment is an exciting new frontier in fertility medicine. The indications, limitations and benefits of these techniques will be covered. Finally KKIVF's experience with both PGD and PGS will be discussed

## **Personalised Medicine in Anaesthesiology**

**A/Prof Sng Ban Leong**

*Head and Senior Consultant*

*Department of Women's Anaesthesia*

*KK Women's and Children's Hospital, Singapore*

Personalised medicine is fast gaining research and clinical applications in medicine including Anaesthesiology. Women's Anaesthesia has been embarking in aspects of personalised patient care and research to optimise efficacy and safety and reducing adverse effects. The use of patient feedback together with robust closed loop algorithm incorporated into the drug delivery system, could allow better tailoring of patient needs and improve outcomes. (1) Novel epidural delivery system techniques aim to improve pain relief while reducing adverse outcomes such as motor blockade, instrumental delivery and breakthrough pain compared to conventional epidural delivery techniques. (2) Opioid induced respiratory depression and sedation are uncommon but serious adverse events from opioid delivery. We designed a delivery system, utilising continuous vital signs monitoring and clinically relevant novel closed loop feedback systems. Clinician leadership, together with collaboration with engineering technology expertise, are key vital elements in our advancement in personalised medicine during anaesthesia care.

## **Personalised Management of Gynaecological Cancer**

**Dr Lim Sheow Lei**

*Visiting Consultant*

*Department of Gynecological Oncology*

*KK Women's and Children's Hospital, Singapore*

*Senior Consultant Medical Oncologist*

*OncoCare Cancer Centre, Singapore*

Chemotherapy has traditionally been the mainstay treatment of advanced gynaecological cancers. As our understanding for the complexity and uniqueness of individual tumour improves, the suitability of this "one-size-fits-all" approach to cancer treatment is called into question. The goal of cancer therapy now is to target the cancer more precisely through personalized cancer treatment. Furthermore, there has also been a move in recent years to give less chemotherapy in order to mitigate treatment toxicities.

Beyond chemotherapy, "targeted" drugs tailored to the unique molecular composition of individual tumour, including the genes and proteins that drives cancer growth have changed the treatment paradigms for certain gynaecological cancers; drugs that target angiogenesis (by disrupting the blood supply to tumours thereby resulting in tumour starvation) and more recently, drugs that target the PARP enzymes in BRCA-mutated / homologous-repair-deficient ovary cancers. Drugs that target the NTRK mutation, a rare mutation found in uterine sarcomas, can achieve high tumour response rates and durable disease control in this aggressive and chemo-resistant disease. Immunotherapy is also making inroads into the treatment of gynaecological cancers. Majority of patients unfortunately do not benefit from this treatment. Immunotherapy should therefore be given as a tailored approach, using biomarkers such as the mismatch repair deficiency status and PD-L1 expression to select patients for treatment, rather than a blanket approach.

## **The Role of Genetics in the Development of Therapeutics for Osteoporosis**

**Dr Ang Seng Bin**

*Head and Senior Consultant*

*Family Medicine Service*

*KK Women's and Children's Hospital, Singapore*

Osteoporosis is a non-communicable disease with huge impact on the individuals as well as the burden on the healthcare system. In the Asia Federation of Osteoporosis Societies Study, it is estimated that the direct cost of hip fractures in Asia will increase from the current 9.5 billion USD to 15 billion USD in the year 2050. In order for the total number of hip fracture to remain constant over time, there needs to be an annual 2%-3% decrease in incidence of the rate of hip fracture. This can be achieved through early detection and treatment of osteoporosis as well as measures of falls prevention. Treatment options of osteoporosis have greatly improved from the early days when only menopausal hormone therapy and alendronate was available. Advancements in the understanding of bone physiology has led to targeted drug development with effective treatment options for patients with osteoporosis. We will explore the various targets for the new therapies in this session.

## **A Social and Developmental Perspective of Autism Spectrum Disorder Across the Lifespan**

**Ms Gwen Chng**

*Autism Resource Nurse*

*Department of Child Development*

*KK Women's and Children's Hospital, Singapore*

**Dr Koh Hwan Cui**

*Senior Psychologist*

*Department of Child Development*

*KK Women's and Children's Hospital, Singapore*

This presentation aims to review current literature on the challenges that individuals with Autism Spectrum Disorder (ASD) may face across the life-span, and share on how we can best work with people with ASD within our healthcare system. Two case examples will be presented to provide context and facilitate further discussion.

ASD is a neurodevelopmental condition characterized by persistent deficits in social communication and interaction, and the presence of restricted, repetitive behaviors, interests, or activities. Behaviours, presentation and level of need that people with ASD show may change across the lifespan, and is often dependent on the severity of the ASD characteristics, the person's cognitive and language abilities, previous intervention received, and the current level of psychosocial support that the person has. In addition to the daily living and educational difficulties that people with autism can experience, there is growing evidence that ASD-related cognitive styles and emotion regulation differences can predispose people with ASD to develop anxiety and depression in adolescence and adulthood.

While it is important to understand the challenges and differences that people with ASD present with, it is as important to focus on strengths that people with ASD show and the commonalities that they share with people without ASD. There is a movement in the international community towards greater inclusion of people with different neuro-developmental characteristics – *neuroharmony*, and we within the hospital setting can and should contribute towards this societal goal.

Also, as we build up our clinical knowledge about ASD, we need to recognize the heterogeneity in ASD and understand that there will be individual differences across each person with ASD. For us to deliver more patient-centric care in our hospital, we can consider adopting an *Ask, Don't Assume* approach, to better engage and connect with our patients with ASD (and their caregivers).

## A Caregiver Journey of Transition to Adult Care for Medically Complex Patients

***Ms Wong Wanlin***

*Senior Medical Social Worker*

*Medical Social Work Department*

*KK Women's and Children's Hospital, Singapore*

***Ms Zhou Li***

*Nurse Clinician*

*Division of Nursing*

*KK Women's and Children's Hospital, Singapore*

For any chronically sick child, the process of transition has its own set of challenges and uncertainties for the patient and family. However, these challenges are more evident for a child with medical complexity requiring multiple homecare equipment and technology, as it involves coordinating of various sub-specialties, locating a suitable adult hospital that can provide all of patient's care, and addressing patient and caregiver's psychosocial needs.

One of the primary goals of the Complex Homecare Team is to ensure seamless, coordinated transition for the older group of medically complex paediatric patients, aged 18 years and above, from KKH to the adult tertiary hospital. This group comprises of patients requiring one or more of the following care types – Non-invasive ventilator, Tracheostomy, Gastrostomy, NGT or NJT technology.

The team's emphasis on a coordinated transitional care has led to the development of a complex care transitional workflow involving the complex care team of doctors, homecare nurses, allied health professionals and medical social workers. After identifying complex care patients from the age of 12 years old, we initiate conversations about transition with patient and their families. This is to prepare them to be familiar with the concept of transition, work through and address their concerns related to transition, give them time to come to terms with the eventual separation from KKH, and to be introduced to a new environment at the adult hospital. We also follow up with phone calls post transition to address any issue and feedback to adult hospital. Having a structured workflow enables us to anticipate potential challenges and obstacles along the way. We also rely on previous patients' experiences to help us fine-tune our care so that it is customised and personalized to patients and families during this transitional journey.

Since the start of the Complex Homecare Service in April 2017, the team has been successful in transiting 20 paediatric patients to various adult hospitals, and are in the midst of transiting 30 more patients by end 2020.

## **Transitioning Rehabilitation Care for Medically Complex Patients from Hospital to Community**

**Ms Maheswari Vellaichamy**  
*Senior Physiotherapist*  
*Physiotherapy Department*  
*KK Women's and Children's Hospital, Singapore*

Singapore started to recognize the importance of early intervention and childhood education for children with medically complex conditions in recent years. There was also a need to increase the accessibility to EIPIC (Early intervention programme for infants and children) in centres and at home. EIPIC provided each child an opportunity to maximise his or her functional potential through holistic and individualised developmental programmes. However, the lack of a standardised model of care for children requiring long term therapy services in Singapore has resulted in a duplication of services in both acute hospitals and in EIPIC centres.

In KK Women's and Children's Hospital, a pilot project was initiated by physiotherapists to facilitate the right siting of medically complex children and children requiring long term therapy services. The aim of this project was to provide continuation of care to these children within their community while minimising the challenges faced by families due to frequent travel to the hospital for various appointments. The workgroup identified areas of limitations including a lack of communication between the hospital and community, and limited caregiver competency. Not only was there inadequate medical information available for therapists in the community, there was also a lack of expertise there equipped to handle these groups of children.

The limitations identified were addressed across the organisations and communication consent was created to share information of these children through parents. Parents were given regular updates on their child's progress and provided information on further management to the community partners through correspondence letters. Therapists from the community were also informed of regular training and conferences to enhance their skills to bridge the gap. These measures streamlined the management of these children in the community and ensured smooth transition of children with complex medical needs from the hospital to the community.

## **Transiting Rehabilitation Care for Medically Complex Patients from Hospital to Community: Speech Therapy**

**Ms Stacy Tan Man Ling**  
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*Speech-Language Therapy Service*  
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The Speech Language Therapy Service at KK Women's and Children's Hospital (KKH) provides rehabilitation services for medically complex patients with a range of feeding and communication difficulties. In the inpatient setting, patients' feeding and communication skills are assessed by a Speech Therapist (ST), with the provision of targeted intervention and caregiver training. In the outpatient setting, patients may be reviewed in the Complex Homecare Multidisciplinary clinic and/or at specialized outpatient ST services, which are provided for patients who require further sessions to establish feeding recommendations and facilitate development of feeding skills. Close collaboration with the community therapists are essential for the transit to the community setting. This may occur at the point of discharge from the inpatient setting or in the outpatient setting. STs contribute to the Agency for Integrated Care (AIC) referrals and write regular memos as handover documents to the community therapists, indicating assessment results, intervention techniques and goals, which facilitate holistic management and continuity of care. In addition, the Speech Language Therapy Service has started a pilot run of community engagement sessions with the community therapists. These sessions serve to provide information regarding KKH ST services and discuss management strategies. The pilot session has been well received and through pre and post survey data, the community therapists have shown an increase in understanding of the ST services at KKH, as well as how to contact and refer patients to a KKH ST. Subsequent sessions aim to discuss management issues such as objective swallow assessments and tube weaning. Consistent communication and collaboration with our patients' core medical team, their parents and community therapists facilitates provision of appropriate intervention and improved patient outcomes, and we will continue to work closely with our community partners to transit our patients into the community setting.

## Transitioning from Hospital to Community: Case G

**Mr Joseph Acuna Tampos**  
*Occupational Therapist*  
*AWWA Community Integration Service*

**Objective:** As interventions progressed to more advanced activities overtime, yet little time was spent on community integration or leisure activities and with very few clients. The purpose of this talk is to share the service provision of AWWA-CIS that assists in the transition of patients from hospital to community and assessment and intervention to address their participation needs in mainstream schools.

**Methods:** Using the PEO model and the Conceptual Model of Optimal Participation, it helped the team frame the approach for the transition of a patient with complex needs into mainstream school. Collaboration with the caregiver, school and MOE facilitated a school trial for the patient. The team embarked on preparation for transition way ahead of commencement of school trial.

**Outcome:** With the use of participation model and collaborative effort of patient, caregiver, CIS team, MOE and school, the patient is able to commence and continue the trial in a Singapore mainstream school. With continued support of the team working with the patient, she was able to increase participation in school activities, engage in social relationships and contribute positively in her role as a student, fulfilling her dream of studying in a mainstream school.

## Caregiver Burnout/Fatigue and Respite Care

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The demands of caring for children with medically complex conditions require at least one full-time caregiver, who is either a parent, extended family member or a domestic helper. The care provided may range from administering daily medical procedures, e.g suctioning or tube feeding, to accompanying them for their special school activities.

Due to the challenging caregiving responsibilities required on top of caregiver's daily stressors, they may experience fatigue and burnout – mental, physical and emotional exhaustion, which may affect their ability to continue to cope well with their daily activities and the daily demands of patient's care needs. As such, caregivers will benefit from respite care which helps alleviate the stress of caregiving so that caregivers may attend to their other daily commitments and also be able to self-care.

At KKH, music therapy is referred for hospitalized children with complex care needs to address rehabilitation and developmental milestones, as well as for caregiver respite. Music is a tool that can normalize the hospital experience, reduce anxiety, and facilitate relaxation.

While conducting a psychosocial and financial assessment to these caregivers, MSWs will provide counselling for those who are assessed to require additional support. We also assess if there is a need to refer them for community respite care services. There are currently 2 institutions that are able to provide inpatient respite care. MSWs also liaise with external agencies in providing ad-hoc home-based nursing and respite care.

This session will inform how music therapists and MSWs support caregivers of patients with high care needs, and how our intervention can benefit them and help them better cope with their stressors.

## The Patient Experience Eco-System

**Ms Irene Chan**

*Director, Office of Patient Experience*

*KK Women's and Children's Hospital, Singapore*

The patient experience is no longer viewed in a singular lens of patient satisfaction but an eco-system that brings together issues of leadership, staff experience, clinical outcomes, patient and family engagement and safety and reliable care. A strategic and integrated framework is needed to frame these elements and a deeper understanding of what drives this eco-system will be shared. The interplay of these resources will not only impact on the patient and family but also on the purpose and motivation of staff and care teams in providing care.

## PROMs / PREMs and Patient Centric Care

**A/Prof Ng Kee Chong**

*Chairman, Medical Board*

*Senior Consultant, Emergency Medicine*

*KK Women's and Children's Hospital, Singapore*

**Mr John Wong**

*Senior Manager, Office of Patient Experience*

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Patient-centered measurements must be patient-driven; holistic; transparent; comprehensible and timely and be co-created with patients are equal partners in measure development and have decision-making authority about how data is collected, reported, and used.

Patient Reported Outcome Measures (PROMs) are principally questionnaires, which measure different aspects of health and quality of life from the patient's perspective. They are three broad categories of PROMs: generic health status, preference-based, and condition or population-specific measures.

Generic instruments comprise items relevant to the widest range of patient conditions and the general population while preference-based measures additionally provide utilities or values regarding health (for use in, for example, cost-utility analyses of interventions). Specific instruments are often more focused on a particular disease or health condition (for example, diabetes), a patient population (for example, older people), a specific problem or symptom (for example, pain), or a described function (for example, activities of daily living)

PROMs can improve care by assisting clinicians to provide better and more patient centred care; assessing and comparing the quality of providers and providing data for evaluating practices and policies.

Patient reported experience measures (PREMs) gather information on patients' views of their experience whilst receiving care. PREMs look at the impact of the process of the care on the patient's experience e.g. communication and timeliness of assistance. They differ from satisfaction surveys by reporting objective patient experiences, removing the ability to report subjective views.

PREMs can be classified as either relational or functional. Relational PREMs identify the patients' experience of their relationships during treatment, e.g. did they feel listened to while functional PREMs examine more practical issues, such as the facilities available. Studies have shown substantial links between patient experience and clinical safety and effectiveness.

## **Community Acquired Pneumonia (CAP) – Value Driven Care (VDC): Patient Reported Experience Measures (PREMS)**

**Dr Biju Thomas**

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CAP is common and is associated with considerable morbidity, healthcare utilisation and economic impact. In 2018, under the Singapore Ministry of Health (MOH) CAP Value Driven Care (VDC) initiative, a workgroup was formed, with an objective of value optimisation for children admitted with CAP. The objective of this talk is to share the experience gathered by the CAP VDC workgroup on the experiences of patients (and parents) admitted with CAP, including the lessons learnt and challenged ahead. Patient experience was assessed using the Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey, shadowing (direct, real-time observation of care segments) using the goShadow application ([www.goshadow.org](http://www.goshadow.org)) and using patient focus groups. Data from HCAHPS survey, shadowing and focus group discussions highlighted many areas where there is scope for further improvement to enhance patient experience. These areas include both relational and functional elements. Empathy, appropriate communication and patient centric approach were highlighted as key areas that need improvement. A concerted effort by all stakeholders would be required to implement the necessary changes for improved patient experience. There is an unmet need to develop validated paediatric generic and CAP specific Patient Reported Outcomes and Experience Measures

## **Certis Living Lab in KKH**

**Mr Fuji Foo**

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(Abstract not available at time of publication)



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## Identification of a *de novo* *TUBA1A* Variant in a Child with Lissencephaly

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**Introduction:** The alpha and beta tubulin gene families encode components of microtubules that are essential in intra- and inter-cellular processes, with tissue-specific expression for different family members. The brain-specific alpha-1A gene (*TUBA1A*, OMIM 602529) is highly expressed in fetal brain during early brain development and have been associated with patients with Lissencephaly 3 (LIS 3, OMIM 611603).

**Methodology:** Our patient was a full-term infant admitted at 3 months for microcephaly and myoclonic seizures. Magnetic resonance imaging (MRI), biochemical testing, chromosomal microarray analysis (CMA) and PCR for cytomegalovirus/Zika virus were conducted. Next generation sequencing (NGS) with TruSight One panel was also performed. Variants identified were validated and inheritance status affirmed using Sanger sequencing on the patient's and parental samples.

**Results:** Head circumference was < 3rd centile. Brain MRI showed microcephaly, hypoplastic brainstem and cerebellum, bilateral simplified gyral pattern, thin cortical lamina, and decreased white matter volume associated with dilatation of the lateral ventricles. Biochemical testing and CMA were all normal, and PCR result was negative. NGS identified a heterozygous missense variant in *TUBA1A* [NM\_001270399.1:c.521C>T: p.(Ala174Val)]. The *de novo* variant (rs587784489) had no allele frequency and was not listed in the databases. The effect of the amino acid substitution was predicted *in silico* to be either pathogenic or likely pathogenic and there were two previous ClinVar submissions.

**Conclusion:** The neurological manifestations and MRI findings of this patient are consistent with the phenotypic descriptions for lissencephaly associated with *TUBA1A* mutations and previously reported cases.

## Identification of Mutations in Patients with Mendelian Disorders Using TruSight One Panel: Experience from KK Women's and Children's Hospital

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**Introduction:** Next-generation sequencing (NGS) technologies have facilitated the discovery of defective genes in various Mendelian disorders. However, data from South-East Asian are limited. We tested a large gene panel for identifying causative genetic variants in single-gene disorders.

**Methodology:** Patients with suspected monogenic disorders were recruited from 2015 to 2019. They were Southeast Asian residents of Chinese, Malay, Indian and other ancestries. Phenotypic characterizations were done by the attending physicians. The disorders included dysmorphism, congenital malformations, developmental delay, neurocognitive impairment and genetic skin conditions. NGS was performed with TruSight One panel which targets 4813 disease-associated genes. Sanger sequencing was performed with the patients' and parental samples for validating the variant and the inheritance status

**Results:** A total of 194 patients with mean age of 6.7 years (60% Chinese, 27% Malay and 5% Indian mainly) were sequenced. In 86 patients, 100 mostly pathogenic/likely pathogenic variants from 58 genes were identified, which contained 24 frame-shift, 18 nonsense, 48 missense, nine splicing and one synonymous; 49 novel; 62, 33 and five with AD/AR/X-linked inheritance patterns, respectively; 52 *de novo*, 28 inherited and 20 undetermined; and 37 found in HGMD. Some of the clinical diagnoses confirmed based on the associated genetic variants were: Type I Neurofibromatosis, Noonan syndrome, Kabuki syndrome, Coffin-Siris syndrome and epidermolysis bullosa.

**Conclusion:** The diagnosis yield is 44.3% which is comparable to similar studies (26~50%). The identification of genetic defects could help to confirm the clinical diagnosis or identify the specific disorder which would enable more targeted care and accurate prognosis.

## Rapid Health Technology Assessment of Erbium-Doped Yttrium Aluminium Garnet (Er:YAG) Laser Therapy for Stress Urinary Incontinence or Genitourinary Syndrome Of Menopause

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**Introduction:** It had been proposed to offer erbium-doped yttrium aluminium garnet (Er:YAG) laser therapy to women with stress urinary incontinence (SUI) who failed conservative measures; or, who experience genitourinary syndrome of menopause (GSM), in CGH. Hospital management requested a rapid health technology assessment (HTA) on the safety and effectiveness of the technology.

**Methodology:** The HTA's PICO elements were: (1) Population- Women with SUI/GSM; (2) Intervention- Er:YAG laser therapy; (3) Comparator- Conventional management; and (4) Outcomes- Adverse effects, clinical outcomes. Bibliographic databases were searched for systematic reviews, HTA reports and clinical practice guidelines. Relevant studies were retrieved for critical appraisal. Included systematic reviews were critically appraised with the AMSTAR 2 tool. The single randomised controlled trial included was critically appraised with the Scottish Intercollegiate Guidelines Network methodology checklist for controlled trials

**Results:** The evidence base for the safety and clinical effectiveness of Er:YAG laser therapy for SUI/GSM comes from case series and a few controlled trials, with one recent randomised controlled trial where the blinding may be compromised by use of zero intensity sham laser as control, and follow-up was only to 3 months. The mainly uncontrolled studies showed improvements in subjective and objective outcomes up to 18 months (most studies only up to six months) and few adverse effects. Current clinical practice guidelines and consensus statements note the insufficiency of evidence and do not recommend the practice.

**Conclusion:** It was recommended to await more randomised trials demonstrating long-term outcomes before introducing this clinical service; or, to offer the treatment only under research conditions for patients unsuitable/unwilling for conventional treatment.

## The Impact of Patient Reported Experience Measures (PREMS) on Patient Reported Health Outcomes in Adolescents Living with Diabetes

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**Introduction:** This study evaluates how PREMs can influence patients' Quality of Life (QOL) in adolescents with diabetes and to utilize findings for intervention of their psychosocial and physical health.

**Methodology:** Eighty-five patients filled up KKH Outpatient Experience Survey. QOL was assessed using PedsQL4.0 consisting of 4 domains (Physical Health, Social Needs, Emotional Needs, Coping in School). An analysis of correlation was used to determine direction and degree of association between PREMs and QOL.

**Results:** All 23 PREMs had positive correlation to psychosocial health outcome, 4 were highly statistically significant with correlation of  $r > 0.3$ ,  $p < 0.01$ , suggesting moderate positive relationship. They were: (A/B) "Doctor's assistant + Nurses explaining things in a way you could understand", (C) "Information about what symptoms or health problems to look out for after consultation" and (D) "How often did doctor/nurse discuss your worries or concerns during treatment". These findings were applicable to clinical practice as management of diabetes emphasizes on self-care and patients get assistance from the care-team. Benchmark results suggest that we need to work on (A/B) explanation and (D) discussing worries. Patients also fared lower in emotional needs (mean: 74.88) versus healthy adolescents (82.73). This signals early psychological symptoms alerts.

**Conclusion:** By utilizing the results, team was able to identify specific aspects of care interaction and focus interventions to facilitate better psychosocial health. To create opportunities to (D) discuss worries, care team will apply consistent and validated psychosocial surveillance and assessment. To improve (A/B) explanation, care team will adopt the teach-back method by asking open ended questions.

## Targeted Next Generation Sequencing as an Early Diagnostic Tool for Paediatric Rare Genetic Disorders in Singapore: RapidSeq

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**Introduction:** Next generation sequencing (NGS) has been pivotal in improving diagnosis rate and aiding management of rare genetic disorders, which account for 2% of all live births. For rapid diagnosis of genetic disorders, targeted NGS focusing on known Mendelian genes was applied in our hospital for patients from the paediatric intensive care unit (PICU).

**Methodology:** PICU patients with multiple congenital/fetal anomalies and were suspected to have monogenic diagnoses were recruited from April 2018 to July 2019. NGS was performed on the DNA of the proband, and parents when available, using Illumina TruSight One panel. Preliminary reports were targeted to be generated within 10 days and only variants associated with the primary condition would be reported. Identified variants were confirmed by Sanger sequencing.

**Results:** A total of 11 patients with median age of 1.7 weeks (0–18 weeks) were sequenced. Five were processed as trios. For the remaining six, one was processed as duo sequencing and five were as probands only. Seven identified variants were associated with the primary condition of five patients, giving a positive diagnostic yield of 45%. The average turnaround time for result disclosure was 9.2 days (6–13 days). The seven variants were from five genes. Among the identified variants, there were both inherited and *de novo* ones.

**Conclusion:** The good diagnostic yield and quick turnaround time enabled the clinical team to initiate or change management for patients with identified variants, and help to rule out certain conditions for those who tested negative for mutations in specific genes.

## Correlation between Gestational Age and Fetal Cell-Free DNA

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**Introduction:** To test for the correlation between gestational age and fetal cell-free DNA (cfDNA) fraction in maternal plasma.

**Methodology:** Retrospective clinical samples, between November 2017 and January 2019, with singleton & non-*in vitro* fertilisation (IVF) pregnancies and with low probability Harmony™ results were included in this audit. A total of 3,960 samples, between 10 and 20<sup>+6</sup> gestation weeks, were analysed. The fetal fraction of the maternal plasma cfDNA for each sample was determined using the Harmony™ Prenatal Test. Linear regression analysis was performed to determine the relationship between gestational age and fetal fraction.

**Results:** The median fetal fraction between 10 and 20<sup>+6</sup> gestation weeks is 11.76%. Fetal fraction was found to increase with gestational age at a rate of 0.07% per week ( $p = 0.0245$ ), over the period of 10 to 20<sup>+6</sup> gestation weeks. However, gestational age only accounted for 0.13% of the variation in fetal fraction based on the regression model in this audit.

**Conclusion:** Fetal fraction was found to be proportional with gestational age and this audit showed that our population is consistent with populations in other publications. Due to the low coefficient of determination ( $R^2$ ) value of the regression model, gestational age alone is a poor predictor to be used to explain the change of fetal fraction.

## A Clinical-Pathological, Immunohistochemical and *DICER1* Mutational Analysis of Pleuropulmonary Blastoma

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**Introduction:** Pleuropulmonary blastoma (PPB) is the most common paediatric lung malignancy. It is associated with *DICER1* mutation and the *DICER1* tumour predisposition syndrome. Of note, *DICER1* encodes a protein involved in the maturation of miRNA. The aims of the project were to characterize the clinical, pathological and genetic alterations of PPBs in our institution, and to determine if immunohistochemical staining with DICER1, FGF9 and beta-catenin correlated with *DICER1* mutational status. FGF9 and beta-catenin were chosen due to known involvement in the development of foetal pulmonary mesenchyme.

**Methodology:** Cases of PPB over the period 2000-2018 were searched for in our archives; with subsequent compilation of clinical and pathological information. Targeted next-generation sequencing covering the exonic regions of the DICER1 gene, and confirmatory Sanger sequencing of identified variants were performed. Immunohistochemical staining with DICER1, FGF9, and beta-catenin was also performed.

**Results:** Five patients diagnosed with PPB were identified. The median age was three years old, and the gender ratio (M:F) was 2:3. All the PPBs were predominantly type II/III. *DICER1* in 4 PPBs was sequenced. Three cases contained a deleterious mutation and a 'hotspot' mutation. One case showed only a 'hotspot' mutation. Immunohistochemically, beta-catenin showed consistent moderate to strong cytoplasmic staining, whereas DICER1 and FGF9 was not consistent, ranging from negative to strongly positive.

**Conclusion:** Three out of four (75%) possess biallelic *DICER1* mutations. Immunohistochemical staining for DICER1, FGF9 and beta-catenin is not helpful as surrogate markers for *DICER1* mutation.

## An Immune Perturbation is Present in Juvenile Idiopathic Arthritis Patients Who Are in Remission and Will Relapse upon Anti-TNF $\alpha$ Withdrawal

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**Introduction:** Biologics treatment with anti-TNF $\alpha$  is efficacious in juvenile idiopathic arthritic (JIA) patients. Despite displaying clinical inactivity during treatment, many patients will flare upon cessation of therapy. The inability to definitively discriminate patients who will relapse or continue to remain in remission after therapy withdrawal is a major unmet medical need. The immune mechanisms which contribute to clinical relapse are unknown. Understanding these mechanisms could; (1) provide a clear difference between therapy and cure, and inform clinical practise, (2) define novel therapeutic targets to overcome autoimmune resilience.

**Methodology:** We interrogated the circulatory reservoir of CD4<sup>+</sup> immune subsets at the single cell resolution with mass cytometry (CyToF) of JIA patients (n=20) who displayed continuous clinical inactivity for at least 6 months with anti-TNF $\alpha$ , and were subsequently withdrawn from therapy for 8 months, and scored as relapse or remission. These patients were examined prior to therapy withdrawal for putative subsets that could discriminate relapse from remission. We verified on a separate JIA cohort (n=16), the continued dysregulation of these circulatory subsets 8 months into therapy withdrawal.

**Results:** CyToF reveals an inflammatory memory subset of CD3<sup>+</sup>CD4<sup>+</sup>CD45RA<sup>-</sup>TNF $\alpha$ <sup>+</sup> T cells deficient in immune checkpoints (PD1-CD152<sup>-</sup>) in relapse patients prior to therapy withdrawal. Transcriptomic profiling through Nanostring reveals divergence between relapse and remission patients in disease centric pathways involving (a) TCR activation, (b) apoptosis, (c) TNF $\alpha$ , (d) NF- $\kappa$ B and (e) MAPK signalling.

**Conclusion:** A unique discriminatory immunomic and transcriptomic signature is associated with relapse patients and may explain how relapse occurs.

## Extended Poly-Dimensional Immunome Characterisation (EPIC): A Web-based Immune Reference Atlas of the Healthy Human Immunome and an Analytics Platform for Translational Medicine

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**Introduction:** We have created a high dimensionality atlas of the healthy human immunome by interrogating the peripheral blood mononuclear cells (PBMC) of 177 healthy subjects, ranging from cord blood to the elderly, with 63 unique mechanistic and phenotypic markers per cell by mass cytometry (CyTOF). EPIC provides a detailed depiction of the architecture of the human healthy immunome.

**Methodology:** The EPIC analytical and visualisation pipeline is based on an open source, web-based R Shiny bioinformatics toolkit. EPIC can be mined in various ways, for instance to follow developmental changes of any given cell subset or to depict the architecture of the immunome at any given age range. The immune landscape is constructed with the x-, y- and z-axes representing the immune cell subset, age and cell frequency (% of total CD45+ PBMC) respectively.

**Results:** The naïve CD4+, without any bio-active markers expression and the naïve IL8+ CD4+ T cells are increased at the younger ages. Additionally, we also observe an age-related reduction in CD4+ CD38+ CD62L+ T cell subset with a reciprocal increase in the CD4+ CD38- CD62L- T cell subset. CD38 is highly expressed on the neonatal T cells, its frequency and reduction with age is consistent with current knowledge.

**Conclusion:** EPIC provides a transformational conceptual advance in Translational Immunology from individual subset focused to immune architecture based approach for the understating of physiology and pathogenesis of immune mediated mechanisms. We intend to make EPIC available to the entire community in its full capacity.



## Peritoneal Fluid 13-HODE as a Potential Angiogenesis Regulating Oxylipin in Endometriosis

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**Introduction:** Endometriotic lesions are highly vascularized and blood vessel formation is crucial for the growth and survival of endometriotic lesions implanted at ectopic sites. Oxylipins are potent bioactive lipids that mediate a diverse range of biological functions including immune functions and signal transduction. In our 'omics study, 13-hydroxyoctadecadienoic acid (13-HODE), an oxylipin, was found significantly elevated in the peritoneal fluids (PF) of women with endometriosis (EM+).

**Methodology:** Mass spectrometry oxylipinomics was performed on PF of EM+ (n=40) and EM- (n=34) women. Immunohistochemistry (IHC) was used to examine the tissue expression of 15-lipoxygenase-1 (15-LOX1), the enzyme that produces 13-HODE. Primary endothelial cell 3D cultures in microfluidics devices were used to study the functional impact effects of 13-HODE on vascular angiogenesis.

**Results:** Liquid chromatography mass spectrometry identified 13-HODE as a significantly elevated oxylipin in severe EM+ (2.1-fold increase relative to EM-; p<0.05). IHC staining of 15-LOX1 in patient tissue samples showed higher expression of 15-LOX1 in the eutopic endometrium of endometriotic patients during the proliferative phase. We also found heterogeneous expression of 15-LOX1 between eutopic and ectopic sites of the same patients. Using physiologically-relevant concentrations, we found that 13-HODE suppressed VEGF-induced vessel sprouting. This effect was abolished with the addition of sphingosine-1-phosphate (S1P). Low concentrations of 13-HODE suppressed the formation of tip cells in VEGF+S1P-induced sprouting angiogenesis, independent of cytostatic or cytotoxic effects. At higher concentrations, 13-HODE induced sprouting levels similar to that of positive controls.

**Conclusion:** Our study suggests that dysregulation in 13-HODE levels may play a role in sprouting angiogenesis for endometriosis.



## Quantification of DNA and RNA of Single Mouse Oocyte without Prior Extraction

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**Introduction:** The use of assisted reproductive technology (ART) has risen steadily, with more than 8 million babies born from *in vitro* fertilization (IVF) and intracytoplasmic sperm injection since 1978. An average of 2.7 treatment cycles are required before pregnancy and ART pregnancy rates are stabilizing at 36%. While ART offers the highest success rate in achieving pregnancy for infertility couples, the take-home baby rate remains low and improvements are being sought to improve ART outcomes. We aim to develop a non-invasive method of assessing oocyte quality for ART.

**Methodology:** Using digital polymerase chain reaction (dPCR), DNA and mRNA of specific genes from single mouse oocytes have been quantified without sample extraction. Sequencing and quantification of secreted miRNA from mouse oocytes exposed to C<sub>24:1</sub> ceramide, that are have previously been shown to inhibit oocyte maturation potential, have also been carried out.

**Results:** dPCR is shown to be highly sensitive to accurately quantify gene copy numbers of single cells. The DNA and mRNA copy numbers are varied widely across each oocyte, characteristic of oocyte individuality. Our sequencing results have identified several secreted miRNAs that are shown to be upregulated in C<sub>24:1</sub> ceramide-treated oocytes.

**Conclusion:** We demonstrate the application of dPCR to non-invasively assess the quality of single oocytes that will potentially be used clinically. We hope that this work can be adopted in IVF clinics to help improve the pregnancy rates of couples including those with endometriosis associated infertility.

## Molecular Alternations in Congenital Mesoblastic Nephroma

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**Introduction:** Congenital mesoblastic nephroma (CMN) is histologically classified into classical, cellular, and mixed subtypes. Cellular CMNs are known to have the *ETV6-NTRK3* fusion. Recently, internal tandem duplications in *EGFR* (*EGFR* ITD) were described in classical CMNs. The genetic alteration of mixed-type CMNs remains unclear. The aims of this study are to characterize the genetic alterations of a series of classical, cellular and mixed CMNs, and to determine the utility of pan-Trk and *EGFR* immunohistochemistry as surrogate markers for *NTRK* gene fusions and *EGFR* ITD.

**Methodology:** Twenty-two archival CMN cases (12 classical, 6 cellular, and 4 mixed) were tested for the *ETV6-NTRK3* fusion and *EGFR* ITD transcripts using reverse transcriptase polymerase chain reaction, as well as the next-generation sequencing-based anchored multiplex PCR (Archer® FusionPlex®). Immunohistochemical staining for pan-Trk and *EGFR* was also performed.

**Results:** Five out of 6 cellular CMNs harbored the *ETV6-NTRK3* fusion. The remaining cellular CMN showed a *KLHL7-BRAF* fusion. The remaining 16 cases (both classical and mixed) showed the presence of *EGFR* ITD. Immunohistochemical staining for pan-Trk was 100% sensitive and 94.1% specific for the presence of an *NTRK* rearrangement. Testing of the *EGFR* stain (clone EP30) showed positivity in 18 of 21 cases (85.7%), indicating its lack of sensitivity for *EGFR* ITD.

**Conclusion:** The majority of cellular CMNs possess the *ETV6-NTRK3* fusion, where a minority of cases may possess *BRAF* rearrangements. Classical and mixed CMNs have *EGFR* ITD, and its absence strongly suggests an alternative diagnosis. Pan-TRK IHC is useful in identifying cases with *ETV6-NTRK3* fusions.

## Validation of A One Day Protocol *MLH1* Promoter Methylation Test for Endometrial Carcinoma Formalin-Fixed and Paraffin-Embedded Tissue

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**Introduction:** *MLH1* promoter methylation is a form of somatic epigenetic mutation. Abnormal methyl group attachment to the gene promoter region results in tumours phenotypically indistinguishable from those harbouring other types of *MLH1* mutations. *MLH1* methylation testing is part of the KKH Lynch Syndrome (LS) screening algorithm. This test identifies endometrial carcinoma patients who do not require genetic referrals. LS is due to germline mutations in one of the DNA mismatch repair genes (*MLH1*, *MSH2*, *MSH6* and *PMS2*). We designed and validated a fast one-day *MLH1* promoter methylation protocol.

**Methodology:** Bisulphite-conversion was performed on 5-200 ng DNA extracted from 4µm thick formalin-fixed paraffin-embedded tissue sections. Subsequently, nested real-time PCR was carried out, using two sets of primers targeting the 3' clinically significant region of the *MLH1* promoter region, in a real-time cycler. The results were analysed by determining the complete-melting-temperature (CMT) of the PCR product in the raw melting-curve data and also the melting-curve analysis.

**Results:** The unmethylated and methylated PCR products were observed at 81 °C and 84 °C of CMT respectively. We compared the results with Dartmouth-Hitchcock Medical Center (DHMC), USA and achieved 100% concordance. The limit of detection showed clear separation of methylated and unmethylated samples, as compared to the equivocal results from the melting-curve analysis, particularly in lower tumour content.

**Conclusion:** We successfully validated our one-day *MLH1* promoter methylation test protocol in ten samples and achieved 100% concordance with the blinded sample from DHMC.



## Unravelling the Cytokine Profile in Spontaneous Miscarriage

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**Introduction:** Threatened miscarriage (TM) is the most common gynaecological emergency, affecting 25% of pregnant women. The profound importance of an imbalanced immune system associated with progesterone deficiency in spontaneous miscarriage (SM) is highlighted by aberrant cytokine levels and dysregulated Th1/Th2 ratio. However, current knowledge on a handful of cytokines have limited a more complete understanding of cytokines in TM and SM.

**Methodology:** This retrospective case-control study compares serum cytokine profiles of 17 women who presented with TM who miscarried or ongoing pregnancy at <16 weeks of gestation (*N*=17 and 49 respectively), and 97 women with ongoing pregnancy as controls recruited from KKH Urgent O&G clinic. Serum samples were analyzed for 65 cytokines, chemokines and growth factors using a multiplex suspension bead immunoassay. Univariate, multivariate statistical analyses and bioinformatic analyses were performed.

**Results:** We identified an attenuated Th1 immune response 14-cytokine signature in TM complicated by eventual miscarriage, including IL-2, IL-12p70, IL-21, IFN $\alpha$ , IFN $\gamma$ , and others. Interestingly, cytokines associated with B-cells suggest the involvement of humoral immunity in SM. Comparing women with TM versus controls, a seven-cytokine signature was obtained. Comparing between high-risk women with ongoing pregnancy and controls, the number of differential cytokines (five) were the smallest.

**Conclusion:** In the largest cytokine characterization performed thus far, we revealed for the first time the involvement of specific cytokines in the susceptibility of miscarriage. A better understanding of cytokines that are associated with the immunomodulatory effects of progesterone might lead to novel targets for prediction and treatment of SM.

## Lateral Pinning of Paediatric Phalangeal Neck Fractures: A Simple Novel Technique

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**Introduction:** Closed reduction with percutaneous pin fixation (CRPP) is the treatment of choice for paediatric phalangeal neck fractures. Currently employed techniques are frequently unable to avoid the physis during pinning, require multiple passes, or have difficulty achieving satisfactory closed reduction. These can result in physeal damage or suboptimal healing and hence functional outcomes. We aim to introduce a simple technique for avoiding these pitfalls.

**Methodology:** The novel surgical technique was established with surface and radiological landmarks as well as approach. Operations were performed by the primary surgical team over seven months from January 2019 to July 2019. Medical records and intraoperative images of four patients were reviewed. Demographic, injury and clinical characteristics were similar. Post-operative function and radiographic outcomes were reviewed.

**Results:** A total of four patients with displaced phalangeal neck fractures underwent fixation with this technique. Intra-operatively, procedures were performed with a single pass avoiding the physes and imaging showed good reduction with stable pin configuration. No patients were lost to follow up. Post-operatively functional range of motion was between 0-90 and 0-110 degrees. Radiographically fractures were well healed with no angulation, mal- or non-union. No physeal arrest is anticipated as the physes were completely avoided during pinning.

**Conclusion:** The simple lateral pinning technique can overcome some recurrent challenges faced during this common CRPP procedure. It is a skill that can be easily adopted to reduce operative time and improve outcomes with no added costs or equipment. This pilot can also be expanded in future to a case control study.



## Fusion Gene Detection in Sarcomas and Solid Tumours by Next-Generation Sequencing-Based Anchored Multiplex PCR

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**Introduction:** Molecular testing for fusion transcripts is important for diagnosis and management of sarcomas and solid tumours defined by specific gene fusions. The aim of this study was to evaluate a next-generation sequencing (NGS)-based assay for identification of gene fusion transcripts in formalin-fixed paraffin-embedded (FFPE) tumour samples.

**Methodology:** RNA isolated from FFPE samples of tumours were used for two NGS-based gene fusion assays (Archer FusionPlex Sarcoma and Solid Tumour assays) that identify gene fusions involving any of 26 and 53 genes commonly involved in sarcoma and solid tumour gene fusions respectively, with the identity of the other gene partner obtained through NGS in a manner agnostic of the identity and breakpoint of the partner gene. The results were orthogonally verified with RT-PCR.

**Results:** The study cohort comprised 211 cases. 84 cases had gene fusions, of which 56 had known gene fusions such as *ASPSCR1-TFE3*, *EWSR1-FLI1* and *PAX3-FOXO1*. Five cases had druggable targets such as *EML4-ALK*, *TPM3-NTRK1* and *ETV6-NTRK3*. 11 cases had highly variable breakpoints that will be very challenging to diagnose by conventional methods e.g. RT-PCR; these included *CIC-DUX4*, *COL1A1-PDGFB* and *NAB2-STAT6*. Four cases had a novel gene partner characterizing a novel pathological entity viz. *KF15B-ALK* in ALK-positive histiocytosis. Nine cases had novel fusions not previously described including *PAMR1-GLI1*, *PPP1CC-PLAG1* and *HMGA2-LUM*.

**Conclusion:** Our results demonstrate the ability of these NGS-based gene fusion assays to identify fusion gene transcripts in sarcomas and solid tumours, including transcripts from gene translocations involving novel gene partners, and translocations with novel gene breakpoints.

## Targeted Gene Panel Sequencing for Paediatric Cancers

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**Introduction:** Cancer is the second most common cause of death in children. Paediatric cancers have genetic alterations different from adults; these are important for classification, treatment and prognostication. The OncoPrint Childhood Cancer Research assay is a commercial targeted cancer gene panel designed for paediatric cancers. Our study's aim is to validate the assay technically and assess its value in the clinical setting.

**Methodology:** The study cohort comprised paediatric cancers diagnosed between 2015 to 2019. We reviewed clinical and pathological data. Nucleic acids isolated from formalin-fixed paraffin-embedded tumour sections were utilized for sequencing using the OncoPrint assay on an Ion Torrent S5 next-generation sequencing platform. Genetic alterations were classified by clinical impact and tiers.

**Results:** One hundred and five cases were sequenced. The cases comprised soft tissue tumours (34/105), brain tumours (21/105), renal tumours (11/105) and others. 71 cases (68%) had mutations. Most cases (59/71) had mutations with clinical impact – 30 of 59 cases had results that directly contributed to diagnosis of otherwise unclassifiable tumours. 49 of 71 of the variants were 'tier 1' (i.e. had strong clinical significance). 8 of 59 cases had mutations that are targets for existing drugs. All identified mutations were confirmed by orthogonal techniques.

**Conclusion:** The OncoPrint assay yielded important mutational information in a significant proportion of cases. Surprisingly, mutational findings contributed to accurate diagnosis in several otherwise unclassifiable tumours. The assay was also able to identify drug targets in a small proportion of cases. Familiarity with the assay is important to identify regions prone to sequencing errors to prevent false positive calls.

## Pro-Inflammatory, IL-17 Pathways Dominate the Architecture of the Immunome in Pediatric Refractory Epilepsy

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**Introduction:** Refractory epilepsy (RE) is a chronic neurological disease with unknown aetiology that represents group of epilepsy patients who do not respond to anti-epileptic drugs (AEDs). The immune mechanism that contributes to RE and neuroinflammation is not known and data from paediatric subjects is completely absent. The goal of the study was to investigate immune phenotype associated with refractory epilepsy.

**Methodology:** A comprehensive antibody panel of lineage, trafficking, functional, surface and intracellular markers were used to identify the immune subsets using Mass Cytometry. Data was analysed in unbiased data driven machine learning approach

**Results:** Patients with RE and AIE displayed similar immune profiles overall, with changes in CD4+ and CD8+ T-cell subsets and an unbalance toward pro-inflammatory IL-17 production. In addition, patients with RE uniquely showed an altered balance in natural killer cell subsets. A systems level intercellular network analysis identified rewiring of the immune system leading to loss of inhibitory/regulatory intercellular connections and emergence of pro-inflammatory pathogenic functions in neuro-inflammatory immune-cell networks in patients with AIE and RE

**Conclusion:** Our network and statistical analysis of immune-cell subsets clearly demonstrate systemic dysregulation of the immunome that leads to a IL-17 dominant pro-inflammatory state in AIE and RE. Biologics that target IL-17 are already undergoing clinical trial for various autoimmune diseases. Repurposing these IL-17 blockers could facilitate early clinical trials for the prevention and treatment of RE

## The Clinical Significance of Benign-Appearing Endometrial Cells in PAP Smears of Women: Shall We Adopt the 2014 Bethesda Recommendation?

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**Introduction:** Endometrial cancer is the most common gynaecological malignancy. The significance of Benign-Appearing Endometrial Cells (BAEM) in smears varies with menstrual cycle, symptoms and age. In women aged above 40 years old and are beyond the 12th day of their menstrual cycle, the finding of BAEM may indicate endometrial pathology. The Bethesda System (TBS) 2014 recommends the reporting of BAEM in women above 45 years old (previously 40 years old in TBS 2001) and evaluation for woman who are post-menopausal or with abnormal uterine bleeding. We aim to determine significance of BAEM as a predictor of endometrial pathology.

**Methodology:** This is a retrospective study of all PAP smears with BAEM retrieved from the Laboratory Information System from January to June 2016 and correlated with clinical symptoms.

**Results:** There are 715 cases of reported BAEM on PAP smears, of which 160 patients (22.3%) had endometrial evaluation. Of these, 45.6% are above 45 years old and 53.8% have abnormal uterine bleeding. 12.5% showed significant findings - 17(10.6%, median age 44 years) have endometrial hyperplasia, of whom 58.8% are symptomatic. 3(1.9%, median age 46 years) have endometrial carcinoma, of whom 66.7% are symptomatic. The majority of patients with significant pathology have a median age of 44.5 years.

**Conclusion:** BAEM in women with abnormal uterine bleeding is a good predictor of uterine pathology and warrants further evaluation. We recommend the reporting of BAEM in women above 45 years old as well as endometrial evaluation to be offered to woman with abnormal uterine bleeding.

## Investigation of the Immune Architecture of Systemic Lupus Erythematosus (SLE)

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**Introduction:** Systemic Lupus Erythematosus (SLE) is a complex systemic disease caused by an interplay of different immune cell subsets. Most current studies utilize an oligo-dimensional approach, examining one or few cell subsets each time. There is a critical unmet need for a multi-dimensional approach to holistically interrogate and elucidate pathognomonic immune signatures associated with disease severity or specific manifestations. This has the translational potential of providing an objective, mechanistically relevant disease assessment in comparison to current subjective clinical scores, and identification of therapeutic targets.

**Methodology:** Peripheral blood mononuclear cells from five active SLE and ten age-matched healthy subjects were interrogated with mass cytometry using a panel of 37 phenotypic and functionally important immune markers. Unsupervised analysis with t-Distributed Stochastic Neighbor Embedding (t-SNE) dimensional reduction was performed with subsequent supervised bivariate analysis to determine cell frequencies of SLE enriched cell subsets. Statistical testing was done with Mann-Whitney U test (p-value <0.05: significant).

**Results:** Total and naïve CD4<sup>+</sup> cells were comparable between controls and active SLE. Interestingly, although the overall memory CD4<sup>+</sup> cell frequency was similar between SLE and healthy controls, a novel CD25-Foxp3-CD4<sup>+</sup> memory cell subset expressing both CD152 and PD1, was found in active SLE. Although not statistically significant (p = 0.0992), this enables us to refine the markers for future SLE specific experiments.

**Conclusion:** A recent study described a PD1<sup>+</sup>CD4<sup>+</sup> helper T cell population enriched in SLE that is distinct from T follicular helper cells important for disease propagation. This CD152<sup>+</sup>PD1<sup>+</sup> cell subset may represent a closely related subset and will be further investigated.

## Elucidating the Immune Signature of Active Enthesis Related Arthritis using Mass Cytometry

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**Introduction:** Juvenile idiopathic arthritis (JIA) is the predominant cause of childhood-onset arthritis of which enthesitis-related arthritis (ERA) is the most common subtype in Singapore. Although common, its aetiology remains poorly understood in comparison to polyarticular and oligoarticular JIA where the pathological contribution of CD4+ T cells is well-documented. Here, we aim to identify the immune signature of active ERA using mass cytometry to determine the immune cells that are important for its pathogenesis. This has the potential dual translational roles of identifying disease pathognomonic signatures and therapeutic targets for manipulation.

**Methodology:** Peripheral blood mononuclear cells from five active ERA patients and ten age-matched healthy controls were subjected to high-dimensional single-cell phenotyping with mass cytometry using a comprehensive panel of 37 markers encompassing the major immune subsets. Unsupervised analysis with t-SNE dimensional reduction and k-means clustering was done, followed by verification of these cell subsets (clusters) using bivariate gating (FlowJo). Statistical testing with Mann-Whitney test comparing the differences in median cell frequencies between ERA and healthy control was done.

**Results:** Classical monocytes (CD14+ CD16-) and CD56+ CD16+ NK cells were relatively enriched ( $p=0.028$ ) and depleted ( $p=0.001$ ) respectively in peripheral blood of active ERA patients. The increase in classical monocytes suggests its potential immunopathologic role that demands further investigation.

**Conclusion:** Deep immunophenotyping via CyTOF can delineate a pathognomonic immune signature of ERA. With downstream functional analyses, we will identify other critical immune subsets that are dysregulated in disease and further delineate their mechanistic contribution through network analysis.



## Effectiveness of Low Dose (0.15mg/kg) Compared to Standard Dose (0.6mg/kg) Dexamethasone in Children with Mild Croup in a Paediatric Emergency Department

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**Introduction:** Croup is a common acute respiratory infection of children, with a single dose of dexamethasone as the mainstay of treatment. This study evaluates the effectiveness of low dose dexamethasone 0.15mg/kg compared to standard dose 0.6mg/kg dexamethasone in the treatment of children with mild croup.

**Methodology:** We conducted a retrospective review of children aged 6 months to 6 years who presented to the Emergency Department (ED) between 1 September 2014 to 30 April 2015 with mild croup (Westley Croup Score  $\leq 2$ ). They were treated with 0.60mg/kg oral dexamethasone from 1 September 2014 – 8 Jan 2015, and 0.15mg/kg from 9 Jan 2015 – 30 April 2015 due to change in the department's guidelines on croup management. Primary outcome studied was the need for admission from the ED. Secondary outcomes studied were 72-hour ED re-attendance, additional dose with 0.45mg/kg of oral dexamethasone in the low-dose group, and adjuvant nebulized adrenaline or salbutamol administration.

**Results:** Of the 791 children, 408 received standard dose (0.6mg/kg) dexamethasone while 383 received low dose (0.15mg/kg) dexamethasone. There were no statistically significant differences in admission (5.4% vs. 5.2%;  $p=1.00$ ) and re-attendance rates (3.9% vs. 3.7%;  $p=0.855$ ) between both groups. In the low dose group, only 4.2% ( $n=16$ ) required top-up dose of 0.45mg/kg dexamethasone. There was decrease use of nebulized adrenaline or salbutamol in the low-dose group.

**Conclusion:** Our study supports the effectiveness and safety of using 0.15mg/kg oral dexamethasone in the treatment of mild croup, with occasional additional dose of 0.45mg/kg when clinically indicated.

## Methicillin-Resistant Staphylococcus Aureus (MRSA) In Hospitalised Infants: Preliminary Analysis from a Point Prevalence Survey

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**Introduction:** In 2015, we have been seeing an increasing number of neonates and infants with clinical MRSA infections admitted to KK Women's and Children's Hospital (KKH) who were born in the private sector.

**Methodology:** Routine MRSA screening swabs were collected from all <1 year old infants admitted to KKH from June to July 2017 by using standardized forms which were completed by the primary clinical teams.

**Results:** Complete data from 298 infants who were screened for MRSA was analysed. Result shows 37.5% (n=21/56) infants with history of having been delivered at private hospitals were found to be MRSA positive compared with 4.3% (n=10/234) of infants delivered at public hospitals. When stratified to only neonates <7 days old, the prevalence of MRSA amongst neonates admitted with a history of delivery from private hospitals was 50% while those with a history of delivery from public hospitals was 2.4%.

**Conclusion:** It is therefore necessary for us to continue with our infection control policy to screen and isolate/cohort, all infants who have a history of delivery at a private hospital or recent admission to a hospital. Contact precautions will be enforced until results are out and MRSA positive patients will be recommended for decolonization.



## Predictive Equation for Optimal Continuous Positive Airway Pressure (CPAP) In Children with Obstructive Sleep Apnoea (OSA)

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**Introduction:** A subgroup of children with OSA requires treatment with CPAP. Mathematical equations to predict optimal CPAP have been developed for adults but not children. The aim of this paper was to determine the correlation between optimal CPAP, clinical and polysomnography (PSG) variables in children with OSA; and to develop a predictive equation for optimal CPAP.

**Methodology:** This was a retrospective study of children with OSA who underwent CPAP titration studies. Patients with craniofacial abnormalities (except Down syndrome [DS]) and neuromuscular diseases were excluded. PSGs were done using Sandman Elite™ sleep diagnostic system. Correlations between optimal CPAP, clinical and PSG variables were analyzed. A multivariable linear regression model for optimal CPAP was developed.

**Results:** One hundred and ninety-eight children (mean±SD age=13.1±3.6 years) were studied. Optimal CPAP had a significant positive correlation with age (rho=0.216, p=0.002), Obstructive Apnoea Hypopnoea Index (OAHl) (rho=0.421, p<0.001), Oxygen Desaturation Index (ODI) (rho=0.417, p<0.001), Rapid Eye Movement Respiratory Disturbance Index (REM RDI) (rho=0.378, p<0.001) and Body Mass Index (BMI) z-score (rho=0.160, p<0.024); and a significant negative correlation with SpO2 nadir (rho=-0.333, p<0.001). The predictive equation derived was: Optimal CPAP (cm H2O) = 4.538 + (0.250 × age [years]) - (0.549 [for females]) - (0.752 [if no adenotonsillectomy done]) + (2.125 [for DS]) + (0.040 × OAHl) + (0.337 × BMI z-score), (adjusted R<sup>2</sup>=0.307, p<0.001).

**Conclusion:** The predictive equation developed may help determine optimal CPAP in children with OSA. Further studies are required for validation and to determine its applicability in different populations.

## Is the 'Scolibrace' Effective In the Treatment of Adolescent Idiopathic Scoliosis? Early Results at 9 Months

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**Introduction:** The Boston brace has been shown to be effective in arresting the worsening of spinal curvatures in Adolescent Idiopathic Scoliosis (AIS). A variation of the Boston brace – the 'Scolibrace' - is a hypercorrective brace that has shown some potential to improve spinal curvature compared to Boston brace. This study assesses the efficacy of the Scolibrace in AIS in Singapore.

**Methodology:** Twenty-five female patients with AIS between 10-12 years of age, who met the Scoliosis Research Society (SRS) criteria, were recruited. Patients were advised to wear the Scolibrace for up to 23 hours/day. They completed the SRS-22r questionnaire, underwent an in-brace x-ray 1 month after brace fitting, and an out-of-brace x-ray at 3 and 9 months.

**Results:** The mean score of the SRS-22r questionnaire was  $4.3 \pm 0.8$  (Function:  $4.60 \pm 0.4$ ; Pain:  $4.66 \pm 0.4$ ; Self Image:  $3.38 \pm 0.5$ ; Mental Health:  $4.06 \pm 0.5$ ). The mean Cobb angles between baseline (recruitment) and 1-month in-brace follow-up were significantly different ( $29.5^\circ \pm 3.5$  vs.  $20.4^\circ \pm 5.9^\circ$ ,  $p < 0.001$ ), demonstrated by in-brace correction of 31%. The mean Cobb angles between baseline versus 3- and 9-month out-of-brace were not statistically different ( $29.5^\circ \pm 3.5$  vs.  $27.7^\circ \pm 6.7^\circ$ ,  $p=0.218$ ;  $29.5^\circ \pm 3.5$  vs.  $26.5^\circ \pm 8.5^\circ$ ,  $p=0.106$ ), suggesting that there was no worsening of the scoliosis at 3 and 9 months after the commencement of bracing.

**Conclusion:** Results from our 25 AIS patients treated with ScoliBrace showed in-brace correction of 31%. At 3- and 9-month follow-up, there was no worsening of the scoliosis. Rather, a small but insignificant reduction of Cobb angles was evident at 3 and 9 months. No patient found the brace overly uncomfortable.

## Audit of PICC Lines Inserted in Paediatric Patients by DDII in KKH in 2017

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**Introduction:** Peripherally inserted central catheters (PICC) is commonly placed in paediatric patients for administration of long term antibiotics, parenteral nutrition and poor venous access. Such lines are known to have complications with occlusion, ecchymosis, catheter migration, thrombosis, infection being reported in literature as ranging from 12.2% to 57.1%). Cuffed PICCs have been shown to have a better profile than non-cuffed with regards to catheter migration, thrombosis, infection and are routinely used for paediatric patients in our hospital.

We carried out an audit of all PICCs placed in paediatric patients by interventional radiologists in our hospital from 1 January 2017 to 31 October 2017. Age of patients ranges from 7 days to 20 years old, with an average age of 3 years 10 months.

**Methodology:** Medical student captured all PICCs inserted into paediatric patients in the first 10 months in 2017. Clinical notes were accessed to document complication rates.

**Results:** There were 118 PICC lines set for 103 patients for from January to October in 2017 who had follow up available. Out of these only 1 was an uncuffed PICC, upon clinician request.

Twenty two (18.6%) of these had single complications comprising 6 occlusion (5.1%), 5 catheter dislodgement (4.2%), 4 catheter migration (3.4%), 3 ecchymosis at insertion site (2.5%), 2 venous thrombosis (1.7%), 2 infection (1.7%), 1 line leakage (0.8%).

**Conclusion:** Our overall PICC complication rate of 18.6% is comparable to those published in the literature. The main complication encountered is catheter occlusion, similar to the data seen in other paediatric centers.



## Postnatal Depression in Singapore: Identifying the Prevalence and Sociodemographic Correlates With a Validation of the Edinburgh Postnatal Depression Scale

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**Introduction:** The Edinburgh Postnatal Depression Scale (EPDS) has come under scrutiny for its potential lack of cross-cultural validity. This present thus sought to: identify the prevalence of postnatal depression in Singapore; revalidate the EPDS international cut-offs in the local clinical context of 6±2 weeks postpartum; and identify sociodemographic variables associated with postnatal depressive symptomatology.

**Methodology:** Six thousand two hundred and fifty-one women at 5.6±1.2 weeks postpartum consented to participate in the present naturalistic, multi-ethnic, cross-sectional cohort at KKH. Participants completed the EPDS and were interviewed with the Structured Clinical Interview for DSM Disorders (SCID-I). Receiver operating characteristic (ROC) analyses compared cutoffs. Univariate and adjusted odds ratios (ORs) were calculated.

**Results:** The SCID-I identified 1% of women as having a depressive disorder in the postpartum period. ROC analyses revealed an AUC value of .96 [.93,.97]. The international cut-off of 9/10 yielded a sensitivity of 92% and specificity of 86%, with positive predictive value (PPV) of 6% and negative predictive value (NPV) of 100%. The international cut-off of 12/13 yielded a sensitivity of 85%, specificity of 95%, and a PPV of 15% and NPV of 100%. Singaporean or permanent residents (OR=1.5[1.1,2.1]) and those who were receiving subsidized hospitalization fees (OR=2.0[1.4, 2.9]) were found to be independently at greater odds of having mild-to-moderate postpartum depression.

**Conclusion:** Internationally-validated cut-offs of 9/10 and 12/13 may be used with confidence in the local clinical setting. The 9/10 cut-off is recommended for screening purposes if second level assessment is available; whilst the 12/13 cut-off is recommended for research or where clinical resources are limited.

## Comparing Ultrafast MRI Brain Protocol against Standard MRI Brain Protocol

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**Introduction:** We modified an ultrafast MRI protocol for neuroimaging created by vendor as the default protocol produced unacceptable numbers of nondiagnostic scans for clinical paediatric imaging. This study investigates the feasibility of our modified ultrafast MRI neuroimaging protocol in clinical paediatric patients.

**Methodology:** The modified ultrafast MRI program consists of optimized faster versions of five standard MRI sequences performed within 5.43 minutes compared to 13:36 minutes for standard MRI. Clinical paediatric patients undergoing MRI brain on 3T MRI scanner Siemens Skyra were scanned with modified ultrafast MRI brain protocol and standard MRI brain protocol in random order. The two data sets were read by a Fellowship qualified Radiologist blinded to the clinical information. The diagnostic accuracy of modified ultrafast MRI was determined by comparing its image quality and concordance of image diagnosis against standard MRI as the reference standard. The image quality was graded as diagnostic or nondiagnostic. The imaging diagnoses were categorized as normal, minor and significant clinical diagnoses.

**Results:** Both protocols were performed on 35 patients, ranging in age from 1 year 11 months to 17 years (18 males and 17 females). The ultrafast T1W, T2W, FLAIR and DWI sequences had comparable image quality to their corresponding standard sequences, while ultrafast T2\*W sequence had significantly higher number of non-diagnostic sequences compared to standard MRI. There was 100% concordance for normal and clinically significant imaging diagnosis, with 23% discordance for minor diagnoses.

**Conclusion:** Ultrafast and standard MRI have comparable image quality and high concordance for clinically relevant diagnoses.

## Rapid Clinical Exome Sequencing in the Paediatric Intensive Care Unit: Challenges to Genetic Counselling

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**Introduction:** Genomic sequencing has become widely available in the clinical setting for diagnostic purposes. Since July 2018, rapid clinical exome sequencing (RapidSeq), focusing on known Mendelian genes, for critically-ill patients admitted to the neonatal or children's intensive care units (NICU or CICU) has been established in our institution. This retrospective review highlights challenges encountered by the genetic counsellors (GCs).

**Methodology:** A standardized RapidSeq protocol has been established. After the initial assessment, the suitability for RapidSeq will be discussed among the clinical geneticists. If deemed suitable, pre-test counselling will be provided by a GC. The genetics team is also involved in the variant classification and result reporting process. The result is returned within 10 working days.

**Results:** Common challenges identified include obtaining informed consent, coordinating sample collection for testing, and managing caregiver expectations of genetic findings. The critical nature of RapidSeq requires effective coordination between the clinical team and laboratory. The pre-test counselling session is often impeded by multiple ongoing issues requiring parental attention. When other acute issues arise, sample collection is deprioritized and testing is delayed. The urgency for testing is often driven by the severity of the condition as it guides prognostication. However, it can be challenging to manage parental expectations of the prognosis and explain the possible result outcomes, which range from clear cut diagnoses to variants of uncertain significance and even incidental findings.

**Conclusion:** The awareness of highlighted issues enable GCs to better support families through the genomic sequencing process and implementation of RapidSeq at our institution.

## An Online Estimator for Bronchopulmonary Dysplasia in Asian Babies

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**Introduction:** Continued high prevalence of bronchopulmonary dysplasia (BPD) with its long-term morbidity favors development of an accurate BPD prediction model to enable preventative measures and improved counselling. Primary aim of this study was to evaluate the validity of the modified NICHD scoring system for prediction of BPD/Mortality in Asian extremely low birth weight (ELBW) infants.

**Methods:** Cohort study of 318 live born ELBW infants between 2012 and 2015 at KKH, the centralized perinatal centre in Singapore. Demographic and neonatal data were collected and prediction model developed using gestational age, birth weight, race, gender, and maximal respiratory support and FiO<sub>2</sub> requirement on postnatal days 1, 3, 7, 14, 21, and 28 to evaluate outcome measure of BPD/Mortality. Statistical analysis was done using STATA 15.0 with multinomial regression for development of C statistic-area under the curves (AUC) to validate the prediction model using the above variables of interest. A Web-based model was constructed for BPD/Mortality by postnatal day

**Results:** Mean gestational age and birth weight of the cohort was 26.3±2weeks and 765±grams respectively with BPD, and BPD/Mortality in 65% and 81% respectively. BPD/Mortality prediction improved with advancing postnatal age, increasing from AUCs of 0.992 on Day 1 to 1.0 on Day 28. Maximal respiratory support and FiO<sub>2</sub> requirement served as the best predictors on each specified day (AUC 0.85-1).

**Conclusion:** Early prediction of BPD/Mortality was accurate with high AUCs from Day 1–28 and will be helpful in postnatal counselling and potentially in developing preventive respiratory strategies and quality improvement.

## Optimising Peri-Operative Sugar Control in Gynaecological Patients with Type 2 Diabetes Mellitus (T2DM) in KK Women's and Children's Hospital

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**Introduction:** Diabetes Mellitus is very common and is associated with increased operative complications. Optimal glycaemic control is becoming increasingly recognized as a perioperative goal in surgical patients. This project aims to optimise blood sugar control of diabetic gynaecological patients planned for surgery and assess compliance to the protocol for blood sugar management for diabetic patients.

**Methodology:** The Plan-Do-Study-Act Cycle of improvement was employed. In cycle one, surveys were designed to assess junior doctors' knowledge in managing pre-operative diabetic gynaecological patients. In cycle two, a protocol for sugar management for diabetic patients kept nil-by-mouth was introduced. In cycle three, measures were taken to improve compliance to the protocol. In cycle four, patients with T2DM on Insulin were referred to Family Medicine doctors for diabetic management perioperatively.

**Results:** The protocol was implemented in Dec 2017. Appropriate fluids and insulin sliding scales were ordered for 59.1% of pre-operative gynaecological patients with T2DM in the same month. Compliance to the protocol was re-audited 9-12 months later. Only 27.1% had both accurate fluids and sliding scales ordered. After PDSA Cycle 4, 46.2% of pre-operative gynaecological patients with T2DM had both correct fluids and appropriate sliding scales ordered. 87.5% of pre-operative T2DM patients on Insulin were reviewed preoperatively by either Family Medicine or Endocrine specialists.

**Conclusion:** A standardised guideline to optimise blood sugar control in pre-operative fasting diabetic patients is important. Measures have to be implemented to maintain and improve compliance to the protocol. Further PDSA cycles need to be conducted to assess the effectiveness of the measures.

## Biliary Complications Post Liver Resection for Paediatric Liver Tumours

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**Introduction:** We study the rate of biliary complications and its associated risk factors following liver resection for liver tumours in children.

**Methodology:** We retrospectively reviewed children who had liver resection for liver tumours from 2010 to 2018. Data were collected from the patients' records including demographic data, operative details and types of biliary complications (leakage, stricture). Mann-Whitney U tests and Fisher's exact test were performed with  $p < 0.05$  considered significant.

**Results:** During the study period, 95 liver resections for liver tumours were performed, of which 61 patients with adequate data were included. Mean age was  $3.3 \pm 3.3$  years and 55.7% were male. Majority of the cases were hepatoblastoma (82%,  $n=50$ ). The commonest procedures performed were right extended hepatectomies (42%,  $n=26$ ) and overall mean operative duration was  $238 \pm 89$  minutes. Ten (16.4%) patients had biliary complications: 7 had bile leakage, 2 had stricture, 1 had both. Biliary complications were not significantly associated with age, gender and operative duration. All of them were patients with hepatoblastoma and 90% developed following extended hepatectomies (5 right-sided, 4 left-sided). Five (63%) cases of bile leakage resolved with nonoperative measures although one subsequently developed bile stricture. Four bilio-enteric anastomoses were performed (3 for strictures, 1 for leakage). One patient with bile leakage had early postoperative mortality, compounded by massive intraoperative haemorrhage and sepsis.

**Conclusion:** Biliary complication is a significant morbidity following extended hepatectomy for hepatoblastoma. Surgery is required for biliary strictures and complicated bile leakage, otherwise most of them can resolve with nonoperative measures.

## Streptococcus Species Pyomyositis in Children

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**Introduction:** Pyomyositis is defined as bacterial infection of striated muscles from a hematogenous source, often accompanied by abscess formation. The most common cause is *Staphylococcus aureus*. We describe 2 cases of *Streptococcus* species pyomyositis.

**Methodology:** This is a retrospective review of 2 cases of *Streptococcus* species pyomyositis in children admitted to KK hospital.

**Results:** Case 1 is a 5-year-old girl with *Streptococcus pyogenes* pyomyositis who presented with fever, cough, rhinorrhea, abdominal pain, vomiting, arthralgia and myalgia. On day 4, she developed septic shock and left thigh pain and swelling. Throat culture and nasopharyngeal aspirate revealed pan-sensitive *Streptococcus pyogenes* and Influenza B respectively. Blood cultures were negative. MRI showed multiple gluteal abscesses, intramuscular fluid collection and osteomyelitis of the left femoral head. She underwent incision and drainage with debridement of left thigh abscess. She received IV Ampicillin and Clindamycin for 6 weeks. Case 2 is a 7-year-old boy with pneumococcal pyomyositis presenting with fever and left inner thigh pain. MRI showed left obturator externus and internus myositis with intramuscular abscess. He underwent drainage of left obturator abscess. Fluid culture grew *Streptococcus pneumoniae* with intermediate sensitivity to Penicillin, Ampicillin and Ceftriaxone. He was treated with IV Ceftriaxone with resolution of fever and improvement in pain. He completed 1 week of IV Ceftriaxone followed by oral Levofloxacin for 5 weeks.

**Conclusion:** Children with acute *Streptococcus* species infection, who develop limb pain and prolonged fever, should be evaluated expeditiously. Pyomyositis is associated with significant morbidity and mortality, so prompt diagnosis and management is needed.



## Do We Ever Need to Fix Clavicle Fractures in Adolescents?

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**Introduction:** There has been an increasing trend towards operative fixation of clavicle fractures in adolescents. This study investigates the outcomes and complications of non-operatively treated clavicle fractures.

**Methodology:** This is a retrospective, single institution study on healthy adolescents (13-17 Yrs.), who sustained an isolated, complete, displaced clavicle fracture from 1997-2015. Records were reviewed for demographic information, fracture location, injury mode, time to radiographic healing, re-attainment of full shoulder ROM and return to activities. Complications and other relevant issues were also recorded. Midshaft (middle third) fractures were compared with distal (lateral third) fractures. We used Robinson Classification to classify the fractures.

**Results:** One hundred and forty-five patients (125 males, 20 females; mean age 13.9±0.9 years) were analyzed. Ninety nine (68%) adolescents sustained midshaft (Type 2) fracture, while 46 (14%) had distal (Type 3) fracture. 68% were sports-related, while 21% were non-sports related; the remaining 11% were from blunt injury (5%), motor vehicle accident (4%) and assault (2%). Time to radiographic healing was 7.8±4.9 weeks, time to full ROM in the ipsilateral shoulder was 6.7±4.6 weeks. Patients returned to activity at 11.8 ± 5.2 weeks from injury. Between midshaft and lateral third fractures, no noted significant differences in the time to radiographic healing, full shoulder ROM and return to activities (p=0.865, 0.433, 0.202 respectively). No reported cases of non-union, no patient required surgery, there was a single case of reported intermittent fracture site pain.

**Conclusion:** Clavicle fractures in adolescents can and should be treated non-operatively. Surgical stabilization should be reserved when early return to sports and competition is important.

## The Use of Sucrose Gel as Pain Relief for Infants Undergoing Painful Procedures

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**Introduction:** When infants are admitted to hospitals, they often have to undergo painful procedures and are conventionally comforted with the use of pacifier or by swaddling. Although they are unable to express their pain verbally unlike the older population, this should not negate the need for appropriate pain relief as pain can have long-term effect on neurological and behavioural development. Sucrose has been shown to reduce pain associated with procedures in infants by releasing endogenous opioid. This quality improvement project aims to reduce pain score in infants undergoing painful procedures (namely intravenous cannulation, venepuncture and heel prick) with the use of sucrose gel.

**Methodology:** Data from 157 infants were collected from February 2018 to December 2018. Pain scores using validated pain scales – Neonatal Infant Pain Score (NIPS) for infants less than 2 months old and Face, Legs, Activity, Cry, Consolability (FLACC) for infants aged 2 to 12 months old – were recorded using a questionnaire. Baseline pain scores for each procedure were collected from 61 infants from February to April 2018. Sucrose gel was implemented in August 2018 and pain scores were collected from 96 infants in 2 Plan-Do-Study-Act (PDSA) cycles. The pain scores were analysed using Student T-test on SPSS Statistics.

**Results:** There were reduction in mean pain scores of infants undergoing intravenous cannulation (from 7.07 to 4.01,  $p < 0.003$ ), venepuncture (from 7.14 to 3.69,  $p < 0.002$ ) and heel prick (from 4.68 to 3,  $p < 0.02$ ) with the use of sucrose gel.

**Conclusion:** Sucrose gel is effective in reducing pain in infants undergoing painful procedures.

## Mechanical versus Chemical Pleurodesis for Primary Spontaneous Pneumothorax: A Meta-Analysis

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**Introduction:** Primary spontaneous pneumothorax (PSP) and its high recurrence rate poses a therapeutic challenge to both patients and their managing surgeons. Mechanical or chemical pleurodesis can be used to prevent recurrence, but the optimal treatment often remains a matter of debate. This meta-analysis aims to compare the outcomes between mechanical and chemical pleurodesis for PSP.

**Methodology:** Studies published up to 2019 were searched from Medline, Embase, Google scholar and Cochrane databases. A meta-analysis of randomized controlled trials (RCT) and observational cohort studies (OCS) comparing outcomes between mechanical and chemical pleurodesis for PSP was performed.

**Results:** Seven studies (1 RCT and 6 OCS) were included, comprising 1032 cases of mechanical (799 abrasions, 202 pleurectomies, and 31 unspecified abrasion/pleurectomy/both) and 901 cases of chemical (643 talc, 69 minocycline, and 189 unspecified talc/kaolin) pleurodesis. The recurrence rate of pneumothorax after chemical pleurodesis (1.2%) was significantly lower than mechanical pleurodesis (4.0%) [pooled odds ratio (OR)=3.00; 95% confidence interval (CI) 1.59-5.67;  $P=0.0007$ ;  $I^2=19\%$ ]. Hospital stay was also slightly shorter in the chemical pleurodesis group [pooled mean difference (MD)=0.42 days; 95% CI 0.12-0.72;  $P=0.005$ ;  $I^2=0\%$ ]. There was no statistically significant difference in post-operative complications (pooled OR=1.18; 95%CI 0.40-3.48;  $P=0.76$ ;  $I^2=71\%$ ) and operative time (pooled MD=3.50; 95%CI -7.28 to 14.28;  $P=0.52$ ;  $I^2=99\%$ ) between these two groups.

**Conclusion:** Chemical pleurodesis is superior to mechanical pleurodesis for PSP in reducing hospital stay and recurrence rate. However, more RCTs with longer follow-up are necessary to demonstrate the benefit of chemical pleurodesis for PSP.

## Safety and Efficacy of Animal Derived Surfactants in Treating Preterm Infants with Respiratory Distress Syndrome: A Retrospective Cohort Study

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**Introduction:** Animal derived surfactants contain different chemical compositions with various responses, efficacy and safety profiles in treating preterm infants with respiratory distress syndrome. We hereby conducted a retrospective cohort study to compare the safety and efficacy between poractant alfa (Curosurf®) and beractant (Survanta®) in preterm infants requiring endotracheal surfactant therapy.

**Methodology:** This is a single-center, retrospective observational cohort study involving preterm infants who required endotracheal surfactant therapy at KK Women's and Children's Hospital from January 2015 to January 2016. Incidence of pneumothorax, chronic lung disease (CLD), mortality, and composite outcome of CLD and death were compared between infants who received poractant alfa and beractant.

**Results:** Overall 179 preterm infants received endotracheal surfactants. Of these, 70 (31%) and 109 (69%) received poractant alfa and beractant, respectively. The incidence of pneumothorax in infants treated with poractant alfa were significantly lower than those treated with beractant (0.00% vs 6.42%,  $p = 0.031$ ). Compared with beractant, poractant alfa significantly reduced the incidence of pneumothorax in very low birth weight (VLBW) infants (0.00% vs 8.00%,  $p = 0.035$ ), but not in non-VLBW infants (poractant alfa 0.00% vs beractant 3.03%,  $p = 1.00$ ). CLD, mortality and composite outcomes of CLD and death were not different between the two groups.

**Conclusion:** Poractant alfa significantly reduced pneumothorax in preterm infants with respiratory distress syndrome. This reduction was more significant in VLBW than non-VLBW infants.

## Improving Women's Health: One Human Papillomavirus Vaccination at a Time!

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**Introduction:** Persistent high-risk human papillomavirus (HPV) infections causes cervical precancer. The Cochrane review reported in 2018 that HPV vaccination decreases the risk of cervical pre-cancer by up to 99%. The rate of vaccine uptake remains low. In KK Women's and Children's Hospital (KKH) C Clinic, the rate of eligible patients vaccinated is 5.3% and only 6.5% of eligible patients were offered the vaccine. The HPV vaccine taskforce aimed to increase the rates of eligible patients vaccinated and offered the vaccine.

**Methodology:** Main factors leading to low uptake rates were identified and included the lack of awareness, lack of information, cost and accessibility issues. The HPV vaccine taskforce improved accessibility issues by making vaccines readily available in clinic, reducing barriers and allowing subsidized patients access to the vaccine without need to upgrade. In addition, the prices of the vaccines were subsidized and Medisave claims were made easier. Education sessions were conducted for staff. In addition, in-house pamphlets and posters were developed. ClinDoc was modified to include HPV vaccination. An audit was conducted over 6 months to assess rates of vaccination.

**Results:** The rate of eligible patients being offered the HPV vaccine in KKH C Clinic increased from 6.5% to 27.1% ( $p < 0.001$ ). The rate of eligible patients vaccinated increased from 5.3% to 8.0% ( $p = 0.083$ ).

**Conclusion:** The HPV vaccine taskforce was effective in improving rates of HPV vaccination and patient awareness of the HPV vaccine. With this project, coupled with changes in Singapore's health policies and attitudes of the population, we may one day eradicate cervical cancer.

## A Pilot Study to Investigate the Immediate Effects of a Week of Supervised Physiotherapy Group Exercises in Children with Rheumatic Disease or Joint Hypermobility Syndrome

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**Introduction:** Children with rheumatic disease (RD) and joint hypermobility syndrome (JHS) often present with arthralgia, muscle weakness and decreased functional ability. The purpose of this pilot study was to investigate the immediate effect of a week of rehabilitation on these children. To date, no such study had been published in Singapore.

**Methodology:** Eligible children aged between five to 13 years old, who were diagnosed with JHS or RD in KK Women's and Children's hospital, were invited for recruitment into the study. The participants attended a supervised group exercise programme for one week. They were assessed using the Kendall 10-point manual muscle test scoring system, pain scores and questionnaire before and after the programme.

**Results:** This pilot study aimed for a sample size of 12 participants, but only nine participants were recruited. Of these, one dropped out. Outcomes obtained from the remaining eight participants were: One participant reported pain worsening after the programme, while four participants reported pain reduction. The remaining three reported no change. Three participants showed improvement in strength, three showed strength reduction, and two showed no change. Five out of the eight participants showed an improvement in their disability level, one participant reported increased disability, and two participants showed no change.

**Conclusion:** In this pilot study, the supervised one-week group exercise programme seemed to bring about positive effects in terms of the level of pain intensity and disability, but the effect on strength remained inconclusive. A larger study should be conducted to further explore these findings.

## Age at First Visit of Preschoolers with Autism Spectrum Disorder to a Child Development Clinic in Singapore

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**Introduction:** Early detection of Autism Spectrum Disorder (ASD) in young children leads to timely access to intervention and better outcomes for the children and their families. This study aims to examine the age at first visit of preschoolers with ASD at one of two main public child development service in Singapore – DCD-KKH, across four birth-cohorts.

**Methodology:** A retrospective review of clinical records was conducted from February 2017 to November 2018, for children seen at DCD-KKH, who were born in years 2008, 2009, 2010 or 2011, and subsequently received a clinical diagnosis of ASD.

**Results:** Data were collected from 2033 children with ASD (82.5% males, 67% Chinese). Regression analyses indicated that children with ASD in the later birth cohorts were more likely to present at an earlier age to DCD-KKH ( $R^2=0.02$ ,  $p<.001$ ,  $B=-.13$ ,  $(SE)B=.02$ ,  $\beta=-.14$ ). In a sub-sample ( $n=1188$  due to missing data), Chinese children on average presented at DCD-KKH four months earlier than non-Chinese children ( $B=.34$ ,  $(SE)B=.07$ ,  $\beta=.15$ ), and children who were eventually assessed to have milder special educational needs (SEN) on average presented at DCD-KKH later than those with moderate to severe SEN ( $B=.22$ ,  $(SE)B=.04$ ,  $\beta=.16$ ).

**Conclusion:** Across the years, children with ASD were on average presenting at an earlier age to DCD-KKH. These are encouraging results despite the small effect sizes and small change in presenting age, especially if the trend continues. Further work on understanding the effect of ethnicity can help with increasing the awareness and understanding of ASD in different ethnic groups in Singapore.

## The Utility and Helpfulness of Magnetic Resonance Imaging (MRI) in the Evaluation of Non-Traumatic Back Pain in Children and Adolescents

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**Introduction:** Low back pain affects up to 50% of the children and adolescent population and is most commonly due to mechanical or musculoskeletal causes. Many of these patients are unnecessarily worked up. We aim to study the relationships of MRI versus clinical symptoms and signs in children and adolescents with non-traumatic back pain who were admitted to hospital for rest and evaluation.

**Methodology:** Between February 2012 to October 2017, all inpatients between 8 – 17 years who presented with atraumatic back pain were included in this IRB-approved study. Demographic information and clinical symptoms such as weakness, numbness, tenderness, location and duration and onset of pain to MRI, duration of hospital stay, time taken to recovery, and MRI findings were analysed.

**Results:** Thirty-one patients met the inclusion criteria: 20 patients (65%) had negative MRI findings, and 11 (35%) had positive findings- four of whom were excluded due to the findings being non-significant. Of the remaining patients, 18 were female. There was no statistically significant difference between a clinically significant positive and negative MRI scan with all of the variables except duration of inpatient stay. Only duration of stay showed a statistically significant difference with a clinically significant positive and negative MRI finding ( $p < 0.048$ ).

**Conclusion:** Slightly more than a third of children and adolescents who were admitted to hospital for atraumatic back pain had a positive MRI result. Of these 11 patients, seven (64%) had a clinically significant finding. Finally, MRI should be considered if symptoms of atraumatic back pain are severe enough to warrant hospital admission.

## Outcome of Boys with Posterior Urethral Valves in Singapore

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**Introduction:** To study the presentation, treatment and outcome of boys with posterior urethral valves (PUV) in Singapore.

**Methodology:** A retrospective review of eighteen PUV patients between January 2007 to July 2019 was conducted to analyse their ages, types of presentation, investigations and treatments. Renal functions and somatic growth were evaluated.

**Results:** Two patients defaulted. The median age of diagnosis was 13.5 days [1 day - 2 years]. Seven patients (43.7%) presented in the antenatal period: two severe oligohydramnios and five hydroureteronephrosis. Three cases (18.8%) presented in the neonatal period: one urinary ascites and two bilateral hydroureteronephrosis (one pneumothorax and dribbling of urine, one renal failure). Six cases (37.5%) presented in the post-neonatal period: four urinary tract infections, one renal failure and one with obstructive urinary symptoms. Diagnosis was confirmed on micturating cystourethrography (MCU) in all patients. Three had associated anterior urethral valves (AUV). Eight patients (50%) had vesico-ureteric reflux (three bilateral and five unilateral). All sixteen patients underwent transurethral fulguration of valves. Nine boys (56.2%) had additional procedures: five re-cystoscopies, two ureteric reimplantation, one deflux injection, three vesicostomies, one Monti- appendicovesicostomy and one nephroureterectomy. Four patients were diagnosed with chronic kidney disease (CKD) over a median duration of 7 years [1 month - 20 years] follow up, while two patients had VURD syndrome.

**Conclusion:** PUV was associated with AUV in three patients. Antenatal presentations have more severe disease. PUV affects the entire urinary tract system and four of our patients have CKD. Hence all patients need long term nephro-urological follow up.



## Improving the Utilization of Special Care Nursery Services of KK Women's and Children's Hospital Using a Feed-Centric Hypoglycaemia Pathway: Quality Improvement Initiative

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**Introduction:** Pathways are important tools in the screening of infants at-risk of hypoglycaemia. We aimed to determine if utilization of a feed-centric pathway (FCP) compared to a glucose-centric pathway (GCP) can reduce the number of admissions for hypoglycaemia to the special care nursery (SCN) at KKH.

**Methodology:** Two hypoglycaemia pathways were compared. The older GCP pathway was in practice before 1 February 2016, after which FCP was implemented. Of 4436 at-risk infants screened for hypoglycaemia from 1 February 2015 to 28 February 2017, 348 who were admitted to SCN were studied. We compared the differences in number of SCN admissions and length of stay (LOS) between infants admitted via the FCP vs GCP.

**Results:** A 58% reduction in the number of infants admitted to SCN for hypoglycaemia was observed [GCP: 246 of 1462 screened (16.8%) vs FCP: 102 of 2976 screened (3.4%),  $P=0.0001$ ]. Among SCN admissions, 196 (56.2%) were male and 152 (43.7%) female, with a mean gestational age of 37.8w. There were 119 GCP admissions directly from labour ward (LW) and operation theatre (OT), but only 10 such FCP admissions ( $P=0.0001$ ). However these 10 FCP admissions had longer total mean LOS (GCP 2.2d vs FCP 3.5d). Overall the LOS in SCN was less by 104 days (GCP 458d vs FCP 354d)

**Conclusion:** Feed centrality at the start of a hypoglycaemia pathway reduces SCN admissions, allowing more efficient utilization of healthcare resources. By reducing SCN admissions, the FCP facilitates mother-child bonding, early establishment of breastfeeding and earlier hospital discharge, saving cost of care.

## Laparoscopic Tubal Re-Anastomosis or IVF in Previously Ligated Patients: A Comparison of Fertility Outcomes and Survey of Patient Attitudes

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**Introduction:** To compare live birth rates, cost analysis and a survey of patient attitudes between laparoscopic tubal re-anastomosis and IVF in patients with previous tubal ligation

**Methodology:** Retrospective cohort review of all ligated patient undergoing fertility treatment from January 2011 to December 2016 in an academic medical centre. The main outcome measure was first live birth after treatment. Interval to first pregnancy, miscarriages and ectopic pregnancies were also reported. A survey was conducted among patients attending the subfertility clinic. Information on both IVF and tubal re-anastomosis was given, and choice of treatment was recorded before and after reading the information.

**Results:** Twelve patients underwent tubal re-anastomosis while thirty-one patients underwent IVF treatment. Pregnancy (75.0% vs 35.5%) and live birth (58.3% vs 25.8%) were significantly higher in the tubal surgery group ( $P<0.05$ ) after transferring all available embryos in one stimulated IVF cycle. Cost per live birth was also lower in the tubal surgery group (\$27,109 vs \$52,438). One hundred patients participated in the survey. A majority of patients preferred tubal surgery to IVF (68.2% vs 31.8%) before given information on the procedures, but indicated a preference for IVF (54.6%) to surgery (45.4%) after receiving information on the procedures.

**Conclusion:** For women less than 40 years of age, desiring fertility after tubal ligation, laparoscopic tubal re-anastomosis offers better live birth rates and cost-effectiveness. Patients in Singapore are equivocal as to their preference after education regarding the choices. Thus laparoscopic tubal re-anastomosis remains a viable alternative to IVF treatment.

## Management of Cardiomyopathy in Pregnancy in a Tertiary Hospital: Case Series of Seven Cases of Cardiomyopathy Managed In Singapore General Hospital

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**Introduction:** Peri-partum cardiomyopathy is a type of dilated cardiomyopathy of unknown aetiology affecting a small but significant proportion of mothers. It occurs in previously healthy mothers and has an incidence of about 1 in 2000 live births and accounts for 17% of maternal cardiac deaths in the UK.

The presentation and course of disease progression in peripartum cardiomyopathy is highly variable and can progress quickly into cardiac failure.

**Methodology:** We present 7 cases of peripartum cardiomyopathy managed in Singapore General Hospital between 2009 and 2013, of which 2 cases consist of patients with pre-existing cardiomyopathy and 5 cases of patients with a history of peripartum cardiomyopathy in a previous pregnancy. We obtained patient relevant history and information using our own hospital database and subsequent references used for the paper were obtained from PubMed.

**Results:** The 7 cases discussed highlighted the prevalence of peripartum cardiomyopathy in previously well woman and its propensity to occur in woman at the extreme of ages. A history of cardiomyopathy in a previous pregnancy pre disposes one to peripartum cardiomyopathy in future pregnancies.

**Conclusion:** Early identification of at risk mothers or mothers in deterioration can help safeguard maternal and fetal outcomes. Planned elective deliveries with multidisciplinary support can help achieve very favorable outcomes. Risk stratifying mothers with peripartum cardiomyopathy post-delivery based on recovery of their cardiac functions would help better manage future pregnancies. With close monitoring and careful management of deterioration, woman with cardiomyopathy can achieve favourable maternal and fetal outcomes.

## Short-Term Voiding Patterns after Vaginal Hysterectomy and Pelvic Floor Repair

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**Introduction:** Transient voiding dysfunction is a known short-term complication of Vaginal Hysterectomy (VH) with pelvic floor repair (PFR). This study aims to determine the duration of urinary catheterization and duration of hospitalisation for patients who have undergone VH, PFR with or without concomitant application of transvaginal mesh (TVM) and/or mid-urethral sling (MUS).

**Methodology:** This is a retrospective cohort study of women who underwent VH with PFR at a single urogynaecology unit in Singapore between 1 October 2016 and 30 September 2017. Patients' files were reviewed for data collection and analysis.

**Results:** A total of 238 women were studied. The mean age was 62.6 years. The median grades of cystocele, rectocele and uterovaginal prolapse were 3, 2 and 4 respectively based on the Baden-Walker classification. Overall, 30 (12.6%) patients failed at least 1 voiding trial during their hospital admission, of whom 8 (26.7%) patients had pre-operative voiding difficulties. Patients undergoing VH PFR without implants had shorter duration of catheterization compared to those with concomitant implants (2.2 days vs 5.6 days,  $p < 0.01$ ). Patients undergoing VH PFR with only MUS had shorter duration of catheterization compared to patients with only TVM (3.5 days vs 4.7 days,  $p < 0.01$ ). Patients with a single implant had significantly shorter duration of catheterization compared to those with two implants (4.2 days vs 5.6 days,  $p = 0.001$ ).

**Conclusion:** Approximately 1 in 10 undergoing VH with or without TVM or MUS experience short-term voiding difficulties requiring prolonged urinary catheterization. Concomitant TVM and/or MUS appear to increase the risk of longer post-operative duration of urinary catheterization.

## The Orthopaedic Surgeon's Guide to Office 3D-Printing

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**Introduction:** 3D-printing has become increasingly popular across scientific and engineering fields. The same trend has been observed in the medical field, with the main users being dentists and neurosurgeons. Within orthopaedic surgery, usage has been limited by accessibility and costs. The benefits of a 3D-printed model in surgical planning and education in orthopaedic surgery is obvious, especially in fields like deformity correction and fracture fixation. We present case examples of how 3D-printing of surgical models was easily performed by our team, and how we utilized the models in the various clinical scenarios. The steps involved in the process are accurately detailed, and are reproducible by any orthopaedic surgeon.

**Methodology:** Pre-surgical paediatric orthopaedic patients with complex limb fractures or deformities were identified. Their CT and/or MRI scans were segmented and processed. A 3D-printer was then used to print 3D-models of the affected limbs using finite-definition-modeling. These 3D-models were used for deformity assessment and pre-surgical simulations.

**Results:** All cases underwent successful correction of their deformities or fixation of their fractures. In certain cases, unique surgical techniques that utilized key-hole approaches were implemented. The benefits of 3D modelling in each individual case is highlighted.

**Conclusion:** 3D-printing in paediatric orthopaedic surgery is especially useful. This is in part due to the variability in the size and conditions of the children, as well as their unique operations. The increased accessibility and cost-effectiveness of an office 3D-printing facility will certainly be beneficial for patients.

## Pregnancy Associated Sleep Disturbances Worsen As Pregnancy Progresses: A Prospective Study

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**Introduction:** Pregnancy associated sleep disturbance is a common pregnancy-related complication which can lead to significant maternal distress and adverse pregnancy outcomes. Various previous studies have demonstrated poorer sleep quality during pregnancy. However, most studies included assessment at only one point of pregnancy. This prospective study aimed to better delineate the effect of pregnancy on the quality of sleep throughout the antenatal period.

**Methodology:** The Pittsburgh Sleep Quality Index questionnaire was employed to assess sleep quality in 4 antenatal visits throughout pregnancy at the outpatient specialist clinics of KK Women's and Children's Hospital in Singapore.

**Results:** Our results showed that global score was higher towards the later part of pregnancy (6.6 to 8.0,  $p < 0.001$ ) and highest in the 4th visit. Sleep latency was higher as pregnancy progresses (20.8 to 25.6,  $p = 0.001$ ). Sleep duration became shorter over time and was shortest in the 4th visit (7.0 to 6.5,  $p < 0.001$ ). Sleep efficiency was the lowest in the 4th visit (84.7% to 81.7%,  $p < 0.001$ ). Sleep quality in the first visit has certain predictive value for sleep quality as pregnancy progresses. However, sleep quality is likely to be affected by multiple factors.

**Conclusion:** In conclusion, our study systemically compared different aspects of sleep quality throughout the antenatal course and found that sleep quality gradually declined during pregnancy and reached its nadir in the last part of pregnancy. Sleep quality in early pregnancy has certain predictive value for sleep quality as pregnancy progresses. However, sleep quality is affected by multiple other factors as well.

## Reviewing the Phase III Efficacy and Safety Data of $\beta$ 3 Agonist Mirabegron for Overactive Bladder

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**Introduction:** Overactive bladder (OAB) is a common condition that have a significant impact on patients' quality of life. Antimuscarinic medications have been used as the mainstay therapy for managing OAB symptoms. However, discontinuation of antimuscarinic therapy is high (up 50% at 3 months) due to the associated side effect profile.

**Methodology:** Mirabegron has been studied extensively in the last few years within the context of phase II and III trials. The author reviewed and summarized the efficacy results of recent Phase III trials that show significant impact on the outcomes of overactive bladder.

**Results:** In the ARIES trial, both mirabegron treatment groups were associated with significantly greater reduction from baseline to final visit *versus* placebo in mean number of incontinence episodes and micturitions per 24 hours. In the SCORPIO trial, there was a statistically significant decrease in number of incontinence episodes and micturitions per 24 hours in both mirabegron groups compared with placebo. From the CAPRICORN trial, both mirabegron groups demonstrated statistically significant improvements for coprimary endpoints *versus* placebo. Notably, incontinence was reduced by approximately 50% in the mirabegron groups *versus* placebo. Lastly, in the Yamaguchi study, mirabegron was also associated with a significantly greater reduction from baseline to final visit in number of micturitions per 24 hours *versus* placebo.

**Conclusion:** Mirabegron is the first  $\beta$ 3 adrenoceptor agonist licensed for the management of OAB. Results from the phase III studies have shown that it is a safe, effective and well-tolerated new class of drug.

## *Ureaplasma Spp.* Colonization is Associated with Worse Respiratory Outcome in Extremely Low Gestational Age Infants

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**Introduction:** *Ureaplasma spp.*, a commensal in human reproductive tract, can result in maternal chorioamnionitis and preterm birth. In addition, colonization of the respiratory tract with *Ureaplasma* has been associated with development of chronic lung disease (CLD) in preterm infants. However, its relationship with the severity of CLD is not known.

**Methodology:** We retrospectively analyzed data for neonates <28weeks gestational age (ELGA) from January 2016 to December 2018 (n=184). Tracheal aspirate (TA) was sent for *Ureaplasma spp.* detection by culture on grounds of clinical suspicion. All *Ureaplasma*+ neonates were treated with Azithromycin for 10-14 days. Data was analyzed for those who survived up to 36 weeks. Severe CLD was defined as requiring mechanical ventilation or  $FiO_2 > 30\%$  at 36 weeks.

**Results:** The neonates in whom TA was sent (n=59) were of a significantly lower GA ( $25.9 \pm 1.1$  vs  $26.6 \pm 1.1$ ,  $p=0.02$ ). *Ureaplasma*+ neonates (23/59) had significantly higher incidence of leukocytosis and PPROM >3 days as compared to the *Ureaplasma*- group (15/23 vs. 12/36 and 13/22 vs. 9/36,  $p < 0.05$  respectively). In addition, the incidence of severe CLD was higher in *Ureaplasma*+ infants (83% vs. 65%). The  $FiO_2$  requirement at 36 weeks and the incidence of oxygen-use at discharge was significantly higher in the *Ureaplasma*+ group ( $31 \pm 10$  vs.  $23 \pm 4$ ,  $p < 0.01$ ; and 17/22 vs. 15/32,  $p=0.03$ , respectively).

**Conclusion:** In our center, respiratory *Ureaplasma* colonization in ELGA neonates is associated with worse respiratory outcome at 36 weeks and discharge. Further studies are required to evaluate its role and mitigate its effect in order to decrease morbidities and hospitalization costs.

## Risk Stratification of Paediatric Sport Injuries Seen at a Tertiary Hospital: A Retrospective Review

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**Introduction:** Sports injuries are a common presentation for school-going children. We aim to evaluate the epidemiology of paediatric sporting injuries that present to a local paediatric emergency department (ED) and to evaluate possible risk factors for severe sporting injuries.

**Methodology:** A retrospective study using data from a trauma surveillance registry and electronic medical records from January 2012 to December 2017. All children with sporting injuries between ages of five to seventeen were included. Variables included patient demographics, type of sports, circumstances, type of injuries and clinical management. We performed a logistic regression to identify predictors for severe injuries, as defined by injuries with Injury Severity Score  $\geq 9$ , requiring hospitalization, trauma team activation, attending in the resuscitation room, or if it resulted in death.

**Results:** We analysed 10951 children who met the inclusion criteria. Soccer (19.4%) was the most common sport that resulted in ED visits. The most common injuries sustained were fractures (44.0%) and sprains (30.4%). For children with severe injuries, the median length of stay was 2 days (IQR 1-3), and 162 days (IQR 104-182) away from sports. Predictors for severe injuries included adolescent age (13-17 years old) (OR=1.176, CI=0.976-1.417), transportation by the Emergency Ambulance Services (OR=6.346, CI=5.147-7.823), involvement in rugby (OR=2.067, CI=1.446-2.957), neurological injuries (OR=4.585, CI=2.393 – 4.365), dislocations (OR=2.779, CI=1.744-4.427), fractures (OR=1.438, CI=1.039-1.990), injuries to head and neck (OR=2.274, CI=1.184-4.365) and injuries to abdomen and pelvis (OR=5.273, CI=3.225-8.623).

**Conclusion:** In this study, we identified predictors for severe sporting injuries. These can aid the ED physician in risk stratification and resource allocation.

## MiniArc Mid Urethral Tape for Female Stress Urinary Incontinence

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**Introduction:** The study aims to assess success rates, complications, long term outcome of MiniArc-sling procedure in women with stress urinary incontinence (SUI).

**Methodology:** Retrospective study of 46 patients who underwent MiniArc (July 2014-June 2015). Primary outcomes –objective, subjective cure rates. Secondary outcomes-intraoperative blood loss, bladder injury, hematoma, post-operative fever, infection, voiding-dysfunction, mesh-erosion, readmission, longterm de-novo genitourinary symptoms.

**Results:** Average age was 57.9 years. 35(76.1%) were menopausal. 43(93.5%) presented with SUI, three had demonstrable SUI and wanted treatment. 56.5% had demonstrable leak during urodynamic study. Average UPP was 60.6 cmH2O. Twenty (47.8%) underwent MiniArc surgery only, average duration of surgery 13.4 minutes. Two had vaginal wall perforation, one bladder perforation. Postoperatively, four had voiding difficulty requiring indwelling catheter (average of 25.5 days). No patients with UTI or thigh pain. One patient with VH, PFR, Elevate and MiniArc, had prolonged voiding dysfunction requiring tape cutting. Duration of hospital stay was 1.4 days for MiniArc insertion only and 2.4 days for the total cohort. At one year, two required treatment for de-novo urge incontinence, one had dyspareunia, 82.6% were cured. At two years, 81.4% remained asymptomatic, 18.6% showed symptomatic improvement. At three years, 83.9% remained asymptomatic, 16.1% showed symptomatic improvement. At four years, 81.5% remained asymptomatic, 18.5% showed symptomatic improvement.

**Conclusion:** MiniArc shows good cure and improvement rates at 4 years with low rates of complications and short hospital stay.

## Diagnostic Yield for Further Investigation of Cases with Presence of HbH Inclusion Bodies but Negative for Routine Alpha Thalassaemia Mutation Screen

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**Introduction:** Presence of HbH inclusion bodies in patients with microcytic and hypochromic anaemia usually suggests  $\alpha$ -thalassaemia. DNA screening for common  $\alpha$ -thalassaemia mutations will confirm the diagnosis in majority (70%) of the cases. As presence of HbH inclusion bodies can also be seen in normocytic patients with Hb New York trait – a  $\beta$ -globin chain variant. This raises the question how many of these patients are true  $\alpha$ -thalassaemia carriers.

**Methodology:** Two hundred and eleven cases screened in National Thalassaemia Registry from 2016 to 2018 were selected for the study. HbH inclusion bodies were detected in these samples but routine screening was negative for mutations that account for 99% of  $\alpha$ -thalassaemia (5 types of deletional mutations – Southeast-Asian, Thai, Filipino, 3.7kb, 4.2kb and 5 point mutations in  $\alpha 2$ -globin gene - Hb Constant Spring, Hb Quong Sze, Start codon(-T), Cd30(-GAG), Cd59(GGC>GAC)). These samples were subjected to 1) Hb New York screening, 2) sequencing of both  $\alpha 1$  and  $\alpha 2$  globin genes to detect rare  $\alpha$ -thalassaemia mutations.

**Results:** Hb New York was confirmed in 9.5% of cases (MCV 80.2–95.5; mean=87.7) and 10.4% had  $\alpha$ -globin gene mutations (MCV 61.4–80.8; mean=72). These include 7  $\alpha$ -thalassaemia causing mutations, 3  $\alpha$ -globin variants and 11 polymorphisms. Also, 1.4% of the cases (MCV 73.5–89.8; mean=82.1) had both Hb New York and  $\alpha$ -globin gene mutations.

**Conclusion:** Further investigation on HbH positive cases with negative  $\alpha$ -thalassaemia DNA screening had a diagnostic yield of 21.3%. This high detection rate strongly suggests the need to incorporate further investigation in diagnostic workflow.

## Vaginal Mesh Kit (Uphold™) For the Management of Anterior and Apical Vaginal Wall Prolapse: A One-Year Outcome at a Single Centre

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**Introduction:** The Uphold™ vaginal mesh is a lightweight polyform mesh made from macroporous monofilament uncoated type I polypropylene. Only two fixation points are used, with no fixation laterally into the levators or obturator muscles.

### Methodology:

The study was a retrospective study in which the case notes of 96 women undergoing vaginal mesh insertion (Uphold™) at our centre from 1<sup>st</sup> July 2017 to 18<sup>th</sup> October 2018 were retrieved. The preoperative parameters, intraoperative details, immediate postoperative and follow up data of these patients were evaluated.

**Results:** Sixty-six patients had grade 3 cystocele (68.7%) and 30 had grade 4 cystocele (31.3%) preoperatively. Ninety two (95.8%) patients had concomitant vaginal hysterectomy, 68(70.8%) had concomitant sacrospinous ligament fixation (SSF) and 39(40.6%) had midurethral sling insertion. The average duration of the surgery was 115 minutes. The average blood loss was 232 ml. One patient had a rectal perforation intraoperatively which was repaired in 2 layers and two had excessive blood loss which required one unit of blood transfusion. Ten patients (10.4%) had voiding dysfunction up to 11 days postoperatively and four required readmission for midurethral tape loosening/division. Fifty out of 90 patients (55.6%) completed the six month follow up postoperatively. All the patients were satisfied with the surgery. None of the patients had recurrence of cystocele on examination.

**Conclusion:** The short term success rate and complications with Uphold™ at our centre appear to be similar to those reported with other vaginal mesh kits. However, long term follow up data regarding its safety and efficacy is required.

## Five-Year Outcome in Patients with Stress Urinary Incontinence Undergoing Tension Free Vaginal Tape-Exact (TVT-Exact) Surgery at KK Hospital

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**Introduction:** The study aims to look at the 5-year outcome in patients with stress urinary incontinence undergoing Tension free vaginal tape-Exact (TVT-Exact) surgery.

**Methodology:** Patients with pure stress incontinence or mixed incontinence with stress incontinence as the predominant symptom who underwent only TVT-Exact surgery between February 2012 and November 2014 were identified. They were followed up for 5 years.

**Results:** Eighty patients underwent TVT-Exact only surgery between 1 February 2012 and 30 November 2014. Mean operative time was 19 mins, average blood loss of 13 mls with average stay of 1 day. Seven (8.7%) patients with bladder perforation requiring catheterization for 48 hours. One (1.3%) patient reported thigh pain radiating to the knee, which resolved with medications and physiotherapy. Five (6.3%) patients had initial voiding difficulty, resolved with a short (2-7 days) period of catheter drainage. None of the patients had urinary tract infection. None had tape extrusion to vagina, nor tape erosion into bladder or urethra. The subjective and objective cure rates varied between 88.1% at 6 months and 90.5% at 5 years and between 89% to 100% at 6 months and 5 years respectively. Relief in the pre-existing urgency urge incontinence symptoms ranged from 24% at 2 years to 43% at 5 years.

**Conclusion:** Our study confirms that TVT-Exact continues to be a less invasive and effective surgery for women with stress urinary incontinence. The recovery and hospital stay are short with an early return to daily activities. The complications are few and easily manageable. Proper pre-operative counselling is important.

## Is DNA Analysis for Borderline HbA<sub>2</sub> Samples an Overcall?

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**Introduction:** Affecting 4% of the population, thalassaemia is the most common genetic disorder in Singapore. The absence or reduced synthesis of the  $\alpha$  and  $\beta$  globin chains causes thalassaemia. An elevated Haemoglobin A<sub>2</sub> (HbA<sub>2</sub>) implicates  $\beta$ -thalassaemia. We look at the percentage of true positives for  $\beta$ -thalassaemia minor in patients presenting with borderline HbA<sub>2</sub> based on the Sebia Capillarys Hemoglobin Testing System.

**Methodology:** Forty-seven samples received in 2017-2018 were selected based on the Sebia System's HbA<sub>2</sub> cut-off value. Samples were subjected to Hb Electrophoresis on two independent systems: the Biorad Variant II Hemoglobin Testing System and the Sebia Capillarys Hemoglobin System. Biorad's cut-off value is 3.4%, whereas Sebia's cuts off at 3.1%. Values above these cut-offs are deemed as indicative of  $\beta$ -thalassaemia. Sanger sequencing which detects 99% of the  $\beta$ -thalassaemia mutations, was done to determine the cause for the borderline HbA<sub>2</sub>.

**Results:** Full blood count done for these cases show mean MCV, MCH and Hb values of 86.3, 28.9 and 13.0, respectively. Only one (2.1%) out of 47 samples sequenced were found to have mutation in the  $\beta$ -globin gene (Poly A region).

**Conclusion:** There is a difference in determining the HbA<sub>2</sub> cut-off values for calling an individual a  $\beta$ -thalassaemia minor, in 2 labs. As majority of the samples were found to be negative by Sanger sequencing, we speculate that the mutations presenting with borderline HbA<sub>2</sub> values are rarely found in our population. However for the partner of a  $\beta$ -thalassaemia carrier, further investigation is necessary to provide accurate risk assessment.

## Low FODMAP Diet as a Treatment Modality for Functional Gastrointestinal Disorders in Children: Results of a Randomised Crossover Control Trial at a Single Tertiary Paediatric Centre in Singapore

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**Introduction:** Low fermentable oligosaccharides, disaccharides, monosaccharides, and polyols (FODMAP) diet effectively reduces symptoms in adults with functional gastrointestinal disorders (FGID) however its role in children is limited. We investigated the effects of a low-FODMAP diet (LFD) and typical Singaporean diet (TSD) in children with FGID at our centre.

**Methods:** Children 7-17 years old with FGID per ROME III criteria completed a 7-day recording of baseline gastrointestinal symptoms of abdominal pain, bloating, nausea, flatulence, and stooling pattern using a validated diary. They were then randomised to either TSD or LFD for 3 days, followed by 5-day washout period, before crossing over to the other diet. Daily symptoms were recorded during both intervention periods. Patients and symptom diaries were reviewed within 6-weeks after completion.

**Results:** Thirty-two children (median 14 y/o, 56% female, 78% Chinese) were enrolled with 27 completing the study. Less bloating (1.2 cm ± 1.6 versus 1.7cm ± 0.8, p=0.006) and nausea (0.7 cm ±1.0 versus 1.3 cm ± 1.9, p=0.04) were reported while on LFD compared to baseline. There was a trend towards less abdominal pain (2.2 cm ± 2.0 versus 2.59 cm ± 1.9, p=0.09) and less flatulence (1.65 cm + 1.9 versus 2.08 + 1.8, p=0.13) on LFD versus baseline. There was no significant difference in symptoms observed between LFD and TSD; in the stooling patterns while on either diet and when compared to baseline.

**Conclusion:** Low FODMAP diet is a useful dietary intervention in the subgroup of FGID patients with bloating and nausea as the predominant symptom.

## Neonatal Presentations to the Paediatric Emergency Department (PED) in Singapore

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**Introduction:** Neonatal presentations to the PED have risen globally, raising concerns as the PED is a highly infectious area. The study aims to characterize these visits, analyse the main illnesses and establish associations between the neonates' demographics and the severity of their illnesses.

**Methodology:** A retrospective analysis of 1200 neonates (aged <28 days) presenting to the KKH PED over seven months (September 2016 to March 2017) was performed. Associations between the clinical and demographic data of the patient's PED and inpatient admissions were analysed.

**Results:** 102196 children presented to the PED in the seven months and 1.2% were neonates. They were more likely to be of term gestation (87.2%), male (51.7%), and less than 15 days old (79.4%) and have an eutocic delivery (74.7%). The racial distribution of Chinese, Malay, Indian and other races was 53.7%, 26.4%, 10.4% and 9.5% respectively. The top presenting complaints were jaundice (66.6%) and fever (17.4%). The top two admitting and eventual inpatient diagnosis were neonatal jaundice (66.8%; 67.5%) and neonatal pyrexia (14.6%; 19.6%) respectively. 57.8% of neonates were admitted - 98.6% to the general ward, 1.2% to the High Dependency and 0.3% to the ICU. Out of those admitted, majority were of term gestation (86.6%), less than 15 days old (81.1%), had a birthweight of more than 2500 grams (77.6%), had a referral (50.3%) and had no re-attendance within 72 hours (97.0%).

**Conclusion:** More robust infrastructure for community paediatrics and better education of caregivers are needed to decrease the exposure of neonates to the infective environment of the PED.



## Does Treatment of Significant Patent Ductus Arteriosus Only in High Risk Very Low Birth Weight Infants with Birth Weight Less Than 800g or Gestation Less Than 27 Weeks, Affects Short Term Outcomes? A Cohort Study

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**Introduction:** Patent ductus arteriosus (PDA) in very low birth weight (VLBW) infants causes significant hemodynamic instability leading to key morbidities. However, treatment failed to improve outcomes. There is high likelihood of spontaneous closure without treatment in VLBW infants. We hypothesize that targeted treatment of PDA only in VLBW infants with birth weight  $\leq$  800g or <27 weeks gestation with ductal diameter (DD) of  $\geq$ 1.6 mm requiring ventilatory support and expectant management in low risk infants will reduce the treatment rate and surgical ligation, without altering the outcomes.

**Methodology:** Prospective cohort study; infants born in a level IIIB neonatal unit from April 2015- March 2016 (control period) and April 2016- March 2017 (intervention period) were included. Echocardiography was performed at 12-24 hours of age. Only high risk infants in the intervention cohort were treated with indomethacin (maximum of 2 courses one week apart). Surgical ligation was considered after 30 days of age only if the infant was ventilator dependent with DD  $\geq$ 2mm. Primary outcomes were rates of treatment and ligation. Outcomes and protocol compliance were documented

**Results:** 202 VLBW infants in control and 213 in the intervention cohorts were enrolled respectively (Total 415). Eighty percent of infants who met the treatment criteria received intervention. PDA treatment rates were 27.7 and 19.7%\* (p=0.04) and ligation rates 7.5 and 2.9% (P=0.04) in the control and intervention cohorts, respectively. Key VLBW morbidities were comparable

**Conclusion:** Targeted treatment in high risk VLBW infants reduced the PDA treatment rate and surgical ligation in this study, without altering key morbidities.

## Initial Experience of a 4-Arm, Ultra-Lightweight Type 1 Polypropylene Transvaginal Mesh (Restorelle® Direct Fix Anterior Mesh) In Treatment of Pelvic Organ Prolapse

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**Introduction:** Concerns with mesh-related complications highlight the need to improve patient selection for transvaginal mesh. This study aims to describe the experience of a single urogynaecological centre with Restorelle® DirectFix Anterior Mesh, focusing on surgical, anatomical and symptom-related outcomes following cystourethrocele repair with Restorelle®.

**Methodology:** This is a retrospective cohort study of patients treated with Restorelle® at our urogynaecological centre between July 2017 and September 2018. Patients were identified from the departmental database and case notes reviewed until 1-year post-treatment.

**Results:** Eighty patients were enrolled. The mean age was 66.8 $\pm$ 6.9 years. 14 (17.5%) had prior hysterectomies. 54 (67.5%) and 26 (32.5%) patients had grades 3 and 4 cystourethroceles respectively. Concomitant surgery was performed in all patients. Four (5.0%) intra-operative complications occurred; 2 bladder perforations, 1 rectal perforation and 1 kinked left ureter. Post-operatively, 9 (11.3%) patients required blood transfusion, 37 (46.3%) had fever while 7 (7.5%) had buttock pain. Median urinary catheterization duration was 3 days with 13 (16.3%) patients remaining catheterized beyond 14 days. In the first month, 9 (11.4%) required reoperation; 7 for loosening or division of concomitantly inserted mid-urethral sling, 1 patient had Restorelle® removal and anterior colporrhaphy, 1 patient had revision of Restorelle®. Mesh extrusion was observed in 2 (2.6%) patients at 1 month and 3 (6.8%) patients at 12-months. At 1- and 12-months, subjective cure rates were 100% and 97.7% while objective cure rates were 100% and 93.2%.

**Conclusion:** Restorelle® provides high anatomical and symptomatic cure rates for severe cystourethroceles. These findings are important for pre-operative counselling of patients.

## Development of Paediatric Rheumatology Transition Programme (PRTP) in Singapore: A Single Centre Experience and Outcomes

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**Introduction:** Majority of childhood onset rheumatic diseases often continue into adulthood. Transition care from child centred to adult oriented healthcare system is crucial. We report our development and outcomes of PRTP at KK Hospital, Singapore.

**Methodology:** A nurse- led multidisciplinary team involving paediatric rheumatologists, specialty nurses, physical/occupational therapists and medical social workers along with respective adult healthcare professionals (AHCP) was formed in 03/2016. Programme consisted of 6 elements: transition policy, planning, readiness assessment, transfer of care, tracking and monitoring; and transfer completion. Preparation for transition started when patients in clinical remission and reached 15 and above. At age of 17, transition readiness procedures applied. Transfer of patients to adult health care system (AHCS) happened once they are in clinical remission and ready psychosocially. Compliance with AHCS was by feedbacks from AHCP. Paediatric side remained in communication and offered support within first year of transition. Successful transition was defined as a complete compliance with every adult rheumatologist appointment during first year of transition. Non-parametric descriptive statistics were used to describe the data.

**Results:** One hundred and thirty-nine patients were recruited. Fifty-six were transited to AHCS; median (IQR) age at transition was 21.6 (19.6-22.9). Systemic lupus erythematosus and related diseases (SLE,53.6%) and Juvenile idiopathic arthritis (JIA,37.5%) contributed the majority. 94.6% were successfully transited, 5.4% failed – 1 JIA and 2 SLE patients. With further counselling and coordination with AHCP, all were back to AHCS within 1 month.

**Conclusion:** Well- planned structured multidisciplinary transition programme with continual support and close follow-up are essential in achieving effective and successful transition.

## Recovering from Eating Disorder on Instagram: #Eating Disorder Recovery

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**Introduction:** Documenting one's Eating Disorder(ED) recovery on social media is gaining popularity. While posts may predominantly center around promoting recovery, we hypothesize they will contain numerous aspects suggestive of active signs and symptoms of ED.

**Methodology:** Data will be collected from Instagram posts using two popular hashtags, #EatingDisorderRecovery and #AnorexiaRecovery. Contents were analyzed and categorized by thematic concerns, namely: People, Food, Quotes or Others. Posts will also be analyzed for behavioral and psychological signs of eating disorders as detailed in the Eating Disorder First Aid Guidelines, and whether they encouraged seeking professional help. Approximately 600 posts will be analyzed or until thematic saturation.

**Results:** The first 130 images retrieved on 18 July 2019 were coded. 19 posts were excluded and 111 posts were analysed. The majority were 43 (38.7%) food images followed by 33 (29.7%) quotes, and 22 (19.8%) people images. Amongst food images, 21 (48.8%) depicted healthy foods. Quotes were mostly inspirational (81.8%). Behavioral signs suggestive of eating disorders were present in 15 of 43 (34.9%) food images. Psychological signs were present in 24 (21.6%) posts. Only 6 (5.41%) posts encouraged seeking professional help.

**Conclusion:** The majority of posts were from Western females documenting their ED recovery through food images and inspirational quotes, with active behavioral and psychological signs of ED, and paucity of posts recommending help-seeking behaviors. These findings provide an opportunity for social media to be used as a platform to encourage afflicted individuals to seek professional help.

## Sacrospinous Ligament Fixation for Treatment of Post Hysterectomy Vaginal Vault Prolapse: A Five-Year Retrospective Study of 25 Cases

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**Introduction:** Vaginal vault prolapse is a known complication following hysterectomy. The two most accepted surgical treatments for post-hysterectomy vaginal vault prolapse (PHVP) are sacrospinous ligament fixation (SSF) and sacrocolpopexy. This study examines the prevalence and outcomes of SSF in women with PHVP at our urogynaecology centre.

**Methodology:** This is a retrospective study of 25 patients with previous hysterectomy, who underwent vaginal unilateral SSF between July 2008 and June 2012 in a tertiary centre, operated or supervised by a single urogynaecologist. They were followed up at one month, six months and yearly for five years.

**Results:** Three hundred and thirty patients underwent vaginal SSF. 25 (7.6%) patients underwent SSF for PHVP. The subjective and objective cure rates were 100% at six months (n=24), 100% and 95.7% at one year (n=23), 95% and 100% at two years (n=20), 100% and 94.7% at three years (n=19), 100% and 93.8% at four years (n=16), and 100% and 91.7% at five years (n=12). Overall, two patients had asymptomatic recurrent grade 3 and grade 2 vault prolapse at one and three-years-post-surgery respectively. One patient underwent anterior prolift mesh surgery for symptomatic recurrent grade 3 cystocele at two-years-post-surgery. Two patients had asymptomatic recurrent grade 2 cystocele at two and three-years-post-surgery. None had recurrent rectocele or dyspareunia. None had intraoperative excessive blood loss requiring transfusion, bladder, ureter or bowel injury, postoperative bleeding, or infection. One patient had transient thigh discomfort post-operatively.

**Conclusion:** SSF is an excellent surgical treatment for PHVP with high success and minimal complications, however recurrent cystocele remains a concern following procedure.

## High Burden of Acquired Morbidities in Survivors of Pediatric Acute Respiratory Distress Syndrome

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**Introduction:** There is a lack of data on functional outcomes in survivors of pediatric respiratory distress syndrome (PARDS).

**Methodology:** We examined clinical records of patients with PARDS admitted to our pediatric intensive care unit (PICU) from 2009-2016. Our primary outcome was acquired morbidities at PICU and hospital discharge. We defined acquired morbidities as an increase in functional status score (FSS)  $\geq 3$  points above baseline.

**Results:** There were 181 patients with PARDS, of which 90 (49.7%) survived. The most common risk factors of PARDS in our survivor cohort were pneumonia (64 patients, 71.1%). Median oxygenation index (OI) at day 1 of PARDS was 11.2 [interquartile range (IQR) 7.8, 16.2]. 21 (23.3%) patients had severe PARDS. 59 (65.6%) and 14 (15.6%) patients had acquired morbidities at PICU and hospital discharge, respectively. 83 (92.2%) and 35 (38.9%) patients did not return to their premorbid status at PICU and hospital discharge, respectively. Feeding and respiratory were the most affected domains of function. 53 (58.9%) had severe respiratory dysfunction at PICU discharge and 34 (37.8%) had moderate feeding dysfunction at hospital discharge. 57 (63.3%) patients had moderate to severe dysfunction at PICU discharge (FSS  $\geq 10$ ) which reduced to 22 (24.4%) patients at hospital discharge.

**Conclusion:** Among PARDS survivors, there was significant proportion of patients with acquired morbidities at PICU and hospital discharge, particularly in the respiratory and feeding domains. Future studies should focus on these two functional domains so as to improve outcomes of children with PARDS.

## A Preliminary Report of the Newly Established Cerebral Palsy Registry in Singapore

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**Introduction:** Cerebral palsy (CP) is the commonest cause of physical disability in childhood. While countries worldwide have well-established registries, data in Singapore remains limited. Thus, Singapore launched her first CP registry in 2017. In this interim report, we delineate the demographics, clinical data and functional outcomes.

**Methodology:** Children diagnosed with CP, born in 2011 or later, were recruited through KK Women's and Children's Hospital, National University Hospital and Cerebral Palsy Alliance Singapore. Using a standardised questionnaire, information was obtained from parents and healthcare providers.

**Results:** Eighty-one children were recruited. 60 (74.1%) were males. 66 (81.5%) were diagnosed before 36 months-old. 68 (84.0%) had prenatal or perinatal aetiologies while the rest were postnatal. Prematurity was the commonest cause (41/68, 60.3%). In terms of dominant motor phenotype, 46 (56.8%) had spasticity, 17 (21.0%) had dyskinesia and 18 (22.2%) had mixed spasticity and dyskinesia. Of the spastic CPs, 43 (67.2%) were bilateral and 21 (32.8%) unilateral. 38 (46.9%) had visual impairment, 9 (11.1%) had hearing impairment while 25 (30.9%) had epilepsy. For gross motor function and communication, almost half the cohort were in severe impairment groups (levels IV-V). For hand function, there was an equal distribution in Manual Ability Classification System.

**Conclusion:** This is the first interim report of a pilot CP registry in Singapore. Compared to other registries, we share similar findings in terms of gender, aetiology, dominant motor features and associated impairments. However, the severe gross motor and communication impairment groups appear over-represented. We hope to expand the registry to better understand CP in Singapore.

## Hearing Outcomes in Hyperbilirubinemic Neonates Treated with Intensive Phototherapy and Exchange Transfusion

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**Introduction:** Sensorineural hearing loss is a well-recognised sequelae of severe neonatal hyperbilirubinemia. The aim of this retrospective study is to determine the incidence and epidemiology of hearing impairment in neonates with moderate and severe hyperbilirubinemia.

**Methodology:** Neonates with hyperbilirubinemia who received intensive phototherapy and/or exchange transfusion during the period from 1 January 2009 to 31 December 2011 were identified from KKH database and data on outcomes were obtained by retrospective review of their case notes.

**Results:** Fifty-two neonates were included in the study. 53.8% were males and the mean gestational age was 37.69 weeks (range 35-42 weeks). 22 (42.3%) neonates had ABO incompatibility and none of them were glucose-6-phosphate dehydrogenase deficient. There were no cases of kernicterus. The peak serum bilirubin levels ranged from 233 to 585  $\mu$  mol/L (Mean 380  $\mu$  mol/L) and exchange transfusion was done in 22 (42.3%) patients. Mean duration of follow-up was 17 months and 14 patients (26.9%) were lost to follow-up. 36 patients (69.2%) showed normal responses for otoacoustic emission (OAE) or auditory brainstem responses (ABR). Two patients with abnormal ABR results are found to have mild conductive hearing loss secondary to otitis media with effusion. None of them had sensorineural hearing loss.

**Conclusion:** Moderate and severe hyperbilirubinemia was not associated with adverse hearing outcomes in this study. Although we did not observe serious adverse hearing outcomes in this small sample, additional studies are required to quantify the known, significant risk of sensorineural hearing loss in babies with very high total serum bilirubin levels.

## Genetic Polymorphism and Response to Antidepressant Escitalopram in Asian Women with Major Depression

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**Introduction:** Depression is the leading cause of disability worldwide but only about 50% of patients respond to antidepressants. This study explores genetic polymorphisms of genes in the serotonin system that may be linked to antidepressant treatment response.

**Methodology:** Patients with moderately severe depression, as defined by Hamilton Rating Scale for depression (HAMD-17) score >18 and who were treated with the antidepressant Escitalopram were recruited into the study. They were followed up over 12 weeks and ratings were done at baseline, four and twelve weeks. One sample of venous blood was collected for genotyping. Response (defined as a 50% reduction in the HAMD-17 score) and remission (defined as HAMD-17 score of 7 or less) were assessed at four and twelve weeks.

**Results:** There were 52 subjects of which 38.5% had a past history of depression and 21.2% had a family history of depression. At four weeks, 69.2% showed treatment response and at twelve weeks, 46.2% were in remission. Menopausal women were more likely to respond to treatment at four weeks ( $p=0.029$ ). There was a trend that those with G allele of rs7997012 of the serotonin 2A (HTR2A) receptor gene were more likely to show treatment response at 12 weeks ( $p=0.059$ , OR=3.75, 95% CI=0.8982–15.6567).

**Conclusion:** Our results were limited by the small sample size but it showed that menopausal women and those that carry the G allele of rs7997012 of HTR2A receptor gene were more likely to show treatment response.



## Artificial Intelligence Enabled Acoustic Analysis for Detection of Breath Sounds in Children

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**Introduction:** The study aimed to create a repository of breath sounds recorded from children and develop an algorithm using Artificial Intelligence to interpret breath sounds in children. There is high inter-observer variability in the auscultation of breath sounds. Adult studies in the use of computerized lung sound analysis has shown high sensitivity and specificity, with a lack of such studies in children.

**Methodology:** Breath sounds were recorded from the chest wall of paediatric subjects. Two independent physicians labelled their auscultation findings on these subjects. Machine learning was carried out via the Support Vector Machine technique. Using the Cross Validation method, breath sounds were grouped into varying combinations of training data and test data. When fed with training data, the machine was able to extract unique fingerprints of these breath sounds in the categories of normal, wheeze and crackles. Using these fingerprints, when presented with test data, the machine would predict if they belonged to one of these three categories. The machine with the best performance was chosen as the finalized classifier.

**Results:** Ninety-three breath sound samples were collected, 81 were concordant and 12 were discordant between the two physicians. The 81 concordant breath sounds consisted of 73 single label and eight multi-label sounds. Performance of the classifier on the 73 single label breath sound samples showed a sensitivity of 91% and specificity of 95%.

**Conclusion:** The finalized model was able to accurately differentiate between three categories of breath sounds using actual paediatric breathe sound recordings verified by observers in real time.

## Is Fasting Plasma Glucose Alone Good Enough for Postpartum Follow-Up?

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**Introduction:** In Singapore, women diagnosed with gestational diabetes mellitus (GDM) during pregnancy are encouraged to return for a postpartum oral glucose tolerance test (OGTT) for monitoring and follow-up. This study aimed to determine if fasting plasma glucose (FPG) was adequate as a means of postpartum detection of prediabetes and Type 2 diabetes mellitus (T2DM).

**Methodology:** This was a clinical audit of 100 KKH obstetric patients with a diagnosis of GDM (using International Association of Diabetes in Pregnancy Study Group (IADPSG) criteria) and with complete antenatal and postnatal OGTT results. Patients' age, race, body mass index (BMI), weight gain and parity were plotted against FPG, 1-hour and 2-hour OGTT values.

**Results:** 16% of participants were found to be prediabetic at postpartum follow-up (with 2% having impaired fasting glucose (IFG) and 16% having impaired glucose tolerance (IGT) at 2-hour value). In addition, 2% of participants were diagnosed with T2DM from 2-hour value. The drop in 2-hour OGTT values between antenatal and postnatal testing was statistically significant. The FPG results had no statistical difference antenatally and postnatally across all patient characteristic categories.

**Conclusion:** Our study has found FPG alone to be inadequate in postpartum testing. The 2-hour OGTT remains a crucial component in detection of prediabetes and T2DM. Further study on how patient characteristics affect IFG and IGT may help improve patient care at KKH.



## Is There Anyone Else Like Me? Establishing a Registry for Genetic Conditions

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**Introduction:** The Genetics Service in KK Women's and Children's Hospital manages approximately 2000 patients annually. Many genetic conditions are rare and there is currently no systematic way of collating genetic data in our local population. The 'Genetics Registry' was developed as a centralized platform to collect and collate clinical information about patients diagnosed with genetic conditions.

**Methodology:** Participants were recruited by their physicians to the Genetics Registry during their outpatient consultation or inpatient ward stay. Patient medical information is de-identified and a unique code number allocated to each individual. Patients are also consented for medical information to be updated regularly. Data is stored using a customized software designed for the Genetics database which can generate required information.

**Results:** Since 2016, a total of 331 participants with 140 different diagnoses have been recruited. There are 175 males (52%) and 156 females (47%) comprising of 250 Chinese (75%), 42 Malay (13%), 22 Indian (7%), and 17 other ethnicities (5%). More common diagnoses in the Genetics Registry include Neurofibromatosis Type 1 (n=45), Trisomy 21 (n=16), Klinefelter Syndrome - 47, XXY (n=14), Williams syndrome (n=14) and Prader-Willi syndrome (n=13).

**Conclusion:** The establishment of the Genetics Registry has provided a better understanding of the prevalence of genetic conditions in the local population. This allows better allocation of resources to provide appropriate and optimal care for patients. The Genetics Registry also provides ready access to information for clinical trials, research and studies. This is a platform for future collaborations with other institutions to build up a local national registry.

## Improving Blood Pressure Monitoring Practices in Paediatrics

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**Introduction:** Practices in blood pressure (BP) taking such as inconsistent selection of cuff sizes and inaccurate documentation can result in erroneous hypertension diagnosis and management. This study aimed to examine paediatric nurses' practices, perceptions and knowledge in BP taking.

**Methodology:** Using a cross-sectional design, nurses in paediatric inpatient, outpatient and emergency units were invited to participate in an anonymous survey. Referring to international guidelines and BP manufacturers' manuals, the survey was constructed in consultation with Paediatric Nephrologists. The survey assesses nurses' knowledge (max 8 points), BP measuring practices and perceptions (8 questions).

**Results:** Two hundred nurses, comprising 154(77.0%) Registered nurses, 28(14.0%) Enrolled nurses and 18(9.0%) Patient Care Assistants, responded to the survey. Most nurses had 7-10 years of experience in paediatrics settings (n=60,30.0%) and had a degree(n=113,56.5%). The median score for knowledge was 4(Interquartile range[IQR]:3.0-5.0). Most nurses were aware of guidelines for BP cuff selection (n=119,60.1%). The top two criteria for cuff selection was a 2/3 coverage of the upper arm(n=88, 44.0%) and the two lines of the BP cuff(37,18.5%). 108(54.2%) of nurses often or always applied BP cuffs on patient's lower limbs and the top two reasons were: 1)difficulty of applying BP cuff on upper limbs for small babies(n=165,82.5%) and 2)inconvenience due to intravenous plug sites (n=151,75.5%).

**Conclusion:** The study allowed better understanding of nurses' knowledge gap and practices in BP taking for paediatric patients. Knowledge can be further improved to standardize practices according to recommended guidelines. Roadshows will be conducted to disseminate best practices and engage ground nurses in implementing changes to BP taking practices.

## Nurses' Perceptions Regarding Sedation and Analgesia Management in Children's Intensive Care Unit

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**Introduction:** Sedation and analgesia is an indispensable component in the management of critically-ill children. Sedation protocols can standardize sedation and analgesia management. Understanding nurses' perceptions can improve the protocol's adherence and effectiveness. This study aimed to explore nurses' perceptions regarding sedation and analgesia management in the Children's Intensive Care Unit (CICU) before a new sedation protocol is implemented.

**Methodology:** Nurses who have worked >6 months in CICU were invited to participate in a survey following the training. The survey consisted of 34 questions; 13 on perceptions with conventional sedation and pain management; 21 on the proposed new sedation protocol. All questions were scored in a 5-point Likert scale; higher scores denote positive outcomes (except for the 'Barriers' domain).

**Results:** Sixty-four (100%) nurses responded to the survey. Median years of experience in CICU were 7[interquartile range (IQR):3-10]. Most nurses had degrees (n=52, 81.3%) and were senior staff nurses (n=30, 46.9%). Current sedation and analgesia management perceptions were above average in domains of: Satisfaction (median=3.5, IQR: 3.1-3.8), Knowledge (median=3.6 IQR:3.1-3.8), and Communication(median=3.5, IQR:3.2-4.0). Autonomy scored the lowest (median=3.4 IQR:3.0-3.9); nurses disagreed/strongly disagreed that they have decision-making freedom(n=34,53.1%) or empowerment(n=37,57.8%) regarding pain management. Regarding the new sedation protocol, nurses were also above average in domains of: New role acceptance (median=3.6, IQR:3.4-4), Satisfaction(median=3.6, IQR:3-4), and Ease of use(median=3.5,IQR:3-4). Nurses perceived low barriers to new sedation protocol use (median=2.8, IQR:2.4-3.1).

**Conclusion:** There is room for improvement for the domain of nurses' autonomy. Findings are in line with the new sedation protocol implementation which aims to enhance nurses' autonomy to improve sedation and pain management in CICU.

## Perspectives and Support Needs of Women Experiencing Menorrhagia: A Descriptive Qualitative Study

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**Introduction:** Menorrhagia significantly impacts women and declines their daily functioning capabilities. Women with menorrhagia lack awareness regarding severity of their condition. There is also a lack of literature understanding the support needs of women with menorrhagia. The aim of the study was to explore the perspectives and support needs of women experiencing menorrhagia in a public tertiary hospital in Singapore.

**Methodology:** Purposive sampling was used to recruit 16 women diagnosed with menorrhagia from July to October 2017. Semi-structured interviews were conducted. The interviews were transcribed verbatim and thematic analysis was used to analyse the interview transcripts.

**Results:** Three themes emerged from the study: (1) Unawareness about the Condition, (2) Support system within the disease experience and (3) Living with the condition. Participants reported being unaware about menorrhagia and its severity. Various factors influenced participants' awareness and understanding towards menorrhagia. The support given to the participants was deemed insufficient. The women shared that menorrhagia had affected their lives physically, emotionally, socially, and financially. They used both external and internal coping mechanisms to cope with their condition. They longed to learn more about their condition.

**Conclusion:** The multi-ethnic Singaporean women with menorrhagia lacked awareness about their condition and its severity, which affected their lives negatively. There should be greater efforts to raise the public's awareness of menorrhagia so that women can seek medical help early and minimize its negative influence on their lives. Healthcare providers need to pay greater attention to menorrhagia in order to provide more holistic care and support for those experiencing the condition.

## Pressure Injury Prevention in High Risk Critically Ill Children in Singapore

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**Introduction:** Pressure injury are common complication of high risk critically ill children in the intensive care unit (ICU). Risk for pressure injury includes reduced mobility, body position, cannulas/ tubing fixation and decreased peripheral perfusion. This project improvement aims to reduce pressure injury among children in ICU.

**Methodology:** A pre-intervention data collection was conducted since March 2016 which includes children of aged 0-18 years, with an estimated ICU admission of 5 days or more. The post intervention group of patients were nursed on the pressure relieve pillow and assessed daily for the presence of pressure injury. Any pressure injuries were assessed and categorised by a Wound Specialty Nurse. Mann-Whitney U Test was used to compare outcome changes between the pre and post intervention group.

**Results:** A total of 150 children were included, 70 were pre-intervention and 77 received the pressure relieve pillow. The median age of the children was 2 years with interquartile range (IQR) 0.60-7.25, the average Glamogan score for patients was high with median of 31 (IQR 30-32.75). The average length of ICU and hospital admission was 10.50 days (IQR 4.25-22.75) and 32.50 (IQR 12.5-91.5) respectively. At pre-intervention, patients developed pressure injury over a period of 20 months. Significant difference was found from baseline (9 incidents) to post-intervention (0 incident) for the presence of pressure injuries over a period of 20 months ( $p < 0.001$ ).

**Conclusion:** The findings reflect the potential of the pressure relieve device to contribute positively towards device-related pressure injury in critically ill children.



## Parental Experiences While Waiting for Children Undergoing Surgery: A Descriptive Qualitative Study

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**Introduction:** This wait is often plagued by anxiety as they worry about the outcome of the surgery. However, very limited studies have focus on parents' experiences and needs during this period. The aim is to explore the experiences and needs of parents while waiting for their child undergoing surgery.

**Methodology:** A descriptive qualitative study was conducted. A purposive sample of 11 parents having their first experience waiting during their 16-years-old and lower children's surgery, was recruited from the paediatric surgical ward of a tertiary public hospital in Singapore from November 2018 to January 2019. A semi-structured interview guide was used for the individual face-to-face interviews with the parents in the ward after surgery. Data were analysed using thematic analysis.

**Results:** Four themes were identified: "Care and care provision related factors affecting waiting experience", "Parental and surgery related factors affecting waiting experience", "Coping strategies used during waiting period" and "Recommendations for the improvement of waiting experience". Pre-operative instructions, professionalism of medical team and the lack of timely updates affected parental experience. Parents were naturally worried. The complexity and types of surgery influenced how they felt. Their concerns included potential complications, surgical outcomes, anaesthesia-related side effects and post-operative care including pain. They spent their waiting time eating, resting, using their smart devices and coped with a support system. Environmental improvements, more updates and mobile applications were recommended.

**Conclusion:** Our results give insights into the experience and needs of parents during the waiting time of their child's surgery, and guide the improvement of current practice.

## A Safe Return to the Ward: O2 Care for the HIGH-RISK Post-Operative Patient

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**Introduction:** Transfer from post-anaesthetic care unit (PACU) to the wards is a potential safety concern. The transfer workflow is done by patient care assistants (PCAs) and often do not have vital signs monitoring<sup>1</sup> in our hospital. PCAs are healthcare staff who do not have formal Nursing training but have basic heartsaver qualifications. High risk patients are at higher risk of respiratory depression and oxygen desaturation that would require closer monitoring during transfer.

**Methodology:** The department implemented a quality improvement project that involved (1) training and competency assessment of PCAs to monitor oxygen saturation and providing oxygen supplementation in the event of oxygen desaturation during transfer, (2) handover from PACU Nursing to PCAs and (3) clinical audit of oxygen saturation monitoring and anonymous PCA survey on the usefulness and confidence in use of oxygen saturation monitoring.

**Results:** A clinical audit was performed in November 2018. There was 100% compliance in the handover and implementation of oxygen saturation monitoring from PACU Nursing to PCAs for high risk patients. Oxygen saturation ranged from 96% to 100% during the period of transporting to ward. There was no respiratory adverse event and use of oxygen supplementation during the clinical audit period. Ninety-seven percent of PCAs found oxygen saturation monitoring useful and were confident in patient transfer with the additional monitoring.

**Conclusion:** This O2 Care project provided additional training to upskill the PCAs to provide patient safety during transfer from PACU to the wards. Continual competency assessment and education is provided to PCAs to ensure adequate oxygenation during patient transfers.

## Nurses and Patients Perspectives towards Sexual Health Education: A Descriptive Qualitative Study

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**Introduction:** Despite intensions to a holistic practice, the scarce attention rendered towards sexual health has led to the neglect of patients' sexual healthcare needs. To complicate matters, sexuality discussion is commonly viewed as inappropriate in conservative Asian societies.

**Methodology:** A descriptive qualitative design with purposeful sampling was used to recruit 15 nurses and 15 patients from two gynecology wards in a Singapore tertiary hospital. Patients recruited possessed gynecological-etiological factors commonly associated with sexual dysfunctions. Semi-structured face-to-face interviews were conducted using an interview guide. Thematic analysis was used to analyze the data, followed by cross analysis of the findings from both groups.

**Results:** Cross analysis revealed four converging themes:

1. *Myths and/or assumptions regarding Sexual Health Education (SHE)*

SHE is a shameful topic, and specific groups required SHE more or did not require it.

2. *Appropriate deliverer of SHE*

Preferences towards other healthcare professionals, especially doctors and counsellors.

3. *Barriers to SHE delivery*

Unreceptive and conservative patients, and the lack of clinical time and appropriate environment.

4. *Wish list for SHE delivery*

The other party to initiate SHE, utilising age-appropriate approaches and availability of SHE resources.

**Conclusion:** SHE is seen as an uncomfortable topic for discussion and its lack of cognizance has generated many inaccurate beliefs. Raising public sexual health awareness is central to create a more open and forthcoming culture. Moreover, specialized sexual health training programmes and resources are needed for nurses and patients, respectively. Lastly, future research is needed to triangulate the findings quantitatively and from their spouses' perspectives.

## Childbirth Self-Efficacy, Fear of Childbirth and Psychological Well-Being of Childbearing Women in Singapore: A Cross Sectional Study

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**Introduction:** Childbirth self-efficacy, fear of childbirth and psychological well-being of expectant women are important factors that facilitate a smooth and positive delivery experience for women.

**Methodology:** A descriptive, cross-sectional study using self-reported questionnaire survey was carried out. Study data were collected from a convenience sample of 205 pregnant women in a large maternity hospital in Singapore. The instruments, Childbirth Self-Efficacy Inventory, Childbirth Attitudes Questionnaire, and Well-being Index were used to measure childbirth self-efficacy, fear of childbirth and psychological well-being, respectively. Multiple linear regression was used to find the significant predictors of childbirth self-efficacy.

**Results:** Overall, pregnant women in the first trimester reported the highest level of childbirth fear ( $40.5 \pm 11.1$  [mean  $\pm$  standard deviation]) and lowest level of psychological well-being ( $54.9 \pm 22.1$ ). Whereas, the lowest level of childbirth self-efficacy ( $96.8 \pm 30.5$ ) was found in the third trimester. Significant correlations were found between childbirth self-efficacy, fear of childbirth and psychological well-being. Chinese, parity, fear of childbirth and psychological well-being were found to be the main predictors of childbirth self-efficacy.

**Conclusion:** The finding of this study highlights the predictive relationship between childbirth self-efficacy with fear of childbirth, psychological well-being, ethnicity and parity among pregnant women.

## Impact of Music Listening On Pain and Anxiety during Paediatric Outpatient Wound Dressing Changes in a Crossover Randomized Controlled Trial

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**Introduction:** Wound dressing changes are painful for children, triggering anxiety and behavioural changes, which may be ameliorated by positive effects of music. We evaluate the impact of music listening on pain and anxiety in paediatric surgical patients undergoing outpatient wound dressing changes.

**Methodology:** With ethical approval, we conducted a prospective crossover randomised controlled trial on children aged 11-16 years requiring multiple wound dressing changes in our specialist outpatient clinic. Patients were block randomised to Group 1 (first dressing change after recruitment accompanied by music listening, subsequent dressing change not accompanied by music) or Group 2 (no music followed by music). Music was self-selected by patients with guidance from music therapists. Post-dressing change, participants completed pain self-assessment scores and Spielberger State-Trait Anxiety Inventory (STAI) Scores. Statistical analysis with  $p < 0.05$  significance was performed. Data are reported as median (range).

**Results:** Forty-eight patients participated, aged 14 years (9-16). Baseline trait STAI scores were similar between Group 1 ( $n=25$ ) and Group 2 ( $n=23$ ), and between male ( $n=18$ ) and female ( $n=30$ ) participants. Overall, comparison of paired pain scores showed significantly lower pain post music intervention (score 2, 0-9) compared to no music (score 3, 0-10),  $p=0.009$ . Comparison of paired state STAI scores also showed significantly lower anxiety post music intervention (score 28, 20-57) versus no music (score 38, 20-61),  $p=0.0001$ . Within the groups, the positive effects on pain ( $p < 0.0001$ ) and state anxiety ( $p < 0.0001$ ) were more pronounced in Group 2.

**Conclusion:** Wound dressing is associated with lower pain and anxiety when accompanied by music listening. The ease of application makes it a useful complement to minor procedures in outpatient and ambulatory care settings, and in resource challenged environments.

## Getting Out Of Darkness (G.O.O.D): An Initiative for Screening Mothers For Depression

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**Introduction:** Parenting children with developmental, behavioral and emotional issues can be demanding and highly stressful. A depression screening was initiated with mothers of children who have been referred for a mental health assessment. The study aims to 1) examine the proportion of mothers who endorsed depressive symptoms and 2) understand if providing psychoeducation and resources would be helpful.

**Methodology:** The PHQ-9 was administered to mothers of children referred to a community mental health service for assessment. Participants were called within two weeks and psychoeducation and resources for help-seeking were provided. At two months, participants receive another phone call and the PHQ-9 was administered again.

**Results:** Twenty out of the 60 participants had scores that fell in the mild to extremely severe range on the PHQ-9 at baseline. 12 of the 20 participants were contactable two months later. For these 12 participants, ratings on the PHQ-9 were significantly lower at two months compared to baseline;  $t(11) = 5.15$ ,  $p = 0.000$ . Qualitative analysis of their responses indicated that information given during the first phone call was helpful in the management of emotional symptoms for half the respondents.

**Conclusion:** A sizeable proportion of mothers of children referred for mental health assessment endorsed depressive symptoms. Results indicated that symptoms do improve, with psychoeducation and resources provided over the phone being helpful to these mothers. It is therefore important to recognize depressive symptomatology in mothers of children referred for psychiatric services to ensure holistic care for families struggling with mental health issues.

## Understanding Factors Affecting Medication-Taking Behavior Among Adolescents with Systemic Lupus Erythematosus: A Qualitative Study

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**Introduction:** Poor medication adherence in adolescents with Systemic Lupus Erythematosus (SLE) often result in increased morbidity, poorer quality of life and higher fatality. Little is known about the complex interplay between the developing adolescents and their treatment concerns, socioeconomical and healthcare environment, which are responsible for influencing adolescents' medication-taking behaviour. This study aims to explore factors affecting medication-taking behaviour among SLE adolescents in Singapore.

**Methodology:** A descriptive qualitative design was employed. Sixteen SLE adolescents were recruited via purposive sampling. Face-to-face semi-structured interviews were conducted from September 2018 to January 2019. Field notes and reflexive journals were regularly maintained. Frequent debriefing sessions were performed to ensure the study's methodological rigour. Constant comparative analysis was executed to determine the study's information power, which was obtained with 14 participants. The audio-recorded interviews were transcribed verbatim, coded, and thematically analysed by two researchers.

**Results:** Five motivator themes and five deterrent themes were identified. The five motivator themes were enlightened about medication treatment, appreciation of medication value, maintaining network of supportive relationships, adept coping skills and minimising medication impact on daily life. The five deterrent themes were neglectful behaviour towards medication taking, dissatisfaction with medication treatment, apprehension towards medication use, impaired external support, and poor doctor-patient relationship.

**Conclusion:** This study has highlighted various medication-taking motivators and deterrents. Despite being identified separately, it is the interdependent relationship between all motivators and deterrents that determine their medication-taking behaviours. Engaging psychological services to address self-image concerns, developing education platforms and using graphical feedback may improve adolescents' medication adherence.

## Bottom-Up Decision in Effecting Process Design Change to Improve Clinical Excellence

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**Introduction:** Medication administration being the most common process in Children's Emergency, was carried out in a corner of an open observation bay. Patients had to navigate to the medication area through an open hallway, Passage 11, and will often lose their way. Nurses also need to take on non-clinical tasks such as crowd control and patient ushering. Risks of medication errors arise with interruptions during medication administration.

**Methodology:** Process mapping, cause and effect analysis were utilised. Passage 11 was identified for conversion to a designated medication administration area. A pre-conversion survey was done to study the types and frequencies of disturbances. Followed by a mock physical setup of the medication administration area. Data was collected during the piloting phase over two weeks and a comparison study was done.

**Results:** For medication administration time, the result (P-value = 0.039) was statistically significant at 95% confidence interval. As the average monthly number of medication administrations amounted to 12,500, the accumulated time saved was 270 hours. This translates to a tremendous reduction in median waiting time. In addition, the percentage of nurses surveyed indicating high level of disturbance (>10) had reduced after the initiative, from the 60% to 33%.

**Conclusion:** With the positive result, the initiative has continued to be an official process. Encouragingly, the frequent interruptions faced by the nurses were resolved. Nurses and physicians were able to offer better care to patients due to the lesser distractions, unneeded crowd management and undue stress. Patients experienced a more seamless journey during their hospital visit.

## Effectiveness of Apply Remove Check Educational Programme in Reducing Peristomal Skin Complication and Improving Patient's Satisfaction

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**Introduction:** Apply-Remove-Check (ARC) education program was designed to help patients identify stoma related issues unique to their stoma shape and skin contour. This study aims to determine its effectiveness in reducing peristomal skin complications.

**Methodology:** One hundred new adult ostomates (51 control and 49 intervention) were recruited. During the 8 weeks study, participants received ostomy products sponsored by Coloplast and an education session by the hospital's enterostomal-therapist post-operatively. The control group was educated as current practice (bedside education with basic handouts). The intervention group received ARC teaching (bedside education with detailed ARC handouts) and home visit from Coloplast's nurse on their 4th and 6th week of the study. Data covering demographics, ostomy appliances used, stoma complications and satisfaction with the education were collected via questionnaire, created specifically, on recruitment and 8 weeks after.

**Results:** The mean age of participants was 61 years old. 74.5% of the control group and 47.8% of the intervention group attended the education session with their carer. The intervention group experienced lesser complications in experiencing effluent leakages; control group (35.3%) and intervention group (26.5%). None of the intervention group participant experienced erosion of base plate but 7.8% in the control group did. Majority of the control group (54.9%) and intervention group (71.4%) reported that the bedside education session by the enterostomal-therapist was easy to understand. Of the intervention group, 62.5% were highly satisfied with the ARC education and 81.6% would likely continue using the education model.

**Conclusion:** The enhanced ARC education did reduce the occurrences of peri-stomal complications.

## Psychological Interventions in Reducing Stress, Depression and Anxiety among Parents of Children and Adolescents with Developmental Disabilities

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**Introduction:** The poor psychological well-being of parents, precipitated by the high levels of stress, paves way to understand the efficacy of psychological interventions in enabling parents to improve their stress.

**Methodology:** A comprehensive literature search was conducted across seven databases from point of inception to December 2018. Individual appraisal of selected studies was conducted using Cochrane Risk of Bias Tool and relevant data for the meta-analysis was extracted by two independent reviewers. Data was synthesised using RevMan software 5.3. Treatment effect was evaluated using z test with p-value set at 0.05 while heterogeneity was assessed using the Cochran's Q and *I*<sup>2</sup>.

**Results:** Eleven out of the eighteen included studies were involved in meta-analysis and the remaining seven studies were summarised narratively. The meta-analysis unveiled that psychological interventions significantly reduced stress among parents of children and adolescents with developmental disabilities at post intervention, however, these effects were not sustained three to six months post intervention. Psychological interventions are not efficacious in reducing depression and anxiety experienced by these parents. Variations in psychological interventions and the methods of delivery did not affect their overall effectiveness in reducing parental stress.

**Conclusion:** Psychological interventions appear to reduce parental stress in short-term. More high-quality studies with large sample size are needed to further support the effectiveness of such interventions. Healthcare professionals can consider alternative treatment, such as prescribing psychiatric medications, adjunct to psychological interventions to improve mental wellbeing of these parents in the long run.

## Nurse Led Feeding Pathway for Infants Born Before 34 Weeks Gestation and Birth Weight More Than 1500grams but Less Than 1800grams

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**Introduction:** Complete and safe oral feeding is one determining factor in deciding if an infant is fit for discharge. The current practice for preterm infants delivered at gestational age of 32 weeks but with birth weight of more than 1500 grams are excluded from the routine speech language therapist (SLT) review. This group of infants experience similar suck-swallow-breathe incoordination (SSBI) as with the very low birth weight (VLBW) infants with birth weight of less than 1500 grams.

**Methodology:** Nurse-Led Feeding Pathway training was carried out in two phases. **Phase 1:** SLT trained a group of nurses to assess, apply proper intervention and conduct caregiver training to promote safe feeding in a selected group of preterm infants. **Phase 2:** Changes were made to the nurse-led feeding pathway based on feedback from nurse-led trained nurses and direct care nurses. 6 nurses were selected as champions to conduct training for the second batch of nurses consisting of 16 nurses in total. Training encompassed lectures, practical assessment, review and caregiver training.

**Results:** Between October 2017 and July 2018, 37 out of 45 infants achieved full oral feeding at 35 weeks of gestational age and discharged between 35 to 36 weeks of gestational age.

**Conclusion:** Nurse-Led feeding Pathway promotes safe feeding and reduces the length of hospitalization.



## The Effectiveness of Rinsing Enteral Feeding System before Feed Refill in Reducing Bacterial Contamination: A Systematic Review

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**Introduction:** With increased emphasize on reusing of enteral feeding system, much effort had been put into studying the effective methods of rinsing and disinfection in reducing bacteria contamination. The methods of rinsing range from using water, detergent, and disinfectant. Conversely, studies also showed that rinsing did not reduce bacterial colonization but instead increased bacterial contamination.

This review aimed to synthesize the best available evidence to evaluate the best method of rinsing enteral feeding system in reducing bacteria contamination.

**Methodology:** The review included all randomized controlled trials, quasi-experimental studies, and observational studies with comparable groups. Initial search was done on six electronic databases for all studies on different rinsing methods of enteral feeding system and bacteria contamination, from 1970 to 2015 and five studies were selected.

**Results:** Meta-analysis revealed that rinsing enteral feeding system using disinfectant significantly reduced bacteria contamination as compared with rinsing with water and detergent. Individually analyzed study supported rinsing with disinfectant as the most effective cleaning method in reducing bacteria contamination.

**Conclusion:** The review demonstrated significant effect of rinsing used enteral feeding system in reducing bacteria contamination. For effective rinsing of feeding system using disinfectants, times and thorough cleaning procedures are essential, thus, it might not be feasible in clinical areas. Also, none of the cleansing methods demonstrated total removal of bacteria in the lumen of contaminated enteral feeding system. Closed feeding system with ready-made formula should be considered rather than rinsing reused sets. Future experimental studies with larger sample size are needed for stronger evidence.

## A Descriptive Study of Paediatric Registered Nurses' Perception of Bedside Shift Handover Report with Caregiver Engagement in Relation to Patient Safety

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**Introduction:** The aim of this study is to describe the perception of paediatric registered nurses towards the bedside shift handover report with caregiver engagement in relation to patient safety. The hypothesis of this study is that paediatric registered nurses will be favourable towards the bedside shift handover report with the caregiver engagement in promoting patient safety.

**Methodology:** In-service training on bedside handover was conducted in Feb 2017. A semi-structured questionnaire on a 5-point Likert scale was used to collect the data. We conducted the survey in June 2018, sixteen months after the pilot implementation. The Institute of Medicine's Aim for Improvement was used as a conceptual framework to guide our study. Statistical Analysis System version 9.4 was used to do the analysis.

**Results:** A total of 352 (77%) Registered Paediatric Nurses responded to the survey. The results suggested that more than 80% of nurses were highly favourable to the bedside handover report in promoting patient safety. Nurses also provided narrative descriptions on some near-miss incidents. An interesting finding was that among the ethnic groups, Filipino nurses were more in favour of bedside handover than Chinese, Malay and Indian nurses. Staff members 25 to 30 years of age with 4 to 6 years' experience or holding a Bachelor degree were less favorable to bedside handover. In addition, 84% of nurses indicated their concern over the challenge of protecting patient confidentiality during the bedside handover.

**Conclusion:** This study reinforces the value of the bedside handover report with caregiver engagement to promote patient safety.

## Neonatal Resident Nurse: An Expanded Role in Special Care Nursery

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**Introduction:** Neonatal nurses perform a variety of roles, from teaching to rendering hands-on care in the neonatal unit. As there is significant increase in survival rates of smaller neonates, demands to elevate the standards of our nurses to meet the needs of these neonates are essential. Hence, neonatal nurses must be trained and equipped with added skills and knowledge. This program may also facilitate those who wish to further their education as an APN in neonatal nursing

**Methodology:** Duration of the course is over a 4-months period. The first month consist of lectures and the following 3 months will be clinical attachment to the clinical area. Course outline include: (1) Management of the stable growing premature babies; (2) Nurses' involvement in Family Integrated Care; (3) Feeding assessment; (4) . Nutritional needs of the VLBW babies; (5) Neurodevelopmental assessment and early intervention program; (6) Supporting the family in need – an overview by MSW; (7) The resident nurses will be evaluated based on hands on demonstration, competencies assessment, case presentation and a final written test.

**Results:** The five trained neonatal resident nurses can conduct physical health assessment confidently and independently. They implement and follow up on daily care plan by initiating discharge planning for VLBW babies transferred from Neonatal Intensive Care Unit (NICU). They facilitate and commence homecare training such as nasogastric tube insertion/feeding and oxygen therapy as required.

**Conclusion:** The collaboration and support from all stakeholders including medical, nursing and allied health are the result for the positive course outcome.

## Impact of Knowledge, Attitude and Perceptions on Medication Adherence in Children with Asthma

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**Introduction:** Poor medication adherence is a common cause of persistent poor control in children with asthma.

**Methodology:** In this prospective study, children aged 7-18 years with asthma had comprehensive clinical assessment and spirometry. A 31 item questionnaire to assess the knowledge, attitude and perceptions (KAP questionnaire) about asthma was administered. Medication adherence was assessed by a combination of self-reporting, pharmacy records review, inhaler check, and tablet counting, as appropriate; and was classified into 3 groups (good, average and poor). Asthma control was assessed as controlled, partly controlled or uncontrolled based on the GINA criteria.

**Results:** One hundred and eighty children (mean [SD] age=11.4 [2.8] years, 59.4% males) were studied. Adherence was good in 101 (56.1%), average in 56 (31.1%) and poor in 23 (12.8) children. The proportion (mean [95% CI]) of appropriate responses on the KAP questionnaire in those with poor adherence (47.7 [41.2-54.2]%) was significantly lower compared to those with good (57.2 [53.4-60.9]%) and average (52.5 [49.1-55.8]%) adherence ( $p=0.0433$ ). Asthma control was good in 47.5% with good adherence, compared to 33.8% with average or poor adherence ( $p=0.0031$ ). Significant bronchodilator reversibility in FEV<sub>1</sub> ( $\geq 12\%$ ) was observed in 23.7% with good adherence, compared to 39.2% with average or poor adherence ( $p=0.0338$ ).

**Conclusion:** Our data suggests that knowledge, attitudes and perceptions about asthma affect medication adherence and asthma control. Hence, improving these should be a key focus in the management of asthma.

## A Descriptive Qualitative Study on KKH Peri-Menopausal Women's Experiences and Needs

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**Introduction:** Women in the perimenopause stage may experience several climacteric symptoms that may affect their quality of life. The most common climacteric symptoms experienced by peri-menopausal women in Singapore are hot flushes, insomnia and lethargy. As Singapore is a multi-racial and multi-religious country, a diverse population of women is needed to obtain a full understanding of the experiences and needs of Singaporean women undergoing peri-menopause with climacteric symptoms. Therefore, the aim of this study is to understand the experience and needs of peri-menopausal women with climacteric symptoms in KKH, Singapore.

**Methodology:** Purposive sampling was used to recruit 20 peri-menopausal women with climacteric symptoms. Semi-structured, face-to-face interviews were conducted, audio-recorded, transcribed verbatim, coded, and analysed through thematic analysis.

**Results:** Five themes were identified: Uncertainty & Misconceptions; Changes in Body; Mixed Feelings; Support for Women; and "Wish" list of Women. Participants were generally uncertain of what this period entailed, leading to numerous misconceptions. They experienced an array of climacteric symptoms which had varying impact on their lives. This brought about varied feelings. While they received support, the source and amount of support differed. They longed for more information, understanding and compassion from loved ones, and empathy from their healthcare professionals.

**Conclusion:** This study highlighted the diversity in experiences and needs of women in Singapore experiencing peri-menopause with climacteric symptoms. Its multi-racial and multi-religious perspective adds value to current literature. It also reinforced that healthcare professionals need to address patient's concerns.



## Paediatric Trauma Workflow: Transfer from Children's Emergency to CT Scan

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**Introduction:** Computed tomography (CT) scan in children is the gold standard diagnostic modality in trauma management. However, it is not advisable for the clinically unstable patients. Even for stable patients, time spent for transfer has to be minimal due to the potential risk of deterioration en route. We reviewed our transfer workflow followed by disposition ward with the aim of a faster and safer way.

**Methodology:** All trauma patients transferred to CT room directly from CE between 1 August 2016 and 31 July 2017 were recruited. Data pertaining to injury mechanism, transfer events, CT protocols and resuscitative interventions were prospectively collected. The transfer team members and radiology staffs were interviewed to elucidate potential cause of delay.

**Results:** Fifteen patients were recruited. Fourteen are male. Average age was 8 years (min 1; max 14). Seven (46.6%) patients were traffic accident victims while 5(33.3%) had falls. Twelve patients had isolated head injuries (IHI) while 3 patients had polytrauma. Average time spent for transfer was 31.8 minutes (25.6 minutes for IHI and 56.7 minutes for polytrauma). Common causes for delay were patients' movement, arrangement for disposition, resuscitative attempts and elevator availability.

**Conclusion:** This project has shown that our transfer workflow for injured child from CE to CT can be improved. We recommend measures such as time out checklist, booking of HD/ICU bed and protocolised communication between CE and CT staffs to achieve faster and safer transfer. Future audit will evaluate the impact of these changes and explore other methods to further improve our workflow.

## APN-Led Patient-Centered Care Approach for Adolescents with Diabetes in Reducing Readmission

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**Introduction:** Type 1 diabetes is a 24/7 disease that requires constant management with careful balancing of insulin injections using blood glucose levels, eating, exercise and other activities. Although diabetes and its demands affect the adolescents' sense of self among peers, a patient-centered care approach showed positive relationship with medication adherence and empowerment. In addition, many evidences showed reduced risk for diabetes ketoacidosis and healthcare costs with patient-centered care approach.

**Methodology:** The study aims to explore the influence of APN-led patient-centered care for inpatient adolescents with diabetes.

**Results:** Retrospective data were collected between year 2014 and 2017 on number of APN-led outpatient visits, frequency and reasons for readmission. In addition to team-based clinical management, APNs provide a patient-centered educational approach with targeted self-care and behavioral interventions that is related to the reason(s) of admission. An APN-led clinic appointment will be given at discharge. Focused data analysis was used.

**Conclusion:** APN-led reviews enables patient-provider interactions to have an influence on patient's self-care behaviors, considering their personal preferences, values and family situations. The shift from authoritarianism to shared decision-making is strengthened by patient empowerment. This is observed when the adolescents utilize their knowledge, skills, attitudes and self-awareness as necessary for effective long-term self-management.

## The Contribution of the Specialist Nurse in the Out-of-Hospital Care of Paediatric Patients with Inflammatory Bowel Disease

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**Introduction:** The management of Paediatric Inflammatory Bowel Disease (PIBD) requires a multidisciplinary approach, and the IBD specialist nurse (SN) plays a pivotal role. We aimed to assess the outcomes of SN-led consultations in the management of PIBD at our centre.

**Methodology:** Retrospective audit of telephone-log maintained by PIBD SN from January to September 2018 at our centre was conducted. Occasions of interactions (OOI) and outcomes of interactions between SN and PIBD patients were reviewed. OOI was defined as any patient-related activity requiring nurse-directed intervention (NDI) or referral to the gastroenterologist for physician-directed intervention (PDI).

**Results:** Three hundred and fifty-six OOI were recorded between SN and 81 of 213 PIBD patients. Of these 81 patients, 60.5% had Crohn's Disease, 56.8% male with mean age  $14.4 \pm 4.1$  years old. 292 OOI were made with direct access to the SN via instant messaging service. 83% of OOI required NDI. Of these, 38.0% required assistance in treatment coordination, 42% needed facilitation of patient and caregiver understanding of condition and compliance to treatment and follow up. Other interventions included prescription refills (13.4%), review of blood tests (3.0%), transition service (2.0%), and non-IBD-related queries (1.7%). Fifty-eight (16.0%) OOIs required physician-directed intervention. These PDIs led to outpatient visit avoidance (70%), emergency visit avoidance via early clinic review (20%) and streamlined admission (8%).

**Conclusion:** The PIBD SN plays an important role in providing first-line support and facilitating medical care of paediatric patients with IBD. Direct access to the SN has led to reduction in unnecessary hospital visits and contributes to improved healthcare resource utilization.

## Workflow for Administering Intramuscular (IM) Asparaginase in Paediatric Oncology Unit

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**Introduction:** The importance of close monitoring is necessary due to the high risk of hypersensitivity and toxicities when administering intramuscular (IM) Asparaginase. Before administering the drug, patients are required to check their blood sugar which is done by pricking their finger with the lancing device at the sides of the finger. This procedure causes pain and discomfort to the patients and it is not recommended with reference to drug literature. Moreover, the checking of sugar in blood and urine, and the monitoring of vital signs vary among those inpatient and outpatient. The aim of the project is to smoothen the workflow thus increase patient satisfaction.

**Methodology:** Systemic computer searches were conducted using 'Asparaginase', 'nursing care' and 'monitoring' between 2011 and 2018, and in consult with oncologist and oncology pharmacist, the workflow was developed.

**Results:** The new workflow does not required patients to check their blood sugar before administration of Asparaginase regardless of doses. Prior to the first dose of Asparaginase in an outpatient unit, only sugar in urine check with the use of urine dipstick is required. The duration for post IM Asparaginase administer monitoring is also reduced from 6 hours to 1 hour.

**Conclusion:** This new workflow has improved patient/caregiver/nursing staff satisfaction and save cost for patients as they are not required to be admitted. The development of a standardised workflow eradicates redundant work processes, minimises patient discomfort and save healthcare cost.

## Factors Associated with Midwives' Work-Related Stress and Burnout: An International Integrative Review

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**Introduction:** Extensive research has been done on burnout and work-related stress in healthcare workers, but seldom with midwives as a distinct group. Midwives are the primary providers of care for childbearing women globally. The shortage of midwives has negative implications on the health of women and their newborns. The aim of this integrative review was to synthesise all available evidence on the factors associated with burnout and work-related stress in midwives.

**Methodology:** A five-step integrative review method was used to guide this review. Articles published between January 2007 to December 2017 were sourced from five online databases. Search terms associated with burnout, work-related stress and midwives were used to identify relevant studies which were then appraised using the Joanna Briggs Institute's critical appraisal checklist.

**Results:** From the initial yield of 584 articles, six themes were identified from the 17 articles included in this review. The themes identified were 1) organisational factors, 2) aspects of midwifery work, 3) interpersonal conflict, 4) emotional intelligence, 5) socio-demographic factors and 6) protective factors of burnout and work-related stress. Protective factors included exercise, having children and working in caseload midwifery. Midwives who perceived that the management was committed in helping them achieve work-life balance had lower levels of work-related stress.

**Conclusion:** An organisational culture and workplace environment where midwives feel secure and valued is needed to attract and retain midwives who are motivated to provide quality care to women and their newborns.

## Exploring the Post Treatment Experiences and Support Needs of Adolescent Cancer Survivors Living in Singapore: A Descriptive Qualitative Study

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**Introduction:** Cancer survivors diagnosed during adolescence period have higher morbidity and mortality rate as compared to other populations (Tai, et al., 2012). The experience and needs of these cancer survivors are not well explored in the local context. The aim of this study is to explore the post-treatment experiences and support needs of adolescent cancer survivors in Singapore.

**Methodology:** The study purposively sampled 8 adolescent patients (10 to 19 years of age) from the paediatric oncology outpatient clinic in KK Hospital, who have finished any form of cancer treatment for at least 5 years since their diagnosis. Semi-structured face-to-face interviews were conducted, audiotaped, transcribed verbatim and analyzed using thematic analysis till data saturation.

**Results:** Three themes were identified. (1) Majority of the participants experienced at least one late side effect, with hearing problems being the most common. Most participants did not seek treatment as they did not find the need to be reviewed; (2) There is a lack of information on diet and nutrition for participants after their treatment. Participants suggested dietician to review after treatment as it will be useful in helping them make informed choices on the types of food to consume; (3) All participants agreed that the amount of information received after treatment was insufficient.

**Conclusion:** There is a big gap on the services provided to them as much of the focus has been on the treatment phase. This brings a great opportunity to bridge the gap and render better survivorship care for this group of cancer survivor.

## Use of Plastic Bags to Drain and Measure Stoma Effluent for Patients in High Dependency Unit, KK Women's and Children's Hospital

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**Introduction:** The usual practice of draining and measuring patients' stoma effluent includes the use of disposable plastic kidney dishes and syringes. There is an increase in number of pediatric patients with stoma and most require draining as frequent as two to four hourly. High usage of syringes and kidney dishes can increase the cost for the hospital. Therefore, disposable plastic bags is introduced as an alternative method to drain and measure stoma effluent.

**Methodology:** To explore nurses' perception towards both methods and to find out if the use of plastic bags is a better alternative for patients, nurses and the organization in terms of reducing cost, time and contamination to the environment.

**Results:** Twenty-one nurses were randomly chosen and timed while they drain and measure stoma effluent for patients using both methods. Results showed a significant reduction in time taken using the disposable plastic bag and weighing scale to drain and measure stoma effluent. This alternative method was then rolled out in the ward and practiced by nurses for the next 6 months. A survey was conducted for 36 nurses to find out their perception towards both methods. 94% of the staff felt comfortable using the new method.

**Conclusion:** The change of method not only helps to reduce the cost by \$1467 per year, but is also of great convenience for nurses. It saves nurses from the hassle to syringe out the effluent to measure the stoma output and thereby reduces the chance of spillage and environmental contamination or stench.

## An Innovative Way to Build an Appreciative Culture at the Workplace

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**Introduction:** The likelihood of internal conflicts between colleagues increases if they are under-appreciated, which often leads to increase in attrition rate. This was statistically proven by studies, showing 80% of employees leaving their jobs because they felt under-valued. Another research showed that there was an incremental positive impact to employees' contributions should they received verbal affirmations or were rewarded tangibly.

**Methodology:** Focus group meetings conducted with nurses revealed that the most significant factors to staff happiness were being appreciated and recognized for their work. Our team developed the content with a variety of video scribes, story-telling, case studies and reflective journal integrated within the e-learning modules to boost learners' knowledge retention.

**Results:** Trainings were conducted from 1 February to 9 March 2018 with 1668 (87%) staff participation. Feedback on training were favourable, with many commented that the contents were informative and useful. Pre and post training survey were collected on 840 and 1190 respondents respectively. Results: (1) Appreciative culture: increased by 6.1% from 77.8% to 83.9%; (2) Nurses' satisfaction level: increased by 5.8% from 81.3 to 87.1%; (3) Recommendation rate: increased by 9.7% from 65% to 74.7%; and (4) Nurses' attrition rate: decreased by 1.37% from 5.26% to 3.89% (n=1900). An estimated cost savings of S\$ 72,270 was achieved from eLearning versus classroom training.

**Conclusion:** This e-Learning enabled nurses to understand the value of showing appreciation which translated into closer and more trusting relationships amongst peers, then enhancing the hospital's clinical excellence. Eventually, our objective in achieving joy at work equates to happy patients.

## Redesign Bedside Handover to Enhance Patient-Centred and Safe Care

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**Introduction:** In KK Women's and Children's Hospital, our key priorities are 'Positive Patient Experience' and 'Target Zero Harm'. In view of these, the practice on bedside handover was redesigned for the Paediatric setting.

### Methodology:

- Creative Tension Model was used.
- Situation Background Assessment Recommendation were incorporated into the practice.
- In-service were conducted.
- Reference guide were developed.
- Focus group meetings were conducted.
- Ward Champions and leaders acted as role models, resource persons and conducted audits.
- Instructional video was developed.
- Stakeholder's feedbacks were monitored through nurses' perception survey and patients' feedback.

**Results:** The objective of this project has been met and the results have shown sustainability for more than 1 year. (1) Recommendation rate: increased by 21% from 53% to 74%; (2) Consistent information: increased by 14% from 53% to 67%; (3) Confidence & trust of nurses: increased by 2% from 75 % to 77%; (4) Call bell activation: decreased from 2.75 to 2.56 (per in-patient day); and (5) Gradual reduction on falls and omission of medication rate since the 1<sup>st</sup> PDSA. A survey study was conducted in May 2018 to identify the perception of Paediatric Registered Nurses (RN) on bedside handover with caregiver engagement in relation to patient safety. A total number of 352 (76%) RNs responded to the survey. More than 80% of nurses favoured bedside handover as vital in achieving patient safety.

**Conclusion:** Redesign of bedside handover has reaped significant benefits to patient care and it has certainly supported our hospital envisions 'Positive Patient Experience' and 'Target Zero Harm'.

## Experiences of Adolescents Living with Cancer: A Descriptive Qualitative Study

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**Introduction:** Adolescence is a complex and changing stage of life, where transition from childhood to adulthood takes place. Having a cancer diagnosis adds more challenges to this phase, making adolescents a unique and vulnerable population whose experiences were unexplored in Singapore. Hence, this study aimed to explore the experiences of adolescents living with cancer and their perceptions on how their experiences could be improved.

**Methodology:** A descriptive qualitative study design was adopted. Convenience sampling was used to recruit 10 participants in a pediatric oncology ward in a Singapore hospital. Individual semi-structured interviews were then conducted and thematic analysis was used to analyse the data.

**Results:** Seven major themes emerged from the thematic analysis. The adolescents with cancer experienced many physical effects of treatment, with fatigue affecting their lives the most. They also faced emotional negativity as they were feeling depressed and fearful. Their social dynamics changed as they had to be isolated. The adolescents were also falling behind in their academics and there was a sense of loss of normalcy in their lives. Despite these, they coped well and emerged as better individuals than before. To improve their cancer experiences, their needs for better hospital food, quiet environment and friends had to be supported.

**Conclusion:** Overall, the adolescents proved to be resilient individuals despite undergoing sufferings in the physical, emotional, social and educational aspects of their lives. As healthcare professionals, we can play a part in alleviating their sufferings and improving their cancer experience and hence, overall quality of life.

## A Survey on Patients and Caregivers Experience in Using Flash Glucose Monitoring in Singaporean Children with Diabetes

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**Introduction:** Flash glucose monitoring (FGM) is an advanced glucose sensing technology. In May 2017, FGM was approved by HSA for use in Singapore. Following its approval, we evaluated the acceptability of FGM among children with diabetes and their caregivers who were under the care of KKH Paediatric Diabetes Service and have not used FGM before.

**Methodology:** We conducted a survey from March to May 2018 on 60 patients with diabetes who had tried using FGM for two weeks. The children and their caregivers were provided with statements relating to their experience using FGM. They answered on the five point Likert Scale. Summary data on their answers were collated.

**Results:** There were 22 boys and 38 girls surveyed age between 5-19 years old. Fifty-four children have type 1 diabetes and 6 have type 2 diabetes. HbA1c ranged from 5.6% to 12.8%. Fifty-four children were treated using multiple daily insulin injections and 6 were on insulin pump therapy. The survey showed more than 90% of the children answered strongly agree or agree to 3 out of 17 questions. More than 90% of their caregivers answered strongly agree or agree to 6 out of 12 questions. More than 80% of children and their caregivers would recommend FGM to others.

**Conclusion:** Our survey results suggested that FGM technology was well received by children with diabetes, and caregivers seemed even more positive about using FGM on their children. It also enhanced their understanding of how daily activities and food intake affected glucose levels of their children.

## A Patient Safety Initiative: Preventing Hospital Acquired Pressure Injury

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**Introduction:** Hospital Acquired Pressure Injury (HAPI) is preventable and is considered an indicator for quality care and practice for healthcare professionals in the hospital setting. Project aims to: (1) Reduce the incidence of HAPI, (2) Educate, train and empower nurses on preventing PI.

### Methodology:

1. Pre and post questionnaire was conducted to assess gynaecology wards nurses' of their knowledge and management of HAPI.
2. Staff Education: Structured in-service and hands-on practice on PI prevention and management was conducted
3. Guideline Development: PI Management Guidelines was displayed at prominent area in the wards.
4. Monitoring of HAPI incidences
5. Monthly tracking of PI incidence rates and benchmark against National Database of Nursing Quality Indicators.

**Results:** Improvement on nurses' knowledge from 75% to 88% while nurses' confidence in managing PI increases from 57% to 76%. Decrease of PI incidence rate from January 2017 to August 2018: Stage 1 - 50% decrease in 2018; Stage 2 - 73% decrease in 2018. There is no incidence of stage 3, 4, unstageable & deep tissue injury for both years.

**Conclusion:** This project standardised the management of PI across the inpatient wards and empowered the nurses to make clinical judgement, decisions and care plan for patients who are at risk in developing PI, which aligns with hospital safety culture on targeting ZERO preventable harm.

## Use of Wireless Respiratory Sensor for Vital Signs Monitoring In Women with Patient Controlled Analgesia after Gynaecological Surgery

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**Introduction:** Respiratory depression is a rare but severe adverse event of opioid patient controlled analgesia. Current monitoring using nursing manual intermittent measurement is labour intensive. We aim to evaluate a patient-worn wireless vital-signs sensor (Aingael) to continuously monitor respiratory rate, heart rate and temperature.

**Methodology:** Upon ethical approval and informed consent, we recruited women who underwent major gynaecological surgery and received patient controlled analgesia (PCA) morphine. Subjects were connected to the sensor for the duration of PCA morphine use. Demographic, nursing vital signs, sensor monitoring, comparison Bland-Altman analyses and user (patient, staff) feedback data were obtained.

**Results:** We recruited and analysed 35 women who received sensor and routine nursing monitoring at KKH. Majority of women had abdominal hysterectomy, with no adverse events reported during the study period. The Bland-Altman showed satisfactory agreement (bias  $-1.04 \pm 4.0$  breaths/min, 95%CI  $-8.96$  to  $6.88$  breaths) between nursing and averaged sensor readings. There was also satisfactory agreement between nursing and averaged sensor readings for heart rate and temperature. Patient and staff feedback were positive, however improvements were needed for loss of readings of device and special training requirement on its use.

**Conclusion:** Satisfactory agreement between nursing and sensor readings for vital signs monitoring suggest that wireless respiratory sensor could be a good alternative and consideration for closer monitoring of opioid respiratory depression in postoperative settings, especially in patients with high risk of respiratory depression.

## Aim for Zero Errors: To Reduce Intravenous Total Parenteral Nutrition (TPN) and Lipid Infusion Errors Through Process Re-Designing

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**Introduction:** A multi-disciplinary workgroup which consists of nurses from neonatal, paediatric, gynaecology and specialty line, and pharmacist was formed. Its aim is to reduce medication errors attributed by switching of the intravenous TPN/Lipid infusion lines which resulted in the wrong rate being infused to patients through process re-designing.

**Methodology:** Solutions were proposed through feedback gathered from nurse clinicians in varying disciplines. Specialty line nurse taught nurse clinicians from all disciplines through hands-on demonstration and structured teaching materials. The nurse clinicians then guided nurses in their respective departments. Competency tests will be carried out to re-assess nurses every 2 years.

**Results:** Since the implementation in April 2018, zero medication errors were reported. Nurses were more confident in changing intravenous TPN/Lipid infusion and care of intravenous TPN/Lipid infusion lines.

**Conclusion:** Variations of practices across the hospital might hamper continuity of care in view of patient safety. Albeit brief differences, all stakeholders collaborated in standardizing practices, worked cohesively with one another to achieve a common goal – target zero harm.

## Hip Surveillance Pathway for Long Term Neurological Condition

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**Introduction:** Children with long term neurological condition (LTNC) often suffer from abnormality in tone and posture, have limited mobility and are at risk for hip subluxation.

**Methodology:** Patients from outpatient neurology clinic were reviewed retrospectively from September 2018 to January 2019. Parents were asked about the hip pain, care and function while doctors were asked to classify the Gross Motor Function Classification System (GMFCS) levels of the patients. Radiological assessment with antero-posterior pelvic radiographs were used to measure migration percentage (MP) of the hip joint.

**Results:** Two hundred and ten patients with mean age of 8.4 years (range 1-21) were reviewed. One hundred and fifty-nine of them were eligible for hip surveillance. Of 131 radiological assessment done, 40 (30.5%) had hip subluxation (MP more than 30%). Of those with hip subluxation, 60% (24/40) were GMFCS 5. The most common motor phenotype was mixed spasticity and dystonia (35%).

**Conclusion:** Hip subluxation can occur in children with LTNC thus there is a need to develop a hip surveillance programme for this group of children for early detection and intervention.



## Treatment of Meconium Obstruction of Prematurity by Nurse-Administered Saline Enema: A Feasibility Trial

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**Introduction:** Meconium obstruction of prematurity (MOP) is a common cause of neonatal intestinal obstruction in preterm infants. Current interventions namely, contrast enema and laparotomy increase the risk of necrotizing enterocolitis, intestinal perforation and risk posed by general anesthesia. We hypothesized that nurse administered twice daily saline enema is an effective and safe intervention to treat meconium obstruction of prematurity in very low birth weight infants.

**Methodology:** Very low birth weight infants born in a Singapore neonatal intensive care unit, were stratified into 2 birth weight subgroups: 750-999 g and 1000-1500 g. Infants were randomized to receive either twice daily SE (intervention) or glycerin suppository (GS) (control). Standardized protocol were used for accreditation of nurses and administration of SE. Primary outcomes were percentages of saline enema administered by nurses and treatment failure, defined as need for additional intervention. Safety outcomes were evaluated. Data was derived from the secondary analysis of an RCT.

**Results:** Sixty-one infants were randomised; 28 infants were managed with saline enema, and 33 with glycerin suppositories. 73.9% of the saline enema procedures were administered by trained nurses. Mean number of rectal washouts, catheter length and volume of saline administered was 14.5 times, 10.6 cm, 21.4 ml/kg respectively. There was no treatment failure in the saline enema arm, and 2 babies in the control arm were treated with rectal washouts and contrast. None of the patients in the treatment arm developed NEC or sepsis.

**Conclusion:** The treatment of meconium obstruction of prematurity with nurse-administered saline enema had shown to be efficacious and safe.



## Improving Safety for In Vitro Fertilization Patients Receiving Hormonal Injection in KKH Urgent O&G Centre: A New Initiative

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**Introduction:** In vitro fertilization (IVF) is a form of assisted reproduction, which helps to increase chance of pregnancy. In order for the egg to become mature and ready to be released by the ovary for the fertilization process, hormonal injection needs to be administered on a daily basis. In KKH, patients will receive their hormonal injection at IVF centre from Monday to Friday and at Urgent O&G Centre (UOGC) on weekends and public holidays. This poses practical challenges for UOGC nurses as the IVF treatment regime can be complicated and have different formularies of hormonal injection. There were two medication errors reported in UOGC whereby patients received only a partial dose of their hormonal injection, as nurses were unfamiliar with the drug.

**Methodology:** Return demonstration and explanation of different hormonal injection formularies using pictorial guides were used. A competency checklist in preparing and administering the hormonal injection served as an assessment tool affirming the nurses' adherence to standard guideline. Three monthly in-service by IVF nurses was conducted. Incidence of needle stick injury or medication error was monitored.

**Results:** Over a three-month intervention period, 50% of UOGC nurses had sufficiently completed the competency and the ability to administer the hormonal injection efficiently. There was no incidence of needle stick injury or medication error reported.

**Conclusion:** In conclusion, this initiative improves nurses' performance thus improving safety and experience of IVF patients receiving hormonal injection in UOGC.

## KIDS 0-3 (Kids Integrated Development Services) Nurses Role in Providing Antenatal Care and Health Checks during Home Visitation

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**Introduction:** \*KIDS 0-3 (Kids Integrated Development Services) is a preventive early intervention home visitation programme for low income families from pregnancy till child reaches 3 years of age. It aims to ensure that infants born receive universal care and support necessary to minimize adverse social and developmental outcomes while optimizing positive impact on early brain development.

**Methodology:** Pregnant women and infants up to 1 week old from families with per capita income less than \$650 are recruited. Thereafter, nurses conduct home visits based on evidence-based approaches, imparting knowledge and skills on mother craft, breastfeeding techniques, building care-givers' capacity in instilling positive parent-infant interaction, as well as detection of at-risk behaviors and screening for maternal mental health issues. These visits also include blood pressure screening and urine dipstick testing for early detection of preeclampsia and gestational diabetes. When managing these cases, the nurses utilize a trans-disciplinary key worker approach for service delivery when abnormalities are detected for close monitoring and management by the professionals.

**Conclusion:** In KIDS 0-3, nurses conduct home visitations to provide medical screenings, antenatal and postnatal care and education for clients from socioeconomically disadvantaged families. It is hoped that an integration of medical, health and social services using neuroscientific evidence, will allow a new generation of young children to grow up on an equal footing as the rest of the society.

*\*KIDS 0-3 is a pilot program that provides integrated community-based care, aimed at optimizing the developmental potential of children from vulnerable families, starting from pregnancy up to the age of three years. This programme is led by KK Women's and Children's Hospital (KKH) and supported by ECDA.*

## Is There a Correlation Between Scored Blastocyst and its Effect on Clinical Pregnancy Rate in Thawed Cycles?

Lim LZH, Lim CJW, Chan MLH, Tan HH

*KKIVF, Department of Reproductive Medicine, KK Women's and Children's Hospital, Singapore*

**Introduction:** Our centre has moved towards performing single embryo transfers increasingly since 2016. Recently, we have been using a simplified blastocyst scoring system to grade all fresh blastocysts to assess their usability. We aim to review this scoring system for our thawed blastocysts in patients' frozen cycles.

**Methodology:** Data of thaw cycles performed between April 2016 and September 2018 were retrospectively analysed. Cryopreserved blastocysts assessed were created by intra-cytoplasmic sperm injection and vitrified; and subsequently thawed a day before or on the day of ET. Only cycles which had single fully expanded (FE) blastocyst transferred were included (n=378, average age of patients= 34.5 years  $\pm$ 3.6). Frozen blastocysts which survived were rescored – either graded A, B, C or UG (ungraded). The blastocyst grade equivalent by Gardner's classification system of the inner cell mass and trophectoderm is in parentheses- A=(AA),B=(AB/BA/BB) and C=(AC/CA/BC/CB). Respective clinical pregnancy rates (CPR) and miscarriage rates (MR) were evaluated and compared. Data was then subjected to Chi-square test for analysis, with  $p < 0.05$  for significance.

**Results:** Overall CPR/ET was 45.77%(173/378) and MR was 35.84%(62/173). Grade A or B FE blastocyst seemed to give statistically higher CPR compared to others. [FEA vs. FEB vs. FEC vs. FEUG; 69.23%(9/13) vs.64.46%(78/121) vs.32.4%(58/179) vs.43.08%(28/65);  $p=0.00001$ ]. MR for ungraded blastocyst appeared to be the highest as compared to those with grades [FEA vs. FEB vs. FEC vs. FEUG; 44.44%(4/9) vs.26.92%(21/78) vs.41.38%(24/58) vs.46.43%(13/28);  $p=0.16$ , *ns*].

**Conclusion:** There is a correlation between the grade of the thawed blastocysts and their outcome on clinical pregnancy and miscarriage risk after ET.

## A Review on Radiation Exposure to Healthcare Workers from Nuclear Medicine Patients in our Department

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**Introduction:** Patients undergoing a nuclear medicine (NM) scans can be a source of radiation exposure to hospital staff. This review aims to show the amount of radiation and risk to the health care workers including sonographers and ward staff from patients who have undergone NM tests in our department.

**Methodology:** Eight common NM scans using Technetium-99m (Tc-99m) were considered. The administered activity and administration time were recorded. We measured the radiation levels at 10 cm and 50 cm from the patient, immediately post injection and just before the scan was performed (0, 1.5, 4 hours). An Innovision-491 ionization chamber was used for measuring radiation levels from the NM patients. A total of 113 patients (both children and adults) were included in this study.

**Results:** The maximum radiation level at 50cm post injection is approximately 30 $\mu$ Sv/h (MUGA and Bone Scans only) immediately post-injection.

**Conclusion:** The dose limit of exposure per year is 1mSv for members of the public and 20mSv for radiation workers (Radiation Protection Regulations 2000). As the effective half-life of Tc-99m is 4 hours (physical and biological), the radiation emitted from the patients drop rapidly after injection. Furthermore, many of these patients are outpatients. This study therefore shows that the radiation exposure to hospital staff from patients undergoing NM scans in KKH is extremely low, is well within the limits of the Radiation Protection Regulations 2000, and is considered negligible.

## Journey Towards Reducing Multiple Pregnancies: KKIVF's Experience

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**Introduction:** In KKIVF centre, we aim to continuously optimize laboratory culture environment to give patients a better experience and also a chance to bring home a healthy singleton. This is a follow up study to share our journey towards single embryo transfer with the aim of reducing multiple pregnancy and its associated risks.

**Methodology:** This is a retrospective study of patients (n= 1747) who underwent stimulated IVF/ICSI cycles in KKIVF between January 2015 and December 2016. Only patients who underwent Day 2 double embryo transfer (dET), Day 3 dET and Day 5 elective single embryo transfer (eSET) were included in the study. Inclusion criteria for Day 5 eSET (1st cycle: n=164; 2nd cycle: n=28; 3rd cycle: n=6), Age ≤ 36 years with ≥4 good grade embryos, OR previous successful pregnancy. Data was subjected to chi-square test for significance at p-value < 0.05.

**Results:** The clinical pregnancy rate (gestational sac)/ ET was statistically not significant (p=0.101) between Day 2 dET 43.7% (538/1231), Day 3 dET 34.91% (111/318) and Day 5 eSET 45.96% (91/198). However, the twinning rate 22.86% (123/538); 28.83% (32/111); 3.3% (3/91) was significantly reduced (p=0.000016) amongst the groups (dET vs eSET) respectively.

**Conclusion:** With constant optimization of the blastocyst programme in our laboratory, we have been able to achieve consistent good clinical outcomes with Day 5 eSET, and significant reduction in multiple gestations. These results are consistent with our preliminary studies in 2012 and 2014. Henceforth, we have moved our clinical practice to Day 5 eSET with this selected group of patients.

## A Pilot Run Of an Intensive and Structured Social Skills Group for School-Aged Children

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<sup>2</sup> *Occupational Therapy Service, Rehabilitation Centre, KK Women's and Children's Hospital, Singapore*

**Introduction:** Therapists regularly run individual social skills training sessions using materials from the 'We Thinkers! Volume 1 Social Explorers Curriculum' (Social Thinking®). Within these individual sessions, there are limited opportunities for children to apply the skills learnt in natural contexts. To promote application of skills in a naturalistic social environment, a pilot run of an intensive and structured social skills group was conducted with school-aged children.

**Methodology:** Six children with social skills difficulties (aged 7-9) participated in eight weekly, one-hour, social skills group sessions run by an occupational therapist (OT) and a speech therapist (ST). A structured approach was used to teach concepts from the Social Explorers curriculum, with modification from the original teaching manual to suit the cultural context and group duration. The sessions involved direct teaching of concepts from the curriculum's storybooks, group application activities, and parent debrief sessions. When the group concluded, parent feedback was collected via survey forms.

**Results:** Most parents expressed satisfaction with the group administration. They listed down perceived benefits of the group relating to what their child had learnt and strategies acquired through parent debrief sessions. Some parents suggested that they would like to learn more in-depth skills to further promote social participation of their children.

**Conclusion:** The pilot run of this structured social skills group was well-received. It provided opportunities for children to acquire and apply social skills within a naturalistic and safe environment. Future runs of this structured group programme would aim to incorporate suggestions for more intensive parent training components.

## Feeding Interventions for Children with Food Selectivity

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**Introduction:** Children with food selectivity have significant feeding issues with adverse health consequences. According to the biopsychosocial model, physiology, behavioural and social factors contribute to the development of food selectivity. However, research has only focused on direct behavioural treatments. There is increasing evidence that indirect intervention, through parental education, may also be effective in reducing food selectivity. The aim of this study was to evaluate the effectiveness of a caregiver education programme with traditional direct feeding therapy.

**Methodology:** Caregiver-child dyads were randomly allocated to receive either intervention. They attended six weekly intervention sessions. A food variety checklist and the Behavioural Paediatric Feeding Assessment Scale were used to obtain the number of foods accepted by the child and the frequency of maladaptive caregiver strategies used during mealtimes at 3 timepoints: pre-intervention, post-intervention and 3 months post-intervention. The results were analysed using ANOVA.

**Results:** Fourteen dyads completed the study. Prior to the start of intervention, there were no significant differences in age, foods accepted and the frequency of maladaptive caregiver strategies between the two groups. At 3 months post-intervention, children of both groups showed significant improvements in the number of foods accepted (M=66.0), compared with pre-intervention (M=40.3,  $p=0.007$ ). Caregivers also showed a significant reduction in the frequency of maladaptive caregiver strategies (M=24.3), compared with pre-intervention (M=29.2,  $p=0.002$ ). There were no significant group or interaction effects.

**Conclusion:** Both types of intervention appear to be effective in increasing the number of foods accepted and reducing the frequency of maladaptive caregiver strategies during mealtimes.

## Nursing Inservice: Dysphagia Education

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**Introduction:** Quality patient care is achieved through multi-disciplinary collaboration. Speech therapy recommendations on texture and fluid modifications are communicated to and carried out by the nurses in the wards. The Speech Therapy team noted occasional gaps in fulfilling these recommendations despite verbal and written handovers.

**Methodology:** Speech therapist conducted three one-hour sessions of Dysphagia education for ward nurses from Wards 31, 55, 65 and 66 where we received majority of SLT referrals. A total of 41 nurses attended. Nurses' knowledge of dysphagia and work processes was assessed pre and post training.

**Results:** There was an increase in accuracy of answers across all topics assessed on Dysphagia on the post quiz. More Speech Therapy specific terminologies were used (e.g. Easy Chew diet, Safe Swallowing Strategies) in the post session assessment. Nurses were able to understand all work process after the session, including booking of outpatient appointments post discharge and actions to take post blue-dye test. The nurses were also appreciative of the knowledge shared during the session.

**Conclusion:** The sessions improved dysphagia knowledge and communicated pertinent work processes to nurses. With better understanding, we can provide high quality patient care.

## Evaluation of a Clinic-Based Social Communication Group through Caregiver Perspectives

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**Introduction:** Children with neurodevelopmental disorders (particularly Autism Spectrum Disorder) are known to have inadequate Social Communication (SC) skills to manage daily social contexts from childhood to adulthood. Past research has found that group intervention with caregiver components can directly improve participants' SC skills and caregivers' own perceived competence. Prior to the SC group creation, children received individual sessions with a Speech Therapist for their SC difficulties. This was insufficient for generalisation with peers so an 8-week SC group was created in response to this need. This study aims to evaluate the SC group by examining caregiver perspectives.

**Methodology:** Caregiver evaluation forms (n=26) from five runs (2016-2018) of the SC group were retrospectively analysed. The return rate of the forms was 86%. Caregivers were asked to rate statements on a 5-point Likert Scale relating to (1) perceived changes in their children; (2) how the group has empowered them and reduced their stress levels.

**Results:** More than 90% of the respondents agreed/strongly agreed that the group made them more confident in managing their children's behaviour and that they felt more equipped to help their children in the development of their SC skills. 65% reported reduced stress levels.

**Conclusion:** This study demonstrates that the SC group does increase caregivers' own perceived abilities and the percentage who had reduced stress may not be so high but still more than half had reduced stress. Given that caregivers play a critical role in their children's SC development, it is important to evaluate SC groups through caregiver perspectives.

## Reclassifying Atypical Urine Cytology Using the New Paris System: A Single Institutional Experience

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**Introduction:** To reclassify abnormal urine cytology using The Paris System (TPS) with an aim of reducing the rate of AUC (Atypical urothelial cells) for better clinical management. TPS uses the following diagnostic categories of Class 1-Nondiagnostic/Unsatisfactory, Class 2-Negative for high-grade urothelial carcinoma (NHGUC), Class 3-Atypical urothelial cells (AUC), Class 4-Suspicious for high-grade urothelial carcinoma (SHGUC), Class 5-High-grade urothelial carcinoma (HGUC), Class 6-Low-grade urothelial neoplasm (LGUN), Class 7-Other: primary and secondary malignancies and miscellaneous lesions.

**Methodology:** All voided and catheterised urine cases for a period of 1 year from January – Dec 2016 were identified from the pathology database. A total of 24 urine cases which had been previously reported as atypical urothelial cells by the pathologists were suitable to be included. There were blinded and circulated to the participating 7 pathologists and 7 cytotechnologists who were asked to classify these based on TPS.

**Results:** Twenty-four cases were reclassified using TPS as: 1 (4%) inadequate, 16 (67%) as NHGUC and 7 (29%) cases as AUC comprising only (1%) of our total urine samples received in 2016 as compared to 8% in two consecutive years 2014 and 2015 which signifies a significant reduction. The concordance rate amongst the reviewers for the AUS category was 49%.

**Conclusion:** TPS of classification of urine cytology is better to stratify urine into clinically relevant categories which have management implications.

## Comparison of MRIs Done at 1.5T and 3T

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**Introduction:** In KKH, patients can be scanned on either of our 2 MRI scanners (1.5T GE, 3T Siemens) during follow up. We wish to assess if the images acquired from the scanners are comparable.

**Methodology:** MRI scan was conducted in the same human volunteer with both MRI scanners using 3 sequences of the standard brain protocol. Volunteer was scanned 3 times on each scanner 1 week apart. The right to left caudate signal on each axial sequence, geometric measurement of the distance between the anterior aspects of frontal horns on each sequence were tabulated.

**Results:** For the 1.5T GE scanner, the right to left caudate signal on T2 FSE is 1.031 +/- 0.025, on T2 BLADE is 1.017 +/- 0.005, on DWI is 1.02 +/- 0.029. For 3T Siemens scanner, the right to left caudate signal on T2 FSE is 1.076 +/- 0.005, on T2 BLADE is 0.857 +/- 0.079, on DWI is 0.977 +/- 0.016. For the 1.5T GE scanner, the distance between frontal horns on T2 FSE is 3.093 +/- 0.099 cm, T2 BLADE is 3.093 +/- 0.099 cm, on DWI is 3.413 +/- 0.189 cm. For 3T Siemens scanner, the distance between frontal horns on T2 FSE is 3.025 +/- 0.065 cm, on T2 BLADE is 3.063 +/- 0.076 cm, on DWI is 3.427 +/- 0.094 cm. The differences between geometric measurements and caudate ratios on the different scanners are not statistically significant ( $p > 0.05$ ).

**Conclusion:** Geometric and ratios values from T2 MRI sequence on both scanners are comparable.



## Survey on Readiness for Telehealth in Patients with Gestational Diabetes at KK Women's and Children's Hospital

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**Introduction:** Default rate for nutrition counselling in our gestational diabetes mellitus (GDM) patients is high (24%). Telehealth may provide an alternate mode for delivering nutritional counselling; however, little is known about the corresponding readiness of our patients. We aimed to explore the readiness for telehealth in GDM patients at our hospital.

**Methodology:** GDM patients referred for nutrition counselling between October 2018 and December 2018 were invited to participate in an online anonymous survey on four key aspects of readiness: availability of technology, confidence in technology, attitudes towards telehealth and interest in telehealth. A summary score was given for each aspect (higher scores indicating greater magnitude) and statistical analyses were conducted to identify possible relationships between the various themes.

**Results:** Eighty-four responses were collected. Smartphone (90.5%), internet access (77.4%) and email (73.8%) were the three most commonly available modes of technology. Confidence in using technology was high (median score=1.88, range 0-2). Perceived advantages were high (median=3.00, range 0-4) while perceived disadvantages were moderate (median=2.00, range 0-4). Participants were moderately interested in using telehealth (median=1.00, range 0-2). Age, education level and employment status did not affect interest for telehealth. Greater confidence with using technology was associated with higher interest in telehealth ( $r=0.40$ ,  $p < 0.001$ ), whereas greater perceived disadvantages of telehealth was associated with lower interest ( $r=-0.35$ ,  $p=0.001$ ).

**Conclusion:** Overall, socio-demographics did not seem to affect readiness for telehealth. Patients were moderately interested in using telehealth for nutrition counselling. Addressing perceived disadvantages of telehealth and utilizing readily available technologies may increase interest of telehealth in our patients.

## Resilience in Children and Adolescents with Psychosomatic Symptoms: A Pilot Project

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**Introduction:** Resilience in Children and Adolescents with Psychosomatic Symptoms (RECAP) is a pilot project run by clinical counsellors (CC) and psychiatrists from the Child and Adolescent Mental Wellness Service (CAMWS) to provide timely outpatient assessment and intervention for suitable cases. RECAP aims to address the following service issues: (1) Need for uniformity in initial assessments and clarity of clinical roles in treating psychosomatic conditions, (2) Repeated admissions and presentations at various KKH departments thereby increasing healthcare costs and utilisation of medical care. Using Cognitive Behavioural Therapy (CBT) informed by the biopsychosocial framework, we seek to address children's barriers to function by tailoring coping strategies to patient-specific stressors.

**Methodology:** Patients between the ages of 5 to 18 years old are screened and referred by CAMWS clinicians and Psychology Service. Suitability of patients is assessed based on severity of psychosomatic symptoms and caregivers' willingness to participate in the programme. Programme structure consists of: (1) One initial assessment conducted by psychiatrist and CC, (2) Five counselling sessions conducted by CC, and (3) Monthly multi-disciplinary case discussions. Outcome measures used include: (1) Perceived Stress Scale, and (2) Children's Somatisation Inventory.

**Results:** Preliminary results from analysis of outcome measures show that more than 70% of patients who have completed the programme report reduction in symptoms and improved stress management.

**Conclusion:** We aim to present more complete findings in due time but preliminary findings are encouraging in suggesting that timely intervention is helpful in somatic symptoms reduction. We will continue to enhance our programme based on feedback gathered from clinicians and relevant stakeholders.

## Parents' Perception of a Pilot Self-Regulation Group Intervention for Kindergarten-2 Children

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**Introduction:** Self-regulation is important for enabling success in school. Group interventions with children for self-regulation issues provide a setting that approximates children's natural social environments (e.g. classrooms), and increase opportunities for practice of skills learnt. This study's aim is to examine parents' perception of the effectiveness of a pilot group intervention for Kindergarten-2 children with self-regulation difficulties.

**Methodology:** A seven-weekly 1.5-hour session group intervention was developed based on concepts from the "Zones of Regulation" (Kuypers, 2011). The session was conducted by two occupational therapists with six children. Parents observed through live video-feed and discussed application of knowledge and skills taught in their daily interactions with child, within a 10-15 minute debrief with the therapists. Parents completed an in-house developed survey at the final session. A five-point Likert scale (Range: strongly agree – strongly disagree) and open-ended questions were used to gather parents' perception of the group. Two groups were conducted and data collected from 12 parents.

**Results:** Ten parents agreed that the group met their goals (e.g. improved child's self-awareness). Nine parents agreed that they were competent in reinforcing each specific concept taught to their child, but only four parents agreed that they could help their child know when to use the skills. More than half agreed that their children acquired ability to identify a range of emotions and categorize into various zones ( $n \geq 9$ ), and perspective-taking skills ( $n=7$ ).

**Conclusion:** These results provide preliminary support for a self-regulation group intervention, and identified areas of improvement. Further research is necessary to provide stronger support for its effectiveness.

## Supporting Resilience and Empowering Mums (SURE MUMS): A Home-Based Mother-Infant Bonding Pilot Programme

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**Introduction:** Maternal mental health is closely related to bonding between mother and child. Postnatal depression and anxiety disorders could adversely affect mother-child bonding, or vice versa. From international studies on parent-child bonding and early childhood development, we know that early experiences can have long term consequences on the child's psychological development, relationships and mental health in later life. A pilot programme, titled "Supporting Resilience and Empowering Mums (SURE MUMS)" was hence implemented to provide home-based psychological support and mother-infant bonding interventions. With support from the Singhealth-ACP Clinical Innovation Fund, we were able to provide up to five home-based sessions for each mother free of charge.

**Methodology:** Twenty-six mothers were identified from the clinic population seeking treatment for postnatal mood difficulties at KK Women's and Children's Hospital (KKH). They were noted to have depressive and/or anxiety symptoms, together with bonding difficulties. Outcome measures were taken at the start and end of the treatment programme, namely the Global Assessment of Functioning (GAF), Edinburgh Postnatal Depression Scale (EPDS) and Postpartum Bonding Questionnaire (PBQ). A semi-structured interview was also done with the mothers at the end of the programme to understand how they experienced the interventions.

**Results:** Twenty mothers completed the intervention programme. 14/19 (74%) of the mothers showed clear improvements in their outcome measures, with respect to their mood symptoms, bonding measures and functioning level. Themes from qualitative data were discussed.

**Conclusion:** The SURE MUMS programme can potentially help mothers improve bonding with their babies, especially when sessions are held at the convenience of their homes.

## Determine if Game Exposing Children to What is Required During Ultrasound Improves Child's Cooperativeness

Aw EJE, Tang PH

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**Introduction:** Determine if game exposing children to what is required of them during ultrasound improves child's cooperativeness. Game allows child to press buttons to assist an animal undergo ultrasound scan (lie down, have gel on tummy, lift arms, hold breath etc).

**Methodology:** Outpatient children coming for paediatric ultrasound during office hours from April to July 2019 were captured in this Institution Review Board approved project. Children's demographics and whether they were co-operative during the scan were scored by sonographers using Houpt and Ohio State University Behavioural Scale.

**Results:** Thirty outpatient children consisting of 16 males and 14 females, ranging from 3 to 16 years old (average age 9 years) were shown ultrasound game during this period. There were 23 Chinese, 3 Malays, and 3 Indians, the rest of foreign nationality. These 30 children scored 5.6 +/- 0.8 on Houpt scale and 1.3 +/- 0.7 on Ohio State University Behavioural Scale. We compared them against 102 aged matched control children aged 3 to 16 years from our previous survey who were not exposed to the games who scored 5.7 +/- 0.6 on Houpt scale and 1.4 +/- 0.9 on Ohio State University Behavioural Scale. There is no significant difference in the Houpt scale ( $p=0.6$ ) and Ohio State University Behavioural Scale ( $p=0.4$ ) between the children exposed to the game compared to those not exposed to the game.

**Conclusion:** The co-operativeness of children shown a game before their ultrasound does not differ significantly from controls not exposed to the game.



## Does Only The Stage Matters? Influence of a Blastocyst Scoring System on Clinical Pregnancy Outcome with Fresh SET: A Preliminary Study

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*KKIVF, Department of Reproductive Medicine, KK Women's and Children's Hospital, Singapore*

**Introduction:** This retrospective study aims to review our centre's pilot scoring system for blastocyst for transfer on Day 5.

**Methodology:** Data of 279 patients with fresh ICSI cycle and single embryo transfer (SET) on Day 5 done between April 2016 and August 2017 were analysed. Rates of clinical pregnancy (CPR), multiple pregnancy and miscarriage were investigated. Data were classified into stage and grade of blastocyst transferred respectively as: Fully Expanded (FE), Early Expanded (EE), Early Blastocyst (EBL); A,B,C and Pseudo(P-; with at least 20% excluded blastomeres from the formation of blastocyst) and subjected to Chi-square test for significance,  $p < 0.05$ .

**Results:** Expanded blastocysts contributed higher CPR [FE vs EE vs EBL; 47.44% (74/156) vs. 44.9% (22/49) vs. 21.31% (13/61);  $p = 0.0016$ , sig]. CPR between transferring an EE and a FE showed no difference [EE vs. FE; 44.90% (22/49) vs. 47.44% (74/156);  $p = 0.756$ , ns]. FEA/FEB appeared to give a superior CPR over FEC or PFE [FEA vs. FEB vs. FEC vs. PFE; 47.22%(17/36) vs. 48.89%(44/90) vs. 43.48%(10/23) vs. 42.86%(3/7);  $p = 0.963$ , ns]. Trend was similarly observed if single EE transferred. Graded C or PBL led to the highest miscarriage rate [FEA vs. FEB vs FEC vs PFE; 5.88%(1/17) vs. 22.73%(10/44) vs. 30.00%(3/10) vs. 33.33%(1/3);  $p = 0.355$ , ns; EEA vs. EEB vs. EEC vs. PEE; 16.67%(1/6) vs. 27.27%(3/11) vs. 33.33%(1/3) vs. 50.00%(1/2);  $p = 0.82$ , ns; EBL vs. PBL; 20.00%(2/10) vs. 33.33%(1/3);  $p = 0.63$ , ns].

**Conclusion:** Stage of blastocyst development on Day 5 is a main determinant to achieving a pregnancy while the blastocyst is graded usable with a visible ICM.

## Comparison of Manual versus Automated Measurement on T2 Weighted MRI Images Using TEXRAD Software

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**Introduction:** In our previous study, entropy values of normal brain tissue generated with TEXRAD showed least variability. However, the manual drawing of region of interest (ROI) is time consuming. In this study, we compared manual versus automated ROI for entropy values of normal brain and tumor on T2 weighted MRI images.

**Methodology:** MRI images of 10 paediatric patients with brain tumors had entropy values generated using manual and automated ROIs. The first method was done by outlining the region of interest manually on each MRI slice. The second method was achieved by drawing a region of interest on the first image slice and propagating to all of the following image slices. Manual and automated values were then compared using paired t test.

**Results:** Entropy at SSF 0 was 4.59 +/- 0.39 for normal right brain with manual ROI, 4.62 +/- 0.47 for normal right brain with automated ROI, 4.56 +/- 0.30 for normal left brain with manual ROI, 4.65 +/- 0.41 for normal left brain with automated ROI, 5.91 +/- 0.639 for tumor with manual ROI, 5.18 +/- 0.642 for tumor with automated ROI. There is no significant difference between entropy values for normal brain using the manual and automated ROI methods ( $p = 0.118$ ) but there is significant difference between entropy values for tumor using the manual and automated ROI methods ( $P < 0.001$ ).

**Conclusion:** In this study, manual and automated ROI methods result in significantly different entropy values for the tumour tissue.

## Cooperativeness of Children Undergoing Ultrasound is Related to Age of Child

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**Introduction:** Determine which children coming for ultrasound are uncooperative.

**Methodology:** Details of children coming for paediatric ultrasound during office hours from March to April 2019 were captured in this project. Children's demographics and cooperative during the scan were scored by sonographers using Houpt and Ohio State University Behavioural Scales.

**Results:** One hundred ninety seven children consisting of 94 males and 103 females, ranging from 0 days old to 16 years old were seen during this period. There were 129 Chinese, 28 Malays, and 22 Indians, the rest of foreign nationality. There were 65 inpatients and 132 outpatients. Of the 197 Children, 0 scored 1, 0 scored 2, 11 scored 3, 47 scored 4, 50 scored 5 and 89 scored 6 on the Houpt scale. On the Ohio State University Behavioural Scale, 96 scored 1, 20 scored 2, 46 scored 3 and 35 scored 4. Plotting the scores with respect to age, children less than 5 are seen to be more uncooperative, scoring 4.6 +/- 0.9 on Houpt scale and 2.7 +/- 1.1 on Ohio State University Behavioural Scale compared to those 5 years and older (scoring 5.8 +/- 0.5 on Houpt scale and 1.2 +/- 0.6 on Ohio State University Behavioural Scale) ( $P < 0.01$  for both scales). There is an inverse relationship between Houpt and Ohio State University Behavioural Scales with cooperative children scoring higher on Houpt scale and having lower scores on Ohio State University Behavioural Scale.

**Conclusion:** Children less than 5 years old are more uncooperative.

## A Routine-Based Approach and Treatment Outcomes for Clinic-Based Occupational Therapy with Children with Developmental Difficulties: A Preliminary Study

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**Introduction:** The Routines-Based Interview shows evidence to provide interventionist with a structure to connect with families and develop intervention meaningful to their environment context. As the two hour RBI protocol is unfeasible in outpatient setting, it was adapted into a routine-based approach (RBA). It involved parental interviews, collaboratively setting functional goals, and embedment of intervention into home routines. This paper examines the use of RBA to improve home program implementation and the impact on family outcomes in clinic-based therapy.

**Methodology:** Children aged two to six, with developmental difficulties received an average of five Occupational therapy (OT) sessions over two months. Data were collected from 13 children of which six children in the control group underwent OT without use of RBA, and seven children in the intervention group who received RBA. Parents completed the Family Outcomes Survey (FOS) and the Canadian Occupational Performance Measure (COPM) in the first and last session.

**Results:** On the FOS, parents in the intervention group reported statistically significant differences in overall parents' perception on the helpfulness of early intervention ( $p < 0.05$ ). 12 out of 13 parents reported a change of two or more points in their COPM scores, which is clinically significant. Parents in the intervention group were able to collaborate with the OT to achieve two therapy goals instead of one in the control group.

**Conclusion:** This is the first known local study to investigate the outcome of using a routine based approach in outpatient, clinic-based pediatric Occupational therapy. These promising results warrant further investigation.

## Scatter Radion from Chest Radiographs: Is There a Risk to Neighbouring Infants in the Neonatal Intensive Care Unit (NICU)

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**Introduction:** In NICU, infants may require numerous chest X-Ray (CXR) for a central venous catheter (CVC) insertion. Portable radiographers routinely perform a post-procedure CXR to confirm the tip of the catheter. Repeat attempts of CXRs are carried out, upon request by the physician, until the tip of catheter is at its rightful position. Our objective is to evaluate the scatter radiation (resulted from these CXRs) to the infants in the room in order to determine a safe distance between them.

**Methodology:** We conducted multiple CXRs on a phantom, to simulate the actual radiography performed during a CVC procedure. The CXRs were made with the Philips MobileDiagnost wDR unit in the Antero-Posterior (AP) projection; the X-Ray beam was directed perpendicular to the floor and the dose meters were placed adjacent to the cot. Perspex blocks equivalent of 10 cm thickness was used to simulate the size of the infant and routine CXR exposure parameters (62kVp, 1mAs at 100cm SID) were used. Electronic personal dose (EPD) meters were employed for measurement of radiation levels at various distances of 1m, 1.5m, and 2m. A sizable number of EPD were set aside for background radiation measurement.

**Results:** Radiation levels measured are as follows:- 0.5  $\mu$ Sv at 1 metre; 0.3  $\mu$ Sv at 1.5 metre and 0.1 $\mu$ Sv at 2 metre. Background radiation levels measured at 0.1 $\mu$ Sv.

**Conclusion:** Our project concluded that current practice causes no harm to the neighboring cots who are at least 2m apart, even though multiple CXRs were performed.

## Carbohydrate Content of Tablet Forms of Medications and Supplements Affect Ketogenic Diet Ratios for Patients on Ketogenic Diet for Epilepsy

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**Introduction:** The effect of carbohydrates (CHO) from medications and supplements on the ketogenic diet (KD) ratios of patients on the classical KD for epilepsy has traditionally been minimized by changing from syrups to tablets. Our audit aims to illustrate that even tablet forms of medications and supplements can significantly affect KD ratios.

**Methodology:** Retrospective audit of four patients on the classical KD from 2013. Only patients on full enteral tube feeding and with at least 50% seizure reduction (treatment responsive) were included. As our clinical practice is to include CHO from medications and supplements into our KD calculations, we calculated the effect of excluding this on the overall, as well as the per feed KD ratio

**Results:** (i) Patient A achieved 90% seizure reduction on 5:1 diet. Excluding CHO from medications would change the overall ratio to 4.5:1 (per feed 3.7-5:1), (ii) Patient B achieved 90% seizure reduction on 3.8:1 diet. This would have changed to 3.7:1 (per feed 3.6-3.8:1), (iii) Patient C achieved 50-90% seizure reduction on 4:1 diet. This would have changed to 3.8:1 (per feed 3.3-4:1), (iv) Patient D was seizure-free on 4:1 diet. This would have changed to 3.7:1 (per feed 3.4-4:1)

**Conclusion:** Our audit shows that CHO content of tablet medications can affect the KD ratio of feeds significantly. 3 out of our 4 patients had 90% or more reduction in seizures. Hence accounting for CHO in tablet forms of medications and supplements is an important aspect of fine-tuning the KD for optimal effect

## Evaluation of Urine Ovulation Kits for Point of Care Testing

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**Introduction:** Detecting ovulation in advance is important for women seeking pregnancy. Prior to ovulation, the body produces a large amount of luteinizing hormone (LH) which triggers the release of a ripened egg from the ovary. Urine ovulation kits are commonly used to detect the presence of LH in urine. In this study, we aimed to evaluate the performance of five different urine ovulation kits i.e. Abon, Fortel, Ascen and Artron 113 and Artron 130.

**Methodology:** A total of fifty female patient urine and blood samples were collected. The urine samples were tested with the different urine ovulation kits by the nurses, admin staff and doctors. A scoring matrix was used to assess the ease of use and ease of reading of the test kit results. The blood samples were tested for serum LH in the laboratory.

**Results:** The results from both Artron 113 and 130 test kits were 96% concordance with Clearblue ovulation kit. Clearblue concordance results for Fortel, Abon and Ascen test kits were 88%, 84% and 66% respectively. The results from both Artron 113 and 130 were 94% concordance with serum LH tests. Serum LH concordance results for Fortel, Abon and Ascen kits were 86%, 82% and 68% respectively. From the staff assessment, Artron 113 kit was the easiest to read while Abon test kit was the easiest to use.

**Conclusion:** All the five different urine ovulation kits were evaluated. Artron 113 was shown to have the best overall performance.

## The Effect of Ankle-Foot Orthoses on Gait Parameters of Spastic Diplegic Cerebral Palsy: A Literature Review

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**Introduction:** There are many varying opinions on the type, design, and effectiveness of ankle-foot orthoses (AFOs) suitable in treating cerebral palsy (CP). The aim is to identify what current evidences delineate the effects of ankle-foot orthoses on children with spastic diplegic cerebral palsy.

**Methodology:** Search was done through the platforms of Ovid, ProQuest, and Ebscohost. The research questions were classified into five categories based on *energy expenditure, temporal spatial parameters, joint kinematics, kinetics and passive dorsiflexion angles*. A total of 13 studies were analysed.

**Results:** Majority of the studies report a decrease in energy expenditure and ankle power generation with AFOs. An increase in velocity and dorsiflexion using AFOs was also reported. No significant results for proximal joint kinematics and kinetics were reported. Only one study reported on improvements in the passive dorsiflexion range of motion.

**Conclusion:** Overall, the quality of evidence for AFO management is very poor. Despite the information outlined at the 2008 International Society for Prosthetics and Orthotics (ISPO) consensus conference on CP, AFOs are still not properly prescribed and applied. This review reiterates that there is a need for more detailed research with careful and accurate application of proper orthotic knowledge to establish its evidence base.

## Prenatal Chromosomal Microarray (CMA) Experience of the Cytogenetics Laboratory at KK Women's and Children's Hospital

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**Introduction:** In the prenatal settings, CMA is equivalent with karyotyping for detecting aneuploidy and unbalanced rearrangements. It offers additional diagnostic benefits by revealing copy number changes (CNVs) too small to be seen on a standard karyotype. About 6.5% of pregnancies with an abnormal ultrasound detected will have a significant clinical finding on CMA after a normal karyotype. We share our experience with prenatal CMA since its launch in October 2018.

**Methodology:** Prenatal amniotic fluid samples were extracted using a modified protocol from Puregene Cell Kit. CMA using Affymetrix CytoScan™ 750K Array Kit was performed on the prenatal samples. Analysis is done using Chromosome Analysis Suite 3.2 (ChAS) software. Standard G-band analysis using Ikaros (Metasystems) was done for specimens with karyotyping requests.

**Results:** Out of 112 samples analyzed, 101 showed a normal result, three (2.7%) had pathogenic findings and eight (7.1%) showed variants of uncertain significance (VOUS). All these findings were confirmed with fluorescent in-situ hybridization (FISH) or karyotype.

**Conclusion:** CMA was able to detect a clinically significant copy number change that could have been missed if karyotyping alone was done. Some CNVs are associated with clinical sequelae. Others may be benign or associated with a spectrum of clinical phenotypes that may range from benign to severe, or their clinical significance may simply be unknown. This may lead to clinical and ethical dilemmas. Pre-test counselling is essential and warranted to address the benefits, limitations and diagnostic scope of CMA.

## Validation of Criteria for Extraction of Pediatric Anticonvulsant Prescription Data from the Cluster Data Repository eHints

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**Introduction:** Pharmacogenetic testing for carbamazepine has been implemented in Singapore for several years and its effect on trends of new anticonvulsant prescriptions can offer insights into its implementation. Manual curation of prescription data can ensure a high level of accuracy for meaningful analysis but is resource intensive. The aim of this study was to validate the filtering criteria for extracting prescription data from the SingHealth cluster data repository eHints.

**Methodology:** Dispensing records for anticonvulsants from KKH in 2005 – 2015 were extracted from the pharmacy dispensing system MaxCare and manually curated. A pharmacist edited missing specialties and excluded prescriptions from external doctors or patients, women specialties, staff or pet prescriptions, prescriptions for routes other than oral, for indications other than epilepsy or with insufficient information about indication, and for patients aged >21 years old. Dispensing data was also extracted from eHints using the same date range, drug list, excluded specialties, prescription type (external and staff) and age criteria. For both datasets, the first prescription of each anticonvulsant was tabulated by year from 2006 – 2015 and compared.

**Results:** The total number of new anticonvulsant prescriptions from 2006 – 2015 obtained from manual curation and eHints extraction were 5553 and 5748, respectively. When analyzed by drug and year, the median % error was 0% (range: -37.5% to 72.7%). Aggregated over the 10 years, most drugs had very low error rates (within ±2%), except for phenobarbitone (29.7%), clonazepam (9.7%) and lamotrigine (-6.6%).

**Conclusion:** Extraction from eHints using the broad filters provided relatively accurate prescription data for anticonvulsants in KKH.

## Genetic Screening Processor (GSP™): Validation of a Multiplex Platform for Newborn Screening

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**Introduction:** The Genetic Screening Processor (GSP™) is a fully automated, high throughput analyzer capable of testing for a wide range of potentially life-threatening conditions in newborn babies using PerkinElmer's dried blood spot assays on a single platform. In this abstract we report our validation of the instrument for the neonatal screening of congenital adrenal hyperplasia (CAH), cystic fibrosis (CF), biotinidase (BIOT) and galactosaemia (TGAL) as part of our test expansion in the Newborn Screening panel.

**Methodology:** Validations were performed using GSP model 2021 instrument and the respective reagent kits from PerkinElmer, Turku, Finland: GSP Neonatal 17-OH-progesterone kit, GSP Neonatal TGAL kit, GSP Neonatal IRT kit and GSP Neonatal Biotinidase kit. Linearity studies were performed with 6 levels of the following calibrators: 17-OH-progesterone (0-300 nmol/L blood), Immunoreactive trypsinogen (IRT, 0-500 ng/mL blood), Total galactose (28-2800 µmol/L blood) and Biotinidase activity (10-325 U/dL blood). Recovery, intra- and inter- CVs were performed with controls at up to 3 levels each for the assays.

**Results:** Linearity studies showed good coefficient of linear regression ( $r^2$ ) for the assays: 17-OH-progesterone ( $r^2=1.000$ ), total galactose ( $r^2=0.999$ ), biotinidase activity ( $r^2=1.000$ ) and IRT ( $r^2=0.999$ ). Recovery studies from dried blood spots for the 4 assays ranged from 97-100%. Intra and inter- day assays (n=20) for all the 4 assays were within 5-10%.

**Conclusion:** The GSP instrument demonstrated good linearity, recovery and method precision. Validation using normal controls, proficiency and blinded anonymized affected patient samples are continuing.

## A Second Tier Dried Blood Spot Test for Congenital Adrenal Hyperplasia (CAH) using Liquid Chromatography-Tandem Mass Spectrometry (LC-MS/MS)

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**Introduction:** Congenital adrenal hyperplasia (CAH) is mainly caused by 21-hydroxylase deficiency, one of several defects in steroids biosynthesis, resulting in an increase of 17 $\alpha$ -hydroxyprogesterone (17-OHP) and decrease levels of glucocorticoids and mineral-corticoids. These hormonal imbalances can lead to life-threatening salt-wasting crisis and incorrect gender assignments of virilized individuals. High false-positive rates often occur in the measurement of 17-OHP by conventional immunoassay in newborn screening. To increase the specificity of CAH screening, we adapted and developed a quantitative LC-MS/MS method to measure 17-OHP in newborn dried blood spots. Here we report our preliminary findings.

**Methodology:** A 3200 ABI MS/MS equipped with a Liquid chromatography (LC) column (C18, 100mm x 2.1mm (id)) was used to separate the steroid compounds. The MS/MS ramp parameters of 17-OHP, 11-deoxycortisol, androstenedione and cortisol were optimized and their MRM transitions assigned.

**Results:** Each compound can be accurately identified by their LC retention time and MRM transition, and quantitated. The linearity of each of the 4 compounds was evaluated through the analysis of 6-level calibrators ranging in concentrations from 0.1 to 13 µg/L. The slope and coefficient of linear regression ( $r^2$ ) of each compound is as follows: androstenedione: slope 0.42;  $r^2$  0.966, cortisol: slope 0.03;  $r^2$  0.999, 11-deoxycortisol: slope 0.67;  $r^2$  0.987 and 17-OHP: slope 0.42;  $r^2$  0.972. Initial intra-assay CVs for 17-OHP range from 10-20%. The limit of quantitation is 0.5 µg/L.

**Conclusion:** The preliminary results demonstrated good linearity and method precision. Further work is being performed with dried blood spot samples from controls and CAH patients.

## Integrated Prenatal Screening and Diagnostic Workflow in KKH

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**Introduction:** The addition of prenatal chromosomal microarray analysis (CMA) into KKH's prenatal screening and diagnostic workflow offers diagnostic benefits to our patients. We present two patients' journeys through this workflow.

**Methodology:** In KKH, pre-test counselling is given to all patients considering prenatal screening and diagnosis. All patients are offered combined first trimester screening (cFTS). Low-risk patients are followed up with mid-trimester structural scans. Invasive testing is offered to patients with very high risk, while high-risk (HR) patients are offered invasive or non-invasive prenatal testing (NIPT). Patients <20 weeks gestation are offered quantitative fluorescent polymerase chain reaction (QF-PCR) for detecting common aneuploidies. Aneuploidy detected is further confirmed by karyotyping, otherwise prenatal CMA is done. Copy number variants (CNVs) associated with known microdeletion/microduplication syndromes are confirmed by fluorescent in-situ hybridisation (FISH) analysis on metaphases if possible. Post-test support is managed by our multi-disciplinary team.

**Results:** Patient 1 is HR for NIPT (Triple X) and FTS (Trisomy 21,13&18). QF-PCR results were normal and CMA showed a female profile with no CNV detected. Karyotyping on five metaphases showed 46,XX. Patient 2 has intrauterine growth restriction and aberrant right subclavian artery was detected through ultrasound. QF-PCR results were normal. CMA showed a female profile with no CN changes associated with aneuploidy. However, a CN gain of 1.295 Mb at 22q11.23 was identified and is of uncertain clinical significance.

**Conclusion:** The addition of CMA to the prenatal workflow together with appropriate genetic counselling, helps to improve patient outcomes with early postnatal intervention.

## Utilisation of the Oncoscan Microarray Assay in Medulloblastoma

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**Introduction:** Medulloblastoma is classified into four subgroups (WNT, SHH, Groups 3 and 4) on the basis of transcriptional signatures that define clinically relevant patient subsets. However, substantial biological heterogeneity exists within each subgroup. A refined classification system identifies new subtypes within each subgroup. These subtypes have copy number aberrations (CNAs) that are not reliably detectable by sequencing platforms. The aim of this study was to determine the value of chromosomal microarray (CMA) for subtyping medulloblastoma.

**Methodology:** CMA was performed using ThermoFisher Oncoscan FFPE assay on twenty-four medulloblastomas comprising four WNT, four SHH, seven Group 3 and nine Group 4 tumours. Data analysis was performed using ThermoFisher Chromosome Analysis Suite (ChAS) 3.2 software and whole chromosome gains and losses, copy number aberrations (deletions and duplications) and loss of heterozygosity (LOH) events were determined.

**Results:** All four WNT tumours showed loss of chromosome 6 which is characteristic of WNT- $\alpha$  subtype. One of four SHH tumours showed GLI2 amplification with i(17q) consistent with SHH- $\alpha$  subtype. One out of seven Group 3 tumours showed MYC amplification with i(17q) characteristic of Group 3- $\gamma$  subtype. Five of seven Group 3 tumours showed gain in chromosome 8, often found in Group 3- $\gamma$  subtype. Seven out of nine Group 4 tumours showed i(17q) which is found in all three subtypes of Group 4 tumour. Two out of nine Group 4 tumours showed 8p-, often found in subtype Group 4- $\alpha/\gamma$ .

**Conclusion:** CMA showed the potential to further subtype medulloblastoma in their respective subgroups. This can improve disease risk-stratification and influence treatment decisions.

## Utilisation of the Oncoscan Microarray Assay in Neuroblastoma Tumours

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**Introduction:** Neuroblastoma is the most common extracranial solid tumour in children. Certain cytogenetic alterations have prognostic significance, including *MYCN* amplification, ploidy and segmental chromosomal aberrations (especially 1p and 11q). The traditional method of assessing these alterations is Fluorescent *in-situ* Hybridisation (FISH). In this study, we aim to determine if Chromosomal Microarray Analysis (CMA) using Formalin-Fixed Paraffin Embedded (FFPE) tumours is comparable with FISH.

**Methodology:** CMA was performed using ThermoFisher Oncoscan FFPE assay on twenty anonymised neuroblastoma tumours previously characterised with FISH for *MYCN*, chromosome 1p and 11q (or 17q) status. Data analysis was performed using ThermoFisher Chromosome Analysis Suite (ChAS) 3.2 software and whole chromosome gains and losses, copy number aberrations (deletions and duplications) and loss of heterozygosity (LOH) events were determined.

**Results:** We found complete concordance between CMA and FISH results for *MYCN*, 1p and 11q (or 17q) status for eighteen tumours. Of the two non-concordant cases, one was due to sampling differences and the other due to low tumour load not picked up by CMA. We found whole chromosome 11 LOH in one case shown not to be deleted for 11q. We also found two triploid (3N) tumours by CMA.

**Conclusion:** The result obtained from this CMA study is concordant with previous FISH analysis and has the potential to unravel additional clinically significant CNAs. CMA is more accurate than FISH in estimating ploidy status. We conclude that CMA is a reliable assay to assess neuroblastoma tumours for genome-wide copy number aberrations (CNAs) and LOHs.

## Reducing Sequencing Artifacts by Applying Uracil-DNA Glycosylase to DNA from Formalin-Fixed and Paraffin-Embedded Tissue in High-Throughput Sequencing

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**Introduction:** Uracil (U) lesions, often caused by deamination of cytosine (C) base, are present in low abundance in DNA from formalin-fixed and paraffin-embedded (FFPE) tissue. These lesions are converted to thymine bases (T) during PCR amplification, causing C>T or G>A sequencing artifacts in the high-throughput sequencing that may lead to false positive results. Here, we demonstrate the effectiveness of uracil-DNA glycosylase (UDG) treatment, by breaking the uracil containing DNA strands, to reduce these sequencing artifacts in a targeted gene sequencing.

**Methodology:** Two of the same FFPE DNA, with one treated with uracil-DNA glycosylase (M0280S, NEB), were subjected to a targeted gene sequencing using high-throughput sequencer. The VCF files generated were analysed by an annotation tool (Annovar). Sequencing artifacts of C>T and A>G variants of less than 10% allele frequency (AF) were enumerated. Post-filtering variants of quality score of > 200, AF of > 20% and non-synonymous exonic function were also compared between the UDG treated and untreated sample.

**Results:** A total of 37 C>T and G>A variants were seen in UDG treated DNA as compared to 428 in untreated DNA. Post-filtering produced one C>T variant of unknown significance (VUS) of 23% AF in UDG untreated sample. The same variant was not seen in UDG treated sample.

**Conclusion:** In a single sample demonstration, we successfully reduced the sequencing artifacts, in low and high AF, in treating FFPE DNA with UDG and also prevented a false VUS for unnecessary downstream curation.



## Tips in Getting Your Bespoke Reverse-Transcriptase PCR Reaction and Sanger Sequencing Results Fast For Gene Fusion: A Standard Practice in KKH Molecular Histology Lab

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**Introduction:** We constantly validate gene fusion results from routine Archer™ gene fusion (AGF) assay. The turn-around-time (TAT) for reporting the findings is short and expected to be completed in days. Here, we describe the steps in designing bespoke primers to getting the sequence confirmation in 3-5 days.

**Methodology:** The steps firstly include getting the exon information from ensembl website. Then, the primer design is done via the IDT website, PrimerQuest tool, by importing the fusion sequence of the two genes into the software and select the amplicon length of between 100 to 150 base-pair. The melting temperature of the primers of 62°C are selected, which is crucial for the real-time one-step RT-PCR to work effectively at 60°C annealing temperature. The amplification curve and a specific melting-temperature peak must be seen to indicate the presence of the specific product but make sure the correct size is shown on a 3% agarose gel. Lastly, the product is Sanger-sequenced to get the DNA sequence in an electropherogram for analysis. The gene fusion is confirmed when the breakpoint sequence is evident.

**Results:** We validated most of the gene fusions, using these steps, detected by the AGF in 3-5 days. But there were few fusion sequences with high GC content that a separate and lengthy approach was required.

**Conclusion:** We successfully introduced a quick RT-PCR validation protocol into our lab for gene fusions detected by AGF assay that meets fast TAT.

## Individual Analysis of Breast Milk Composition to Facilitate Use of Expressed Breast Milk with the Ketogenic Diet for Epilepsy Control in Infants

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**Introduction:** The ketogenic diet (KD) is a strictly-controlled, high-fat-ratio treatment for epilepsy. In infants, breast milk is a dietary component even on KD and variation in nutrition content could significantly affect calculated ratios, which have been based on reference sources. We compared the nutritional composition of breast milk to reference values and its impact on KD ratio.

**Methodology:** Four samples of EBM were obtained from mother of Patient A, which were expressed and stored under consistent conditions. EBM samples were analysed using MIRIS Human Milk Analyzer for amount of energy, carbohydrate, fat and true protein. Energy and macronutrient content of the EBM samples were compared with generic values of mature breast milk (United States Department of Agriculture's Food Composition Database, USDA) in the 4:1 and 2.75:1 KD provided to Patient A from commencement in December 2018 to July 2019.

**Results:** Compared with reference values, there was a -11.4% to 22.6% difference in KD ratio of analysed samples. In 2.75:1 KD, ratios of each feed ranged from 2.64 to 2.83:1, with overall KD ratios ranging from 2.67 to 2.80:1. In 4:1 KD, ratios of each feed ranged from 3.94 to 3.99:1, with overall KD ratios ranging from 3.95 to 4.00:1.

**Conclusion:** There is considerable difference between EBM macronutrient content compared to reference values, thus affecting the KD ratio of each sample. However, variations in overall KD ratio with different EBM samples are not clinically significant, likely due to the small amount of breast milk used in each feed.

## Associations between Mobile Touch Screen Device Use and Musculoskeletal and Visual Symptoms: A Cross-Sectional Study of Adolescents in Singapore

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**Introduction:** The use of technology among adolescents, especially mobile touch screen devices (MTSDs), i.e. smartphones and tablet computers, has grown rapidly in the recent years, yet research on the implications of their use is limited. This study examined the amount of MTSD use in adolescents, and its association with musculoskeletal and visual symptoms.

**Methodology:** A representative sample of 1884 adolescents in Singapore (50.4% girls; response rate=74.1%) from primary 5 to post-secondary year 1 (10-18 years old), recruited via stratified sampling from 13 schools, completed an online questionnaire in class. Questions on weekday/weekend use duration/frequency and patterns of use (including bout length, types of activities and multitasking), musculoskeletal and visual symptoms were asked. Logistic regression analyses adjusted for potential confounders were conducted.

**Results:** Total technology use was high, with smartphone use being highest (mean=264(SD=243) minutes/day). Patterns of use, including bout length and multitasking, were influenced by gender, school level, type of device and activities. Musculoskeletal and visual symptoms were commonly reported, with neck/shoulder symptoms most commonly reported (42%). Higher hours/day of smartphone use was associated with increased risk of neck/shoulder, upper back, arms and wrist/hand symptoms (OR=1.04(95%CI=1.01-1.07) to 1.07(1.03-1.10)) and visual symptoms (OR=1.05(1.02-1.08)). No statistically significant associations were found for tablet use.

**Conclusion:** MTSD use was highly prevalent among adolescents. Higher smartphone use, but not tablet use, was significantly associated with musculoskeletal and visual symptoms in adolescents. There is a need to develop guidelines for wise use to reduce possible negative impact of use on adolescents' health.

## Detection of Copy Number Aberrations and Loss of Heterozygosity in Wilms Tumour DNA Samples from Formalin-Fixed Paraffin-Embedded Tissue Using Molecular Inversion Probe-Based Array

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**Introduction:** Wilms tumour (WT) is the most common renal tumour in children. Loss of heterozygosity (LOH) for chromosomes 1p and 16q is an adverse prognostic factor in WT. The aim of this study is to characterize WTs using Molecular Inversion Probe-based (MIP) Array to identify copy number aberrations (CNAs) and LOH.

**Methodology:** Genomic DNA were extracted from 8 formalin-fixed paraffin-embedded (FFPE) sections of WTs using Promega Maxwell RSC Instrument and purified as input into Affymetrix OncoScan FFPE Assay Kit. Data was analysed with Chromosome Analysis Suite software version 3.2.0.1252.

**Results:** We saw gains of chromosomes 1q and 7q; segmental gains of 1q21.1-q32.1, 2p24.3, 4q31.3, 11p14.3, 14q11.2, 15q21.3, 16q22.2, 17q24.1, 17p11.2-q25.3, 19p13.11, 22q13.33 and Xp22.33; losses of 1p, 7p, 10p, 11 and 14; and segmental losses of 3p25.2, 4q12-q13.1, 4q13.3-q35.2, 8q24.3, 10p11.23, 11p15.4, 16p13.3, 16q22.2, 19q13.2, 19p13.2, 19p13.3, 22q12.3-13.33, 22q11.23-q12.1 and Xq11.1-q11.2. The most common aberrations were gains of chromosomes 12(5/8), 13(4/8), 7(3/8), 7q(2/8) and 8(3/8); and loss of 7p(2/8). Frequent LOH seen were 1p36.11-p35.3(2/8), 1p31.1(2/8), 1p33-p32.3(3/8), 1q21.2-q21.3(3/8), 3p21.31-p21.31(6/8), 3p12.2p12.1(3/8), 6p22.1(2/8), 7q11.1-q11.21(3/8), 10q11.21-q11.23(2/8), 11p(3/8), 12q21.3-q21.33(3/8), 17p11.2-p11.1(5/8) and 17q23.1-q24.1(2/8).

**Conclusion:** Of 8 WTs, we identified LOH at 11p in 3 cases, a frequency consistent with reported literature, and found LOH in 1p and 16q(1/8). Our data also supports published reports that trisomies 6, 7, 8, 12, 13 and 18 are the most common aneuploidies in WT. Our findings demonstrate the potential of MIP-based assay towards the identification and mapping of important CNAs and LOH involved in WT for its prognostication.

## Studying the Efficacy of a Home-Initiated-Programme-To-Prepare-For-Operation (HIPPO) and Its Effects on Improving Perioperative Anxiety

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**Introduction:** Hospital admissions and surgeries can trigger fear and anxiety in young children. If unaddressed, such anxiety can create future psychosocial challenges. <sup>1</sup> HIPPO's aim was to provide appropriate resources to allay perioperative anxiety and improve patient satisfaction.

**Methodology:** Four 10-year-olds undergoing elective surgery were randomized into two groups. Group A received standard perioperative counseling while Group B received an additional animation video and activity sheets. Patients' response at the holding room and during anaesthesia induction were measured with Children's Emotional Manifestation Scale (CEMS), Induction Compliance Checklist (ICC), and Visual Analogue Scale (VAS). The State-Trait Anxiety Inventory for Children (STAI-C), State-Trait Anxiety Inventory (STAI) and hospital feedback questionnaire were also used.

**Results:** Of the 130 patients recruited, group A had 54 participants while group B had 59. No significant differences were demonstrated for CEMS, STAI-C, STAI, ICC, VAS and STAI scores. However, a subgroup analysis on school aged children (7-10 years) revealed better STAI-C scores (in Group B) approaching statistical significance ( $p=0.052$ ). Parents from group B also reported receiving significantly better explanation from their doctors. STAI-C and CEMS scores at the holding room reliably predicted patients' behaviors during induction. Unlike previous studies, we observed that parent's STAI scores did not correlate with their children' STAI-C scores.

**Conclusion:** HIPPO may benefit school going children. Self-reported anxiety appears more reliable than observer rated scales- perhaps owing to our sociocultural upbringing. Better patient experience and workflow efficiency can be achieved if CEMS and STAI-C are used as indication for administration of perioperative anxiolytics.

## Profile of Patients on Allergy Diet in KK Women's and Children's Hospital

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**Introduction:** The Allergy Diet is free of the eight common food allergens (cow's milk, egg, soy, wheat, fish, shellfish, peanuts, tree nuts), launched in July 2018 as part of an initiative to minimize the risk of adverse allergic reactions in inpatients requiring strict food allergen avoidance. The aim of the audit was to profile the patients requiring this diet during their admission to KK Women's and Children's Hospital.

**Methodology:** For all patients who ordered the Allergy diet between July 2018 to July 2019, data on food allergen(s) requiring elimination, food allergy diagnosis, personal atopic history and growth was collected from electronic medical records (Citrix).

**Results:** There were 14 children requiring Allergy Diet. All patients had medically diagnosed food allergy. 71% (10/14) of food allergies were IgE-mediated and 50% (5/10) had a history of anaphylaxis. The remaining 29% (4/14) had a diagnosis of allergic gastrointestinal (GI) disease presenting with symptoms such as hypoalbuminemia, upper GI bleed and prolonged diarrhea. Most patients (11/14) required 3 or more food elimination. 10 patients (71%) were on regular follow-up with the dietitian. Only two patients (14%) had weight below 10<sup>th</sup> percentile but were never referred to the dietitian.

**Conclusion:** The Allergy Diet was ordered appropriately for the majority of patients. These patients typically require multiple food avoidance and are at risk of severe adverse reactions. Food allergy policies and protocols should be communicated to all healthcare professionals to ensure correct provision of the diet.

## Co-Inheritance of Haemoglobin Q-Thailand and Haemoglobin H Disease (Hb Q-H Disease): A Case Study

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**Introduction:** High prevalence rate of different thalassaemias and haemoglobinopathy carrier states in Southeast Asia results in unusual combinations of gene defects which can be a diagnostic challenge. Haemoglobin (Hb) Q-Thailand is an alpha globin haemoglobinopathy. Hb Q-H disease, resulting from co-inheritance of Hb Q-Thailand and  $\alpha^0$ -thalassaemia, is rare. We present a case of Hb Q-H disease diagnosed through haemoglobinopathy screening.

**Methodology:** Full Blood Count (FBC), peripheral blood film (PBF), HbH inclusion bodies detection, Capillary Electrophoresis (CE), Gel Electrophoresis, and High Performance Liquid Chromatography (HPLC) were performed.

**Results:** FBC and PBF examination revealed hypochromic microcytic anaemia (Hb 8.8g/dL, MCV 48.6fL, MCH 15.5pg) with target cells, fragmented cells, spherocytes. Hb H inclusion bodies were seen in 24% of the red blood cells. CE and HPLC detected a predominant fraction corresponding to Hb Q-Thailand (97.6%) with absence of Hb A. This was seen as an abnormal band between Hb F and Hb S in alkaline gel electrophoresis and between Hb A and Hb S in acid gel electrophoresis. CE also showed small fractions of Hb H (0.6%), Hb Bart's (0.7%) and A2 variant (Hb Q-Thailand - 1.1%). Genotyping was not performed.

**Conclusion:** The combination of unique laboratory features corroborating with other reported cases in literature (Leung et al., 2004) helped us in arriving at this rare diagnosis of Hb Q-H disease. Alpha gene sequencing has been advised for genetic confirmation. Accurate identification helps in appropriate management and genetic counselling of antenatal patients with a diagnosis of rare haemoglobinopathy.

## Incidence of True Food Allergy Amongst Patients with Special Diet Orders in KK Women's and Children's Hospital

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**Introduction:** Food service is integral in ensuring safe hospital food allergy management. In KKH, patients are offered two special diet menu options for self-reported food allergy: Standard menu with indicated food(s) removed or the 8-allergen free Allergy Diet, which involves strict allergen elimination meal preparation and delivery processes. The aim of the audit was to determine the incidence of true food allergy amongst patients with special diet orders.

**Methodology:** A retrospective audit of 942 special diets ordered from all wards between July 2018 to July 2019 were randomly selected. Specific food(s) eliminated, food allergy diagnosis and personal atopic history were collected from electronic medical records (Citrix). Diet orders from Electronic Meal Order System (EMOS) was compared to nutritional orders in Citrix. True allergy was defined as allergist-diagnosed allergy. Possible food allergy was defined as reported history of allergic reaction(s) to food(s) and/or allergy testing done, but without diagnosis by an allergist.

**Results:** Out of 96, 26 (27%) had true allergy, 15 (16%) had possible food allergy. In those with true allergy, 23 (88%) had IgE-mediated food allergy and/or sensitization, 3 (12%) had allergic gastrointestinal disease. Three patients (3%) were on the Allergy Diet. There was a discrepancy between Citrix nutritional orders and EMOS for 18 (69%) patients with true allergy and 15 (27%) with no documented food allergies.

**Conclusion:** Distinction between food allergy and preferences is important to avoid unwarranted dietary restrictions. Healthcare professionals involved in the care of food-allergic patients should ensure consistent and accurate documentation to ensure safe provision of inpatient meals.

## The Use of Technology in Training of O&G Residents: Virtually the Way Forward

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**Introduction:** Traditionally, the attainment of knowledge and skills in Obstetrics and Gynaecology were garnered through a somewhat structured apprenticeship which included lectures, tutorials and supervised surgical training. As the Singhealth O&G residency became more structured and duty hours were strictly adhered, the need for a holistic surgical training curriculum became evident. Hence, we embarked on developing an in-house module that can enable residents to have simulated hands-on surgical experience without entering the operating theatre.

**Methodology:** Our team developed a prototype of high fidelity medical simulation and assessment module through the use of augmented reality technology. We collaborated with our expert partners from ASTAR on the prototype module, "Understanding pelvic anatomy through an abdominal hysterectomy". This module has two concurrent segments. The first segment assesses residents on theoretical knowledge on pelvic anatomy and abdominal hysterectomy and the other segment allows residents to visualise the operating theatre using the augmented reality lens to perform an abdominal hysterectomy. Residents' performance can be reviewed and compared to other residents, allowing them to identify their strengths and areas for improvement.

**Results:** Since developing this module, residents who have tried the module have given constructive suggestions to finetune the module to cater to their needs and we have worked with our experts to improve our module. The module is slated for completion in Q4 of 2019.

**Conclusion:** We are excited to progress together with technology and harness its great powers to benefit the learning and training of future generations of obstetricians and gynaecologists, and in turn improve our patient care.

## KK Hospital Implementation of Advanced Clinical Education (ACE) Immersion Programme

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**Introduction:** Many Registered Nurses upon completion of advanced specialty training did not utilize the skills learned. Needs analysis conducted revealed that these nurses lack clinical competence and confidence. Hence, ACE Immersion Programme was developed to help assimilate their roles as advanced practicing nurse. This study evaluates the programme in enhancing nurses' clinical knowledge and skills, and its application in the clinical practice.

**Methodology:** The four-week programme commenced in May 2018. A pre-course MCQ test was conducted to analyse their learning needs. Lectures and case discussions were conducted on topics related to Paediatric and Gynaecology. Pre-reading materials were given before each class. Caselogs prepared by ACE nurses were discussed. They were rotated to different clinical areas to increase clinical exposure. Protected time was given for completion of 16 Caselogs and 5 Mini-CEX assessment. Workgroup facilitators met with the ACE nurses weekly and at the end of the programme to evaluate learning progress. A post-course MCQ test was again conducted.

**Results:** We compared the individual MCQ scores pre-and-post course. Score improvements were seen among OT nurses (n=5, 100%), Pediatric nurses (n=12, 70.5%) and Gynecology nurses (n=2, 25%). All ACE nurses (n=30) passed their Mini-CEX assessments and demonstrated critical thinking skills in their caselogs. Evaluation of the programme showed that majority met their learning objectives and expressed more confidence in patient assessment and management.

**Conclusion:** The ACE Immersion Programme was useful in assessing learning needs of the ACE nurses. Their clinical knowledge and skills were enhanced and they were able to apply them in their clinical practice.

## Baseline Ultrasound Competency of Residents in Their First Month in KKH

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**Introduction:** Ultrasound is the most common on-call request. We aim to evaluate the baseline ultrasound competency of residents in their 1st month in KKH.

### Methodology

Residents were given orientation in 1st week on how to carry out ultrasound scans systematically, optimize images and shown guidelines on how to capture the essential images. Residents were observed and rated as they carried out ultrasound scans during their 1st Gynaecology and Pediatric sessions in their 1st month in July 2019 after orientation. Three components were evaluated for each ultrasound scan: (1) Competency in carrying out a systematic scans, (2) Making a diagnosis, and (3) Demonstrating patient care. Each of the components are graded from 0 to 5 (highest score).

### Results

For gynaecological scans, residents had average scores of 2.0 for carrying out scans, 2.1 for making a diagnosis, 3.1 for patient care. For pediatric scans, residents had average scores of 2.9 for carrying out scans, 3.0 for making a diagnosis, 3.8 for patient care. Overall, residents score best in demonstration of patient care (3.4) compared to performing scans (2.4) and making diagnosis (2.6) and this is statistically significant ( $p < 0.01$ ). There was no significant difference for the scores across the years of residency in our small sample of 8 residents.

### Conclusion

Baseline ultrasound assessment of residents in their first month show that their demonstration of patient care is adequate, but they score much lower in performing the scans and making a diagnosis.



## HEADSS UP: Using Simulation to Improve Medical Students' Adolescent Communication and Risk Assessment

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**Introduction:** Many providers express discomfort with adolescents and desire further training in adolescent communication. Medical students' exposure to communication with adolescent patients can be limited. One successful strategy has been the use of adolescent simulated patients (SP). This has been shown to be an effective teaching strategy in several different countries, but little is known about the generalizability of this strategy to Singapore. We report on the effects of participating in a workshop using adolescent SPs on medical students' self-efficacy in communicating with adolescent patients.

**Methodology:** The study was approved by the SingHealth IRB. The workshop has been completed by serial cohorts of medical students. We used a survey to evaluate medical students' reported self-efficacy in communicating with adolescents using a four point Likert scale. The survey was administered to the students prior to the workshop, and again five weeks after the workshop. Results were analyzed using Wilcoxon sign rank tests. Written qualitative feedback was also solicited.

**Results:** One hundred and forty-five medical students have participated in this study. The medical students reported statistically significant increases in self-efficacy in all surveyed skills and content areas related to caring for adolescent patients. The qualitative feedback highlights the value that the medical students placed on interacting with adolescent and the feedback from the adolescent SP.

**Conclusion:** This educational intervention shows promising effect on the self-efficacy of medical students communicating with adolescents. This can be an effective intervention for teaching adolescent psychosocial assessment to medical professionals.

## The Use of Flip-Chart in Delivering Nursing Education to Families of Newly Diagnosed Cancer Patients

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**Introduction:** A diagnosis of childhood cancer is a life-changing event for entire family. Parents has to obtain new knowledge and skills to safely care for their child at home. In our Paediatric oncology units, we noticed variation with the methods and content used by nurses in providing initial education. This is because nurses do not have a standardized teaching tool and utilized a simple checklist on the topics to be covered during nursing education.

**Methodology:** Oncologist are consulted to provide input on the important topics to be discussed prior to first discharge after diagnosis. Information are type out on an A4 paper in lay-man terms for parents to refer to during the session. On the other side of the paper, a more detailed explanation is written out to guide nurses while delivering their nursing education. A QR code is created on the cover of the file for parents to download the online version for their referral.

**Results:** Parents verbalized that they can understand better with the use of a flipchart as a visual aid for them during the teaching session. In addition, the availability of information online via the QR code acts as an informational resource for them at home.

**Conclusion:** The use of flipchart facilitate learning among parents of newly diagnosed cancer patients. In addition, this ensures standardization in delivery of content among the nurses.



## Paediatric Oncology Nursing Program: Children Cancer Course for Nurses (C3N)

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**Introduction:** For children with cancer and their families, there is substantial evidence of benefit when care is provided by a specialized oncology nurse. There are courses in Paediatric and oncology advanced diploma level at present. However, there is no specific course that combines the features of Paediatric oncology. C3N is therefore a necessary to build capabilities and competences among nurses working in paediatric oncology setting and hence improve cancer nursing care outcomes.

**Methodology:** Admission requirement for this course with minimum of two years working in Paediatric oncology unit. The program is organized so that the participants attend classes twice a week over 4 month's period. Total of 10 modules with Biological basis of cancer investigative procedures to diagnose cancer, and treatment for cancer, Children oncologic emergencies, Nursing Health Assessment, Palliative care, Nutrition and complementary therapies, Patient counselling, Infection control, Bone marrow/ stem cell transplantation, Wound and stoma care and Quality improvement project. The course components include lectures, practical assessments. A comprehensive approach was undertaken to assess participants by physical assessment, case study presentation, exam and competencies.

**Results:** The post course evaluation showed participants retained their knowledge and increased in both confidence and competence. High level of satisfaction was attained. In additional, nurses attended the training have completed two quality improvement after course completion.

**Conclusion:** C3N course has successfully supported the learning needs of Paediatric oncology nurses. This ultimately improved nursing care standards and patient outcomes. Moving forwards, course modules and contents will be reviewed yearly to ensure up-to-date evidenced practice

## Development of a Genetics Education Program: Equipping Medical Professionals for the Genomics Era

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**Introduction:** Advances in molecular diagnostic technologies and greater integration of genetic testing into the diagnostic process have required the modern healthcare provider to become literate in genomics. Many physicians report lack of knowledge and confidence as barriers to offering appropriate genetic counselling. In response to this, a half-day interactive workshop was developed to provide existing healthcare professionals with current knowledge in field of genetics.

**Methodology:** The educational program was tailored to equip providers with an awareness of the benefits, limitations and risks of available genetic testing. Course components included basic genetic concepts, current testing methodologies, interpretation of results and local legal frameworks regulating genetic testing. Through case studies, providers also gained an understanding of medical, social, ethical and legal issues surrounding genetic testing.

**Results:** Since 2018, the workshop has been run twice, with participation from more than 90 healthcare providers from various healthcare professions. A pre- and post-course evaluation was conducted to assess knowledge improvement and self-reported confidence in ordering and interpreting genetic test results. There was an improvement of a pre-course score of 6 to post-course score of 9 out of 12 questions. However, participants generally did not report changes in their level of confidence in ordering or interpreting genetic test results.

**Conclusion:** The genetics education program is effective in improving the level of genetic knowledge amongst healthcare providers. It will be useful in future to explore the factors that increase provider confidence in ordering and interpreting test results so as to empower healthcare providers in this genomics era.

## Actinomycosis in Singapore Children: A 15-Year Retrospective Review

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A retrospective medical review of all children admitted with Actinomycosis to KK Women's and Children's Hospital, Singapore, from 1 Jan 2004 to 1 Jan 2019, identified from the inpatient registry of the Paediatric Infectious Disease Service. There were 7 patients in the study, mostly female (4, 57.1%). Median age of first presentation was 9.8 (range 4.7 to 15.7) years. Sites of Actinomycosis included orocervicofacial (5, 71.4%), pulmonary (1, 14.3%), and cervical spine (1, 14.3%). Risk factors included dental infection (4, 57.1%), of which 1 patient also had a pyriform sinus tract, recent dental procedure (1, 14.3%), and cholesteatoma (1, 14.3%). Risk factors included dental infection (4, 57.1%), of which 1 patient also had a pyriform sinus tract, recent dental procedure (1, 14.3%), and cholesteatoma (1, 14.3%). Five cases had histopathological-confirmed diagnosis, while 3 were microbiologically confirmed-*Actinomyces odontolyticus* (2, 66.7%) and *Actinomyces israelii* (1, 33.3%). Six cases had concomitant organisms including anaerobes such as *Fusobacterium necrophorum*, *Fusobacterium nucleatum*, *Prevotella oris*, *Bacteroides* species, *Propionibacterium acnes*, Gram-positive organisms such as *Streptococcus milleri*, *Streptococcus constellatus* and Gram-negative organisms such as *Pseudomonas aeruginosa*, and *Aggregatibacter actinomycetemcomitans*. All patients received Ampicillin/Augmentin or other beta-lactams, for a median of 7.2 (range 1.5 to 8.8) months. Six patients underwent surgical procedures, such as incisional drainage and excision biopsy. Complications included recurrent neck abscesses (1, 14.3%), and intracranial extension (1, 14.3%). All patients had complete resolution after treatment.



## Adenocarcinoma of the Caecum Presenting as Unusual Case of Intussusception

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**Learning Objectives:** We discuss an unusual case of intussusception in a 14 year old boy and demonstrate the important role of imaging modalities that help in the assessment of a lead point, for early management.

**Contents:** A 14-year-old boy presented with a three day history of abdominal pain, distension and vomiting. He had a prior history of right nephrectomy for Wilm's tumour at four years of age. Radiographs revealed dilated small bowel loops with multiple air-fluid levels in keeping with mechanical obstruction. Computed Tomography (CT) imaging showed an ileo-colocolic intussusception with resultant small bowel obstruction and mild ascites. No definite mass was seen on CT. Ultrasound performed subsequently confirmed a long segment intussusception. Air reduction enema was successfully performed. Magnetic Resonance Imaging (MRI) performed showed presence of a vascular soft tissue mass in the ileo-caecal region, with evidence of caecal wall thickening. There was good correlation of the soft tissue mass on repeat ultrasound, highlighting ultrasound as an important modality in looking for a lead point. The child subsequently went for hemicolectomy. The soft tissue mass was shown to be an adenocarcinoma on histopathology.

**Teaching Message:** Different imaging modalities are important in the assessment of a lead point for intussusception. In this case, a combination of radiographs, ultrasound, CT and MRI helped in making the diagnosis, allowing for early and efficient surgical intervention. In older children, a lead point such as a benign/malignant mass or polyp, as a cause for the intussusception, must be considered.

## Late Diagnosis of Lesch-Nyhan Disease with End-Stage Renal Disease and Tophus Burst

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**Background:** Lesch-Nyhan disease (LND) is a rare X-linked recessive inborn error of purine metabolism which is characterized by uric acid overproduction, neurological disorder, and self-injurious behavior (SIB). Late diagnosis of LND may cause significant morbidity.

**Case presentation:** A 15-year-old male with acute on chronic kidney disease and multiple tophus was referred to Cipto Mangunkusumo Hospital, Indonesia for emergent dialysis. On admission, his tophus on left ankle burst discharging blood, debris, and white crystal materials. Multiple lumps were observed in the extremities. His lower lip was severely deformed due to repeat self-biting. Since the age of 7 months old, he was mistakenly diagnosed as cerebral palsy based on psychomotor retardation and extrapyramidal symptoms, and the CT scan result of cerebral atrophy. Laboratory results showed serum uric acid 1608 µmol/L; urea 100 mmol/L; creatinine 671.8 µmol/L; eGFR 7.6 mL/min/1.73 m<sup>2</sup> (*New Schwartz*); urinary uric acid level 1.1 mmol/24 h; and random urine uric acid-to-creatinine ratio 2.7. Exon 1 deletion of the HPRT1 gene confirmed LND diagnosis. Patient received oral allopurinol 300 mg/day, subcutaneous erythropoietin 6000 units/week, oral calcitriol 0.5 mcg/day, and underwent peritoneal dialysis. At two-month follow-up, the lumps subsided and the uric acid level normalized.

**Conclusion:** This is the first report of extreme clinical presentation of late LND. In developed countries, LND can be diagnosed as early as 3 days after birth; however, due to the rarity of LND and limited genetic testing facilities in Indonesia, diagnosis and treatment in the present case were delayed. Late diagnosis leads to renal failure and irreversible abnormalities.

## Community-Acquired Pneumonia in Inpatient Children: The Value of Antibiotic Guidelines

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**Introduction:** Community-acquired pneumonia (CAP) is a frequent cause for hospitalization in paediatrics. Our aim was to evaluate antibiotic treatment options and outcomes using our current inpatient CAP guidelines.

**Methodology:** This was a retrospective study of patients with uncomplicated CAP from January to May 2016. Patients with complicated CAP were excluded. Clinical, microbiological, radiographic data and antibiotic utilization were extracted from patient records. All patients were tracked for empiric, final and change of antibiotics and the 30 day readmission.

**Results:** For the 267 patients, the mean age was 4.67 years. A positive organism was detected in 135 patients (50.6). Empiric antibiotics were: clarithromycin (37.1%), amoxicillin (30%), IV ampicillin (23.2%), azithromycin (3%), augmentin (1.5%) or ceftriaxone (0.7%). An older age (6.2 years) was associated with empiric clarithromycin compared to ampicillin/ amoxicillin (3 years,  $p < 0.001$ ). For the final antibiotics, these were: No change from ampicillin/amoxicillin/clarithromycin 71.9%, change to amoxicillin 2.3%, clarithromycin 13.9%, azithromycin 2.6%, amoxicillin and clarithromycin 1.5%, augmentin 1.1%. No change of antibiotics was more likely among patients given empiric ampicillin/amoxicillin/clarithromycin compared to others ( $p = 0.005$ , OR 3.2, 95% CI 1.4-7.5). Reasons for change of antibiotic were positive mycoplasma (43.9%), poor response (19.7%), compliance (7.6%), other (28.8%). Six (2.2%) patients were readmitted within 30 days.

**Conclusion:** Ampicillin/amoxicillin or clarithromycin was adequate as empiric therapy for CAP with no change required in 71.9%. Mycoplasma infection was the most common reason for changing empiric antibiotic therapy.



## Correction Using Halo Gravity Traction for Severe Rigid Scoliosis: A Report of Two Cases

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Singapore General Hospital reviews 25,000 to 35,000 spine patients a year. Up to 20% may have a background of scoliosis. Some of these are complex cases with severe curves more than 100°. The spine can be lengthened up to 7cm but spinal cord can only accept a stretch of 2-2.5 centimeters before there is a risk of neurological damage. The treatment of rigid and severe scoliosis is a surgical challenge. Acute correction of large rigid curves at time of surgery is difficult, but also increases risk of neurologic injury and implant failure. The applications of halo gravity traction (HGT) allow a gradual stretching of soft tissues and neural element of spine. HGT has been considered a way to reduce deformities and prevent neurological complications.

Two female patients with severe rigid scoliosis with main Cobb angle of 89° and 112° had HGT for 18 to 20 days after first stage of scoliosis surgeries. Patient had at least 16 hours of traction per day when lying in bed or in wheelchair. Traction weight was gradually increased daily up to 40% of patient's body weight. Both patients had posterior instrumentation and fusion surgeries. They had Cobb angle of 26° and 57° post-operatively with no neurological complication.

HGT is therefore an adjuvant treatment option for reducing neurological complications.

## Novel Use of Superficial Cervical Plexus Block and PECS I Block for Vagal Nerve Stimulator Implant Surgery in a Paediatric Patient: A Case Report

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**Background:** A 5 year-old girl, 17.5kg with a history of refractory infantile epilepsy, presented for an elective vagal nerve stimulator implant surgery. Despite being on multiple anti-epileptic drugs, she had up to 20 episodes of seizures per day. She is non-verbal and communicates discomfort by pointing or making incomprehensible noises.

**Methods:** Patient was induced with IV Propofol 60mg, Fentanyl 30mcg and Atracurium 8mg and intubated with a McGrath video-laryngoscope. An intra-arterial cannula was inserted for haemodynamic monitoring. After intubation, a left superficial cervical plexus block and PECS I block was performed aseptically using an in-plane approach with a Pajunk 50mm needle under ultrasound (Sonosite, M-Turbo) guidance. Levobupivacaine 0.25% 2mls and 8 mls were given respectively for the superficial cervical plexus and PECS I block after negative aspiration for blood. IV Paracetamol 250mg (15mg/kg) and IV Fentanyl 40mcg (2.3mcg/kg - including 30mcg given at induction) were administered intraoperatively.

**Results:** The child was monitored in the Post Anaesthesia Care Unit (PACU) for immediate post-operative complications. She remained comfortable during recovery and did not show any signs of discomfort over the operation sites. She was discharged to the high dependency unit and prescribed regular Paracetamol and Ibuprofen. Her FLACC pain scale was 0 both after surgery and on Post-Operative Day (POD) 1 with oral Paracetamol. She was discharged well on POD 2.

**Conclusion:** The combination of superficial cervical plexus block and PECS I block is an effective means of providing peri-operative analgesia for vagal nerve stimulator implant surgery in paediatric patients.

## Emergence of Streptococcus Gallolyticus Causing Early Onset Neonatal Sepsis Complicated By Solitary Liver Abscess in a Preterm Newborn Infant

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*Streptococcus Gallolyticus ssp pasteurianus (SG)* is an uncommon but increasingly recognized cause of neonatal sepsis and meningitis. Although case reports have been published worldwide, there was none reported from Singapore.

We present a case of a late preterm female infant born via normal vaginal delivery. Maternal vaginal swab was sterile. Shortly after birth she had progressively worsening respiratory distress and required intubation at 13 hour of life. Her blood culture on Day 1 grew pansensitive SG. Lumbar puncture ruled out meningitis. She was initiated on Penicillin G and Cefotaxime from birth but had a spike of fever on day 5 of life. An ultrasound scan of the abdomen revealed a multi-septated cystic liver abscess in the right lobe of the liver (3.8 x 3.6 x 3.2cm), indicating escalation of antibiotics.

Needle aspiration and biopsy of the liver abscess was performed under US guidance. Histopathology confirmed liver abscess but the aspirate was sterile. Patient was discharged after 5 weeks of parenteral antibiotics with serial US scans of the liver. A reduction in size of hepatic abscess (1.9 x 1.6 x 2.1cm) was noted. On discharge 5 weeks course of oral Augmentin was recommended. Serial scans showed near-resolution of the hepatic abscess and child was thriving well.

*Streptococcus Gallolyticus* is known to cause sepsis and meningitis. We report for the first time SG causing liver abscess in a preterm infant. Being a perinatal pathogen causing fatal fulminant infections, neonatologist should be aware of the spectrum of illness caused by SG.

## Two Successive Livebirths Following Transfer of Embryos or Blastocysts from Fertilized Thawed Frozen Oocytes: A Case Report

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**Background:** Until recently, oocyte freezing is deemed as a well-established technique in IVF worldwide. In Singapore, oocyte freezing is only offered for medically-indicated reasons. The current efficacy of IVF using cryopreserved eggs requires 20 frozen oocytes to achieve one livebirth.

**Objective:** This is a case write-up reporting our centre's recent first two successive livebirths from 2 patients, following transfer of embryos/ blastocysts from fertilized thawed oocytes.

**Method and Results:** *Case 1:* Patient, a 37-year old, para 0, underwent an ovum pick-up in January 2018 where 10 oocytes were collected. Six metaphase II oocytes were vitrified as her spouse faced difficulty in producing fresh ejaculate. Two months later, she utilized all her cryopreserved eggs, with stored frozen testicular sperm aspirates for use. All 6 thawed oocytes fully survived, 3 were fertilized, resulting in 2 usable embryos transferred. Patient conceived and delivered a healthy male (3619g, APGAR Score 9.9). *Case 2:* Patient, a 33-year old, para 0, diagnosed with papillary thyroid CA, had 23 oocytes retrieved (January 2017) for fertility preservation. However, only 12 oocytes were mature and hence vitrified. In August 2018, frozen donor sperm was used to inseminate the thawed oocytes as spouse was diagnosed azoospermia with testicular insufficiency. Only 6 frozen oocytes thawed; all fully survived and 5 fertilized. A usable blastocyst was transferred while 2 more others vitrified. Patient achieved pregnancy and delivered a healthy baby girl (3118g, APGAR Score 9.0).

**Conclusion:** Oocyte freezing is now a realistic option particularly for patients requiring fertility preservation, as compared previously.

## Leiomyosarcoma in Pregnancy: Incidental Finding of Leiomyosarcoma during Pregnancy

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**Problem Statement:** Uterine leiomyosarcoma (LMS) is uncommon. Majority of cases occur after childbearing age and incidence during pregnancy rarer, with only 8 cases reported.

**Methods:** We present a case report of an incidental finding of uterine LMS associated with pregnancy after myomectomy was done for a subserosal fibroid during caesarean section.

**Results:** Patient is a 30 year old para 2, with a known history of fibroid on regular follow-up since 2015. Spontaneous pregnancy was achieved and the fibroid was monitored. In her previous pregnancy, the apparent same fibroid grew to a significant size but shrunk post pregnancy. Lower midline caesarean section for breech presentation was performed at term. Intraoperatively, a 19cm subserosal fibroid was noted and hence concurrent myomectomy was performed. Histopathology showed high grade spindle cell leiomyosarcoma. Staging scan showed no radiological evidence of distant metastases. Completion surgery with total abdominal hysterectomy, bilateral salpingo-oophorectomy, bilateral pelvic lymph nodes dissection and omental biopsy was performed. Histology showed small amount of focal residual leiomyosarcoma within its wall with no evidence of local or distant metastasis. Multidisciplinary team discussion confirmed Stage 1B high grade leiomyosarcoma. Systemic chemotherapy was recommended in view of high risk of recurrence. Patient opted for clinicoradiologic monitoring instead. 3 months post surgery, patient had no radiological signs of local recurrence.

**Conclusion:** Although LMS diagnosis in pregnancy is uncommon, it is important to be aware of this possibility for better pre-operative counselling of patients with known history of large fibroids.

## FOXG1 Syndrome: A Rett Syndrome-Like Disorder with Severe Developmental Delay, Microcephaly and Brain Malformations

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**Introduction:** FOXG1 syndrome, previously described as congenital variant of Rett syndrome, is a condition characterised by impaired neurodevelopment and structural brain abnormalities. Children with FOXG1 syndrome have severe developmental delay and intellectual disability, microcephaly, epilepsy, irritability, excessive crying, sleep disturbances, hypotonia and stereotypic movements. Brain malformations include delayed myelination or hypomyelination, hypoplastic corpus callosum, frontal and temporal atrophy with gyral simplification.

**Case report:** We report a 3-year-old Malay boy with microcephaly (37cm, <3<sup>rd</sup> centile), hypotonia, convergent squint and global developmental delay detected when he was admitted to hospital for viral illness at 4 months old. His birth head circumference (31.5cm, 50<sup>th</sup> centile) was normal. He also had excessive crying episodes, intermittent irritability and sleep disturbances since birth. He was diagnosed with epilepsy with semiology (i.e. cyanotic episodes with right eye deviation) at age 1 year 3 month old and was started on carbamazepine. He had abnormal movements described as repetitive fidgety, jerky arms and legs with head banging episodes but his MRI brain and spectroscopy performed at 1 year old was normal. Metabolic investigations were unremarkable. Chromosome microarray and DNA methylation for Angelman syndrome were negative. The targeted exome sequencing (PaedSeq) detected heterozygous *de novo*, likely pathogenic variant c.974dup (p.Leu325Phefs\*130) in FOXG1 gene explaining his neurological symptoms.

**Conclusion:** The molecular diagnosis of FOXG1 syndrome in the child allows his family to understand more about the condition, parents' future pregnancy recurrent risk and opportunities for the family to participate in support groups and research for potential treatment development.



## Primary Lymphoma of the Bladder

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**Introduction:** Primary lymphoma of the bladder is a rare lesion, with less than 100 cases reported in the literature. We discuss the diagnosis and management.

**Case Study:** A 74-year-old woman presented with frequency, nocturia and recurrent UTIs since past 6 months. The urine culture was negative with persistent microscopic haematuria. Urine cytology was negative for malignant cells and CT urogram and cystoscopy showed a posterior wall bladder mass measuring 3.4cm. Biopsy with immunohistochemistry revealed CD20 positive atypical small B cell lymphoma in particular mucosa-associated lymphoid tissue (MALT) tumor. A PET CT and a bone marrow biopsy showed no evidence of extra vesicular disease. The patient underwent radiotherapy.

**Discussion:** Primary lymphomas account for less than 1% of the bladder tumors. Secondary lymphomas involve the bladder in 10-25% cases of advanced leukemia or lymphoma with a more disseminated disease. The most common histological subtype is MALT and other being diffuse large B cell lymphomas. Diagnosis is based on imaging, cystoscopy, histopathology and immunohistochemical staining. Prognostic factors include tumor staging and histologic subtype. MALT lymphomas are low grade, localized, indolent tumors, with an excellent prognosis. The aggressive tumors are majority of the diffuse large B cell type, with relatively poor prognosis. Radiotherapy is curative.

**Conclusion:** Primary lymphoma of the bladder may be a rare diagnostic outcome for patients with recurrent UTI or persistent haematuria. It is important to raise awareness amongst clinicians in such cases of lesser known pathology.

## Adult-Onset Bilirubin Encephalopathy in Crigler-Najjar syndrome: A Case Report

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**Introduction:** Crigler-Najjar syndrome (CNS) type 1 is the most severe hereditary cause of non-conjugated hyperbilirubinemia due to a mutation of the UDP-glucuronosyltransferase gene. We report a rare presentation of adult-onset bilirubin encephalopathy in a 20-year-old female with CNS type 1.

**Case Report:** The patient was born to consanguineous parents and presented at day 30 of life with severe prolonged unconjugated hyperbilirubinemia. Genetic analysis revealed a novel mutation of the UGT1A1 gene as a result of homozygous T to A substitution at nucleotide 479. She spent 8 to 10 hours per night under phototherapy and was on phenobarbital and calcium treatment. Total bilirubin level ranged from a peak of 491  $\mu\text{mol/L}$  to a lowest of 115  $\mu\text{mol/L}$  at 2 months of life. She showed normal intellectual development, attended mainstream school and was enrolled into nursing course. At 19 years old, she was admitted for acute confusion and an electroencephalogram performed showed diffuse encephalopathy. She was admitted 6 months later for encephalopathy, precipitated by a viral infection. Total bilirubin level peaked at 594  $\mu\text{mol/L}$  which down-trended to 426  $\mu\text{mol/L}$  with regular phototherapy. She developed seizures and was started on Carbamazepine for focal epilepsy. On follow up, she has improved with no further seizures but remains intermittently forgetful.

**Conclusion:** This case illustrates the reduced effectiveness of phototherapy with age for the treatment of CNS type 1 potentially causing bilirubin encephalopathy. Sustained effects of gene transfer therapy remain unknown. Liver transplant remains the only effective treatment and should be performed before the onset of neurological complications.



## Prominent Brown Adipose Tissue in an Infant Presenting with Left Neck Mass

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A 32-day-old male infant presented with torticollis. On examination, a mobile mass was palpated over the left lateral neck. Initial ultrasound revealed echogenic bilateral subcutaneous soft tissue structures extending from the neck to the axillae and lateral chest with no distortion of the subclavian vessels.

MRI subsequently showed bilateral symmetrical mildly enhancing soft tissue structures in the neck, supraclavicular regions, bilateral axillae and chest. These displayed intermediate T1 signal and heterogeneously hyperintense T2 signal with no fat suppression. In view of their distribution, they were thought to represent brown adipose tissue (BAT). Clinically, the masses decreased in size over two weeks and the infant was discharged.

BAT accounts for 5% of an infant's weight and can be present in the neck, axilla, back, thorax, abdomen and thigh. BAT is historically diagnosed on positron emission tomography as foci of high <sup>18</sup>F-fluoro-deoxy-glucose uptake and shows intermediate attenuation between fat and muscle on CT. Both these imaging modalities subject patients to radiation.

Current MRI studies on BAT are variable and the appearance of BAT on routine sequences is not well established. Two case reports of histologically confirmed BAT described MRI features similar to our case. Although contrast enhanced ultrasound has been used to detect BAT, greyscale ultrasound appearance of BAT has not yet been described. This case illustrates the importance of recognising the imaging features of BAT on grey scale ultrasound and MRI (both modalities are free of ionizing radiation) in order to avoid invasive investigations.

## ACKNOWLEDGEMENTS

The organising committee would like to thank the following for their support and generous contribution:

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Ministry of Law and Ministry of Health, Singapore  
Guest of Honour, 10<sup>th</sup> KKH Scientific Meeting 2019

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