ASIA PACIFIC MATERNAL AND CHILD HEALTH CONFERENCE & INTEGRATED PLATFORM FOR RESEARCH IN ADVANCING METABOLIC HEALTH OUTCOMES OF WOMEN AND CHILDREN (IPRAMHO) INTERNATIONAL MEETING 2022

Integrated Platform for Research in Advancing Metabolic Health Outcomes of Women and Children (IPRAMHO)

21 & 22 January 2022

KK Women's and Children's Hospital, Singapore

Conference: Virtual Meetings & Webinars
Scientific E-Posters available online

Jointly organised by:

IPRAMHO Advancing Metabolic Health

KK Women's and Children's Hospital SingHealth

SingHealth DukeNUS Academic Medical Centre Obstetrics & Gynaecology

SingHealth DukeNUS Academic Medical Centre Paediatrics

Polyclinics SingHealth

National Healthcare Group Polyclinics

Jointly supported by:

Obstetrical & Gynaecological Society of Singapore

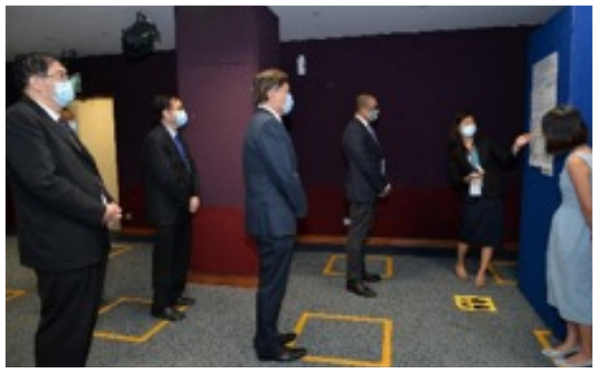
College of Obstetricians & Gynaecologists, Singapore

PERINATAL SOCIETY OF SINGAPORE

Federation of Asia and Oceania Perinatal Societies

ASIA PACIFIC MATERNAL AND CHILD HEALTH METABOLIC CONFERENCE & IPRAMHO INTERNATIONAL MEETING 2021

Launch of the Singapore Integrated 24-Hour Activity Guidelines for Children and Adolescents. 08 Jan 2021
(From left to right): A/Prof Ng Kee Chong, Dr Benny Loo, Prof Alex Sia, A/Prof Benedict Tan and Prof Tan Kok Hian



Welcome Message

Dear Colleagues and Friends,

On behalf of the Organising Committee, I bid a warm welcome to all of you to the Asia Pacific Maternal & Child Health Conference and Integrated Platform for Research in Advancing Metabolic Health Outcomes of Women and Children (IPRAMHO) International Meeting 2022, hosted virtually at KK Women's and Children's Hospital (KKH), Singapore.

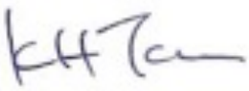
This meeting brings together clinicians, nurses and allied healthcare professionals to discuss on diseases for women and children in our Asia-Pacific region. The best preventive efforts start upstream from preconception and at conception in the womb to the early childhood years. The optimal strategy must necessarily begin with effective battles against diseases with lifestyle and obstetric and perinatal interventions at this early phase, using a life course approach.

We had a successful meeting in 2018 where the College of Obstetricians and Gynaecologists, Singapore Guidelines on the Management of Gestational Diabetes was launched. Through the meeting, we have also achieved and published the AOFOG MFM Committee Consensus of GDM screening. We launched the Perinatal Society of Singapore Optimal Perinatal Nutrition Guidelines and also published the Asia Pacific consensus in perinatal nutrition in 2019. In 2020, we launched the Perinatal Society of Singapore Guidelines on Physical Activity & Exercise in Pregnancy and published the Asia-Pacific consensus on physical activity and exercise in pregnancy and the postpartum period. In 2021 we launched Singapore Integrated 24-Hour Activity Guidelines for Children & Adolescents and published the Asia-Pacific Consensus Statement on integrated 24-hour activity guidelines for children and adolescents. This year 2022, we are focusing on the development of the Singapore Integrated 24-Hour Activity Guidelines for Early Childhood with strong support again from various colleges and societies in Singapore and SingHealth Duke-NUS Maternal & Child Health Research Institute. In line with RIE2025, these activities aim to translate our research findings for active dissemination and implementation and to improve the health of women and children, enhancing early life-course moments from preconception onwards and optimising the health and human potential of every child born in Singapore and our region.

For 2022, the conference on Day 1 will discuss maternal and child health in the morning session followed in the afternoon by IPRAMHO Education and Training Session (Track 1) on Excellence in Perinatal Health and updates at Primary Care Health (Track 2). On Day 2, the programme will invite the Asia Pacific and regional experts to discuss and obtain consensus on the exercise and activity guidelines for early Childhood (Child Health Track 3) as well as discuss about future research to address the current gaps in women's health in Asia-Oceania (Maternal Health Track 4), focusing on screening and supplementation of Vitamin D in pregnancy. Asia Pacific experts from Malaysia, Thailand, Indonesia, Philippines, Myanmar, Vietnam, Hong Kong, Japan, China, India, Bangladesh, Sri Lanka, Australia, Fiji, Hawaii, and Mongolia as well as practitioners and healthcare professionals from Singapore will present their studies at this Conference.

Due to the ongoing COVID-19 situation, our conference will be virtual with presentation talks conducted through webinars. There will be a virtual scientific poster exhibition at the website.

We are happy again for the strong support for past five years by members of several key organisations - Perinatal Society of Singapore (PSS), College of Obstetricians & Gynaecologists, Singapore (COGS), College of Paediatrics & Child Health Singapore (CPCHS), Obstetrical & Gynaecological Society of Singapore (OGSS), SingHealth Duke-NUS OBGYN Academic Clinical Programme and SingHealth Duke-NUS Paediatrics Academic Clinical Programme. We are also grateful for the support given by Exercise is Medicine Singapore (EIMS), SingHealth Duke-NUS Sport & Exercise Medicine Centre, the SingHealth Duke-NUS Maternal & Child Health Research Institute & Federation of Asia and Oceania Perinatal Societies (FAOPS). We thank the sponsors and also the support of the NMRC (National Medical Research Council)'s collaborative centre grant – Integrated Platform for Research in Advancing Metabolic Health Outcomes in Women and Children (IPRAMHO) involving KKH, SingHealth Polyclinics and National Health Group Polyclinics and also KKH Centre Grant. We look forward to seeing you virtually at this exciting the Asia Pacific Maternal & Child Metabolic Health Conference and IPRAMHO International Meeting! We thank everyone for the support and wish everyone a fruitful academic experience.



Professor Tan Kok Hian
Chairperson, Organising Committee
Lead, NMRC Integrated Platform for Research in Advancing Metabolic Health Outcomes of Women and Children (IPRAMHO)
Head & Senior Consultant, Perinatal Audit & Epidemiology Unit, KK Women's and Children's Hospital
Benjamin Henry Sheares Professor in OBGYN, Duke-NUS

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SINGAPORE JOURNAL OF OBSTETRICS & GYNAECOLOGY

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Acknowledgments:
SMS Dr Koh Poh Koon, MOH
Prof Satoshi Kusuda, FAOPS

SCIENTIFIC PROGRAMME

Theme: *Towards Better Maternal and Child Health in the Asia Pacific*

DAY 1 – 21 JANUARY 2022, FRIDAY	
0800	Registration
0815	**Welcome Address** *Prof Alex Sia, Chief Executive Officer, KK Women's and Children's Hospital, Singapore*
0825	**Opening Remarks on Asia Pacific Collaboration for Maternal & Child Health** *Prof Satoshi Kusuda, President, Federation of Asia and Oceania Perinatal Societies*
0840	**SYMPOSIUM I - MATERNAL AND CHILD WELLNESS** **Chairperson:** Asst Prof Derek Tse Wan Lung, Director, Primary Care, Family Medicine Academic Clinical Programme; Senior Consultant, SingHealth Polyclinics, Singapore **Co-Chairperson:** Assoc Prof Lourdes Mary Daniel, Head & Senior Consultant, Department of Child Development, KK Women's and Children's Hospital, Singapore
0845	**A New Model of Holistic Maternal and Child Health Care - The Integrated Maternal and Child Wellness Hub** *Assoc Prof Chan Yoke Hwee, Chair, SingHealth Duke-NUS Paediatrics Academic Clinical Programme*
0900	**Advancing Child Developmental Assessment for Early Intervention** *Dr Pratibha Agarwal, Senior Consultant, Department of Child Development, KK Women's and Children's Hospital, Singapore*
0915	**Setting the Foundation with Good Nutrition in Early Childhood** *Dr Elaine Chew Chu Shan, Senior Consultant, Adolescent Medicine Service, KK Women's and Children's Hospital, Singapore*
0930	**Postnatal Depression Screening and Intervention in Primary Healthcare** *Assoc Prof Helen Chen Yu, Head, Psychological Medicine and Senior Consultant, Psychiatrist, Department of Psychological Medicine, KK Women's and Children's Hospital, Singapore*
0945	**Q&A Session** All Speakers and Dr Guo Xiaoxuan Dr Guo Xiaoxuan, Family Physician, Consultant, SingHealth Polyclinics, Singapore
1015	*Intermission*
1030	**SYMPOSIUM II - PHYSICAL ACTIVITIES AND EXERCISE FOR CHILDREN** ***Chairperson:*** *Dr Benny Loo Kai Guo, Consultant Paediatrician, General Paediatrics Service and Sports Medicine Service, KK Women's and Children's Hospital, Singapore* ***Co-Chairperson:*** *Adj Assoc Prof Benedict Tan Chi'-Loong, Senior Consultant and Chief of Sport and Exercise Medicine, Changi General Hospital, Singapore*

SCIENTIFIC PROGRAMME

Theme: *Towards Better Maternal and Child Health in the Asia Pacific*

DAY 1 – 21 JANUARY 2022, FRIDAY	
1035	**Are Our Children Moving Enough? A Physical Activity Guide for the Early Years** *Dr Miriam Lee, Senior Manager, Division of Children & Youth Programme Development, Sport Singapore, Singapore* *Dr Aaron Sim, Assistant Director, Division of Physical Activity & Weight Management, Health Promotion Board, Singapore*
1050	**Sedentary Behaviour: Finding the Right Balance and Seeking the Best Even When Still** *Dr Teresa Tan Shu Zhen, Consultant, General Ambulatory Paediatrics and Adolescent Medicine, Khoo Teck Puat – National University Children's Medical Institute, National University Hospital, Singapore*
1105	**Association Between Breastfeeding and Sleep Patterns in Infants and Preschool Children** *Dr Cai Shirong, Principal Investigator, Singapore Institute for Clinical Sciences, Agency for Science, Technology and Research (A*STAR), Singapore*
1120	**Nourishing Our Next Generation** *Asst Prof Mary Chong **Foong**-Fong, Assistant Professor, Saw Swee Hock School of Public Health, National University of Singapore, Singapore.*
1135	**Q & A Session**
1150	*Intermission*
1200	**LAUNCH OF THE SINGAPORE INTEGRATED 24-HOUR ACTIVITY GUIDELINES FOR EARLY CHILDHOOD** **IPRAMHO Initiatives for Maternal & Child Health** *Prof Tan Kok Hian, Organising Chairperson, Asia Pacific Maternal & Child Health Conference & IPRAMHO International Meeting 2022* *Lead, IPRAMHO, Singapore; & President, Perinatal Society of Singapore* **CPCHS Initiatives for Child Health** *Prof Lee Yung Seng, President of the College of Paediatrics & Child Health of Academy of Medicine Singapore, Singapore* **Singapore Integrated 24-Hour Activity Guidelines for Early Childhood** *Asst Prof Benny Loo Kai Guo, Chairperson, Singapore Integrated 24-Hour Activity Guidelines for Early Childhood Workgroup* **Opening Address by Guest of Honour** *Dr Koh Poh Koon, Senior Minister of State, Ministry of Health and Ministry of Manpower, Singapore* **Oral Poster Presentations**
1300	*Intermission*

SCIENTIFIC PROGRAMME

Theme: *Towards Better Maternal and Child Health in the Asia Pacific*

DAY 1 – 21 JANUARY 2022, FRIDAY	
1315	**LUNCH SYMPOSIUM III – SINGHEALTH DUKE-NUS MATERNAL & CHILD HEALTH RESEARCH INSTITUTE - LIFE COURSE APPROACH FOR A HEALTHIER AND MORE RESILIENT POPULATION** ***Chairperson****: Prof Tan Hak Koon, Chair SingHealth Duke-NUS OBGYN Academic Clinical Programme* **Key Domains and Platforms for Maternal & Child Health Translation** *Assoc Prof Derrick Chan Wei Shih, Director, KKH Research Centre, Senior Consultant and Head, Neurology Service, KK Women's and Children's Hospital, Singapore* **Learning Health Ecosystem for Maternal & Child Health Excellence** *Assoc Prof Ng Kee Chong, Chairman of Medical Board, KK Women's and Children's Hospital, Director, SingHealth Duke-NUS Maternal & Child Health Research Institute, Singapore*
1345	**Q & A Session**
1400	**TRACK I: SYMPOSIUM IV – IPRAMHO EDUCATION SESSION: TRAINING PROGRAM FOR DOCTORS AND RESIDENTS – EXCELLENCE IN PERINATAL HEALTH** ***Chairperson****: Assoc Prof Tan Lay Kok, Head & Senior Consultant, Department of Maternal Fetal Medicine, KK Women's and Children's Hospital, Singapore* ***Co-Chairperson****: Prof Victor Samuel Rajadurai, Vice President, Perinatal Society of Singapore & Senior Consultant, Department of Neonatology, KK Women's and Children's Hospital, Singapore*
1405	**Perinatal Epidemiology: Advancing Perinatal Health Standards in Singapore** *Prof Tan Kok Hian, Head Perinatal Audit & Epidemiology, KK Women's and Children's*
1425	**Metabolic Health in Pregnancy: Guidelines and Reality** *Prof Shakila Thangaratinam, WHO Collaborating Centre for Global Women's Health, UK*
1445	**Safe Maternity and Childbirth - A Multidisciplinary and Multifaceted Effort** *Assoc Prof Tan Lay Kok, Head & Senior Consultant, Department of Maternal Fetal Medicine, KK Women's and Children's Hospital, Singapore*
1505	**Communication, Collaboration and Consensus: Role of The Multidisciplinary Team in Optimising Mother and Child Health Care in High and Low Resource Settings** *Dr Ann Wright, Head, Peripartum Unit & Senior Consultant, Department of Maternal Fetal Medicine, KK Women's and Children's Hospital, Singapore*
1525	**Perinatal Birth Defect Clinic** *Dr June Tan Vic Khi, Head & Senior Consultant, Obstetric Ultrasound & Prenatal Diagnosis Unit, Director, Antenatal Diagnostic Centre, KK Women's and Children's Hospital, Singapore*
1545	**Q & A Session**
1600	*Intermission*

SCIENTIFIC PROGRAMME

Theme: *Towards Better Maternal and Child Health in the Asia Pacific*

DAY 1 – 08 JANUARY 2021, FRIDAY	
1615	**Perinatal - Neonatal Care in the Developed & Developing Countries** *Prof Victor Samuel Rajadurai, Vice President, Perinatal Society of Singapore & Senior Consultant, Department of Neonatology, KK Women's and Children's Hospital, Singapore*
1635	**Optimising Care of Infants with Congenital Heart Disease in The Perinatal Period** *Dr Jonathan Choo Tze Liang, Director, Fetal Cardiac Programme, Head & Senior Consultant, Cardiology Service, KK Women's and Children's Hospital, Singapore*
1655	**Perinatal Mental Health - Understanding the Mind of a Mother** *Assoc Prof Helen Chen Yu, Head, Psychological Medicine & Senior Consultant, Psychiatrist, Department of Psychological Medicine, KK Women's and Children's Hospital, Singapore*
1715	**Development Of a Nutrition and Physical Activity Assessment and Intervention Tool to Support Preconception, Pregnant and Postpartum Women Who Are Overweight or Obese** *Dr Ku Chee Wai, Clinician Scientist, Senior Resident, Division of Obstetrics and Gynaecology, KK Women's and Children's Hospital, Singapore*
1730	**Q & A Session**
1745	**Closing Remarks** *by Chairperson: **Assoc Prof Tan Lay Kok, Head & Senior Consultant, Department of Maternal Fetal Medicine, KK Women's and Children's Hospital, Singapore***
1750	-End of Programme-

SCIENTIFIC PROGRAMME

Theme: *Towards Better Maternal and Child Health in the Asia Pacific*

DAY 1 – 08 JANUARY 2021, FRIDAY PARALLEL AFTERNOON TRACK	
1400	**TRACK 2: SYMPOSIUM V – PROMOTING OPTIMAL PRIMARY HEALTH & POSTNATAL MANAGEMENT** ***Chairperson****: Assoc Prof Tan Ngiap Chuan, Associate Professor SingHealth Polyclinics, Director, Department of Research at SingHealth Polyclinics HQ, Vice-chair (Research), SingHealth-Duke NUS Family Medicine Academic Clinical Program (FM ACP), Singapore* ***Co-Chairperson****: Assoc Prof Tang Wern Ee, Senior Consultant and Director of the Clinical Research Unit, National Healthcare Group Polyclinics and Assistant Dean, Family Medicine, Lee Kong Chian School of Medicine, Singapore*
1405	**SingHealth High Risk Metabolic Postnatal Surveillance (SHRIMPS): Postnatal GDM Management** *Ms Asmira Bte Mohamed Rahim, Nurse Clinician, Obstetric Day Assessment Centre, KK Women's and Children's Hospital, Singapore*
1425	**Management of Postnatal Mothers with GDM at the Secondary - Primary Care Interface** *Dr Ng Lai Peng, Family Physician and Consultant, SingHealth Polyclinics, Singapore*
1445	**Experiences of Primary Care Physicians Managing Postpartum Care. A Qualitative Research Study** *Dr Poon Zhimin, Clinical Lecturer, Lee Kong Chian School of Medicine and Physician Faculty, SingHealth Family Medicine Residency, SingHealth Polyclinics, Singapore*
1505	**A cross sectional study of the common facilitators and barriers to post-partum diabetes mellitus screening among Singaporean mothers with a recent history of gestational diabetes mellitus (GDM)** *Dr Andrew Tan Yen Siong, SingHealth Polyclinics, Singapore*
1525	*Intermission*
1540	**Postnatal DM Screening of Mothers with GDM: Results of an Innovation to Improve Uptake** *Dr Andrew Tan Yen Siong, SingHealth Polyclinics, Singapore*
1600	**Integrated Hyperglycaemia Incentivised Postnatal Surveillance Study (I-HIPS) – Design of Wearable Devices (CGM & Activity Tracker) RCT for Postpartum Women** *Dr Elaine Quah Phaik Ling, IPRAMHO Senior Research Fellow, KK Women's and Children's Hospital, Singapore*
1620	**Anchor, An Inter-Agency Collaborative Programme for Children Exposed to Maltreatment** *Asst Prof Yeleswarapu Sita Padmini, Senior Consultant Department of Child Development, KK Women's and Children's Hospital, Singapore*
1640	**Q & A Session**
1655	**Closing Remarks** *by Chairperson: **Assoc Prof Tan Ngiap Chuan, Associate Professor SingHealth Polyclinics, Director, Department of Research at SingHealth Polyclinics HQ, Vice-chair (Research), SingHealth-Duke NUS Family Medicine Academic Clinical Program (FM ACP), Singapore***
1700	- End of programme-

SCIENTIFIC PROGRAMME

Theme: *Towards Better Maternal and Child Health in the Asia Pacific*

DAY 2 – 22 JANUARY 2022, SATURDAY (Track 3 – CHILD HEALTH)	
0900	**ASIA PACIFIC CONSENSUS WORKSHOP ON INTEGRATED 24-HOUR ACTIVITY GUIDELINES FOR EARLY CHILDHOOD** ***Chairperson****: Asst Prof Benny Loo Kai Guo, Consultant Paediatrician, General Paediatrics Service, Sport & Exercise Medicine Service, KK Women's and Children's Hospital, Singapore.* ***Co-Chairperson****: Assoc Prof Benedict Tan Chi'-Loong, Senior Consultant and Chief of Sport and Exercise Medicine, Changi General Hospital, Singapore.* ***Facilitator****: Dr Elaine Quah, IPRAMHO Senior Research Fellow, KK Women's and Children's Hospital, Singapore*
0910	**Consensus Introduction**: *Asst Prof Benny Loo Kai Guo & Assoc Prof Benedict Tan Chi'-Loong* **IPRAMHO Survey on Integrated 24-Hour Activity for Early Childhood (E-24 Study)** *Dr Elaine Quah, IPRAMHO Senior Research Fellow, KK Women's and Children's Hospital, Singapore* **Asia Pacific Consensus Statements Discussion** ***Panel Members*** *– Please see panel members list for Child Health Track, at the end of the programme* **Discussion on Collaborative Studies - Asia Pacific Survey on Integrated 24-Hour Activity for Early Childhood (ISAP & E-24 International Studies)**
1300	*Intermission*
1400	**Physical Inactivity and Screen Device Usage by Children and Adolescents in Sri Lanka** *Prof Sachith Mettananda, Department of Paediatrics, Faculty of Medicine, University of Kelaniya, Sri Lanka* **Nutritional Status of Children (Age < 5 Years Old) in Malaysia** *Prof Dr Muhammad Yazid Jalaludin,* ***Professor*** *of Paediatrics, Faculty of Medicine, University Malaya, Malaysia* **Prevention of Iodine Deficiency in Hong Kong** *Assoc Prof Betty But Wai Man, Department of Paediatrics, Queen Elizabeth Hospital, Hong Kong* **Gestational Age-Dependency of Body Mass Index Trajectories During the First 3 Years in Japanese Small-For-Gestational Age Children** ***Dr Kazumasa Fuwa*** *and Prof Ichiro Morioka, Department of Pediatrics and Child Health, Nihon University School of Medicine, Tokyo, Japan* **Update: Recommendations for Physical Activity for Thai Children Aged 0-6 Year Old** *A/Prof Pongsak Noipayak, Vice President, Navamindradhiraj University, Thailand* **Pre-Conception Counselling: NIMS-Spectrum-CDRC Model** *Prof MKC Nair, Developmental Paediatrician, Emeritus Professor Research & Formerly Vice Chancellor, Kerala University of Health Sciences, India*

SCIENTIFIC PROGRAMME

Theme: *Towards Better Maternal and Child Health in the Asia Pacific*

DAY 2 – 22 JANUARY 2022, SATURDAY (Track 3 – CHILD HEALTH)	
	The Association Between Mode of Delivery and Children Neuropsychological Development: A Birth Cohort Study *Dr Zhao Yanjun, Attending Physician, Department of Child Health Care, Shanghai Children's Hospital, China*
	Prevalence Of Metabolic Syndrome Among Filipino Children and Adolescents Seen In A Weight Management Center *Dr Divina Cristy Redondo-Samin, Chair, Medical Nutrition and Weight Management Center, Premiere Medical Center, Nueva Ecija, Philippines*
	The Development and Impact of Australian 24-hour Movement Guidelines for the Early Years *Senior Prof Anthony Okely, Director of Research, Early Start, University of Wollongong, Australia*
	Eliminating the double burden of malnutrition: The Indonesian experience *Prof Aman Bakhti Pulungan, President of Indonesian Pediatric Society, Indonesia*
1630	**Closing Remarks** *by Chairperson: Asst Prof Benny Loo Kai Guo, Consultant Paediatrician, General Paediatrics Service, Sport & Exercise Medicine Service, KK Women's and Children's Hospital, Singapore*
1640	-End of Programme-

SCIENTIFIC PROGRAMME

Theme: *Towards Better Maternal and Child Health in the Asia Pacific*

DAY 2 – 22 JANUARY 2022, SATURDAY

(Track 4 – MATERNAL HEALTH)

0900	**IPRAMHO-INTERNATIONAL COLLABORATIVE STUDY NETWORK** **Opening and Introduction** ***Opening by Lead:*** *Prof Tan Kok Hian, IPRAMHO Lead Investigator, KK Women's and Children's Hospital, Singapore* ***Facilitator:*** *Dr Ryan Lee, IPRAMHO Investigator, KK Women's and Children's Hospital, Singapore*
0910	**Asia Pacific Survey on Vitamin D Screening & Supplementation in Pregnancy** ***Panel Members*** *– Please see panel members list for Maternal Health Track, at the end of the programme* **Consensus Building Proposal Discussion** **Vitamin D Screening & Supplementation in Pregnancy – Asia Pacific Perspectives** **Maternal Vitamin D Status and Outcomes in Singapore** *Dr Loy See Ling, Assistant Professor, Duke-NUS Medical School, Senior Research Fellow, Department of Reproductive Medicine, KK Women's and Children's Hospital, Singapore* **Vitamin D and Pregnancy** *Assoc Prof Wu Ting, Chengdu Women's and Children's Central Hospital, School of Medicine, University of Electronic Science and Technology of China, Chengdu, China* **Maternal Vitamin D status and its related factors in Thailand** *Assoc Prof Busadee Pratumvinit, Department of Clinical Pathology, Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand* **Vitamin D Deficiency in Pregnant Women – Asia Pacific Perspective** *Prof Milind R Shah, Naval Maternity & Nursing Home, India & Deputy Secretary General Asia Oceania Federation of Perinatal Societies, India* **Vitamin D status during late pregnancy on the development of malnutrition and allergic diseases in the first year of life** *Assoc Prof Yit Siew Chin, Head of Community Nutrition Unit, Department of Nutrition, Faculty of Medicine and Health Sciences, Universiti Putra Malaysia, Malaysia* **Maternal Vitamin D Status : Related Factors and Outcomes in Indonesia** *Dr Raden Tina Dewi Judistiani, Public Health Depertment, Faculty of Medicine Universitas Padjadjaran, Bandung, Indonesia* **IPRAMHO-INTERNATIONAL COLLABORATIVE STUDIES** **Discussion on the Next Steps in IPRAMHO-International Collaboration** *Prof Tan Kok Hian, IPRAMHO Lead Investigator, KK Women's and Children's Hospital, Singapore (GDM Studies*
1300	*-End of Programme-*

PANEL MEMBERS FOR CHILD HEALTH TRACK

1. Asst Prof Benny Loo Kai Guo, KKH, Singapore
2. Assoc Prof Benedict Tan Chi'-Loong, CGH, Singapore
3. Prof Victor Samuel Rajadurai, KKH, Singapore
4. Assoc Prof Tan Ngiap Chuan, SingHealth Polyclinics, Singapore
5. Dr Teresa Tan, NUH, Singapore
6. Dr Elaine Quah, KKH, Singapore
7. Asst Prof Mary Chong Foong-Fong, NUS, Singapore
8. Dr Cai Shirong, Singapore Institute for Clinical Sciences, Singapore
9. Dr Elaine Chew, KKH, Singapore
10. Dr Miriam Lee, SportSG, Singapore
11. Dr Aaron Sim, HPB, Singapore
12. Dr Zhao Yanjun, Department of Child Health Care, Shanghai Children's Hospital
13. Prof MKC Nair, Kerala University of Health Sciences, India
14. Dr Divina Cristy Redondo-Samin, Philippines
15. Assoc Prof Nobuhiko Nagano, Nihon University, Japan
16. Prof Ichiro Morioka, Nihon University, Japan
17. **Dr Kazumasa Fuwa, Nihon University, Japan**
18. Assoc Prof Pongsak Noipayak, Vice President, Navamindradhiraj University, Thailand
19. Prof Sachith Mettananada, University of Kelaniya, Sri Lanka
20. Assoc Prof Betty BUT Wain Man, Queen Elizabeth Hospital, Hong Kong
21. Senior Prof Anthony Okely, Faculty of Social Sciences and Director of Research at Early Start at the University of Wollongong, Australia
22. Prof Aman Bakhti Pulungan, President of Indonesian Pediatric Society, Indonesia
23. Dr Areekul Amornsriwatanakul, Mahidol University, Thailand
24. Dr Huynh Manh Nhi, Hospital for Traumatology and Orthopedics, Vietnam
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COMMENTARY

Maternal & Child Health Research and Translation for Optimizing Human & Health Potential

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Introduction

The objectives of maternal and child care focus traditionally on the reduction of maternal, perinatal, infant and childhood mortality and morbidity. There has been growing emphasis in maternal and child health on the promotion of reproductive health and the physical & psychosocial development of the child and adolescent within the family to enhance and maximise human potential. This is propelled by increasingly strong interest in having a life course approach to maternal and child health and applying it to the clinical practice. (1-5)

The Developmental Origins of Health and Disease (DOHaD) hypothesis and Fetal Origins of Adult Disease (6-10) concept postulate that exposure to certain environmental influences during critical periods of development may have significant consequences on an individual's short- and long-term health. The developing fetus or child, if exposed to an adverse maternal uterine or childhood environment (caused by insults such as poor or excessive nutrition or infections), responds by developing adaptations, that not only foster its immediate viability, but also affect its survival if a similar environment is encountered later in life, including resultant susceptibility to chronic diseases. A life course approach, based on the science, research and practice of the DOHaD, aims at improving the effectiveness of early interventions throughout a person's life, especially in early years, to enhance human potential and healthy development.

Life Course Approach

The life course concept recognizes the best opportunities to prevent and control diseases at key stages of life from preconception through pregnancy, infancy, childhood and adolescence, through to adulthood. The approach focuses on a healthy start to life and targets fulfilling the needs of people at critical periods throughout their lifetime. It promotes timely health & social investments and implementation with a high rate of return for public health and the society & economy, by addressing the causes, not the consequences of ill health.

The first thousand days (from conception to age 2) is the most critical and has significant influence on long term health and development. The fetus, infant & child at these stages of development are most adaptable. They respond to a range of factors in the environment resulting in changes in their epigenetic makeup with lifelong effects including increased susceptibility to the adverse development of non-communicable diseases such as diabetes, obesity and hypertension in adulthood.

The Developmental Origins of Health and Disease (DOHaD) concept is transgenerational in nature and the burden is substantial. Consequences will be huge if these are not addressed in the proactive preventive style of life course approach. A huge burden to current world is ill-health from diabetes and obesity. The prevention and management of diabetes mellitus and obesity in the population should start early (preconception, fetus in the womb, infant & child) rather than at a later stage of life, to gain optimal preventive value and maximum leverage on quality of life and human potential. Optimal nutrition, physical activities, exercise and weight management before, during and after pregnancy have a strong influence in prevention and management of diabetes and obesity and on the well-being of mothers and development of infants. The need for optimal perinatal nutrition and optimal lifestyle at early critical stages is paramount to improve metabolic health of the population.

Life Course Program Indicators

It is crucial to continually evaluate the science of the developmental origins of health and disease; as well as the impact and challenges of life course program implementation. Research and programs relating to life course approach to optimize human potential are now in vogue.

The core features for research and programs in life course approach include equity, resource realignment, impact, intergenerational wellness, and life course evidence. (11) Some examples of life course indicators, based on these core features and organized by descriptive categories (11), are: Childhood experiences - Substantiated child maltreatment including physical abuse, psychological or emotional maltreatment; Community health policy - Baby-Friendly Hospitals: proportion of births occurring in baby-friendly hospitals; Community wellbeing - Small for gestational age: proportion of singleton live-born infants whose birth weight is below the 10th percentile for gestation; Early life services - Early intervention: proportion of children aged 0–3 years who received early intervention services; Family wellbeing - Adolescent smoking: percentage of adolescents who smoked cigarettes; Health care access and quality - Children receiving age-appropriate immunizations; Mental health - Postpartum depression: percentage of women screened for postpartum depression; Reproductive life experiences Diabetes during pregnancy: percentage of adult women with GDM; Reproductive life experiences - Teen births; Social capital Incarceration rate - prevalence of juveniles detained in residential placement.

One key weakness for life course approach and research is the lack of indicators based on longitudinal data. The prospective birth cohort study design is ideal for examining diseases of public health importance, as its inherent temporal nature and provision of longitudinal data render it advantageous for studying early life influences on health outcomes and research questions of etiological significance. Information and insights gathered from these longitudinal studies are useful for developing beneficial life course programs.

Evolving Indicators - The Millennial Morbidities in Maternal & Child Health

As we journey into the 21st century, the health challenges faced by our population has changed and evolved – particularly in the maternal and child population group. Palfrey et al discussed this in the context of community paediatrics early this century. (12) They traced the trends of morbidity through the last century and identified the new morbidities in this century resulting from disorders of the bioenvironmental interface. These millennial morbidities apply equally to maternal and child health. In addition to widening health disparities, there are two key health areas that require deep attention - namely metabolic & mental health in the sphere of maternal and child wellness in this 21st century. The Evolving Trends in Pediatric Morbidity is depicted in Fig. 1.

Fig 1. Evolving Trends in Pediatric Morbidity (Palfrey et al 2005)

- Classical Pediatric Morbidity (1900s–1950s)
  - High infant mortality rates
  - Poor nutrition
  - Few cures for chronic disease
  - Epidemics (eg, influenza, polio)
  - Diseases of overcrowding
- The New Morbidity (1960s–1980s)
  - Family dysfunction
  - Learning disabilities
  - Emotional disorder
  - Functional distress
  - Educational needs
- Beyond the New Morbidity (1980s–2000s)
  - Social disarray
  - Political ennui
  - New epidemics (eg, violence, acquired immunodeficiency syndrome, crack cocaine, homelessness)
  - Increased survivorship
  - High-technology care
- Millennial Morbidity (2000–present): Disorders of the Bioenvironmental Interface
  - Socioeconomic influences on health, including poverty
  - Health disparities

Birth Cohort Research Studies in the World

There are vigorous efforts globally and nationally to address these important gaps in longitudinal knowledge and gain new millennial insights (especially in mental and metabolic health) starting in pregnancy or even preconception, for better precision of application of life course programs. A 2013 report on 'Pregnancy and Birth Cohort Resources in Europe' stated 56 fulfilled the inclusion criteria of enrollment of least 300 mother–child pairs during pregnancy or at birth and with postnatal data; compassing a total of more than 500000 live-born European children. (13) A 2020 paper on 'An Inventory of European Birth Cohorts' found references to 111 birth cohorts, 45 of which began enrolment at birth. These cohorts began between 1921 and 2015 and represented 19 countries, with varying sample sizes (from 236 to 21,000 children). (14) Another paper on Birth Cohort Consortium of Asia in 2017 reported 23 birth cohorts established in 10 Asian countries, consisting of approximately 70,000 study subjects in the consortium. (15)

Examples of European birth cohorts include Danish National Birth Cohort Pregnancy (prospective cohort with pregnancy recruitment and 94,837 children) (16); Avon Longitudinal Study of Parents & Children of United Kingdom (prospective cohort with pregnancy recruitment and 14,062 children) (17); and Norwegian Mother and Child Cohort Study (prospective cohort with pregnancy recruitment and 108,500 children). (18)

Two examples of Asian birth cohorts are Kyushu Okinawa Maternal and Child Health Study and the Shanghai Birth Cohorts. The Kyushu Okinawa Maternal and Child Health Study was a prospective prebirth cohort study performed to examine risk and preventive factors for maternal and child health problems. In total, 1757 pregnant women Between April 2007 and March 2008 were recruited. (19) The Shanghai Birth Cohorts were designed to have two recruitment points, to form a preconception cohort of 1180 couples who came to two preconception care clinics for care in Shanghai from 2013 to 2015 and a pregnancy cohort of 3426 pregnant women and their husbands. (20)

Birth Cohort Research Studies in Singapore

In Singapore, the major cohorts are the GUSTO birth cohort, the S-PRESTO preconception cohort and the NORA antenatal pregnancy cohort. Growing Up in Singapore Towards Healthy Outcomes (GUSTO) study, has yielded local-based evidence on child and maternal health, enabling us to better fine-tune some of our practices and policies. The GUSTO study recruited pregnant women aged 18 years and above, attending their first trimester antenatal dating ultrasound scan clinic at Singapore's two major public maternity units, namely KK Women's and Children's Hospital (KKH) and National University Hospital (NUH) between June 2009 and September 2010 with a total of 1176 babies were born. (21)

The Singapore Preconception Study of Long-Term Maternal and Child Outcomes (S-PRESTO) is a preconception, longitudinal cohort study that studies the effects of nutrition, lifestyle, and maternal mood prior to and during pregnancy on the epigenome of the offspring and clinical outcomes. Between February 2015 and October 2017, the S-PRESTO study recruited 1039 Chinese, Malay or Indian (or any combinations thereof) women aged 18-45 years in KK Women's and Children's Hospital (KKH) and who intended to get pregnant and deliver in Singapore, resulting in 1032 unique participants and 373 children born in the cohort. (22) The S-PRESTO study has given us interesting insights on fertility, fecundability and maternal preconception health.

The Neonatal and Obstetric Risk Assessment (NORA) pregnancy cohort study was set up to assess clinical, biochemical and biophysical markers for risk assessment and prediction of the outcomes early in pregnancy. A total of 1013 patients in KK Women's and Children's Hospital between September 2010 and October 2014 were recruited in the first trimester. Women were followed at 18 to 22 weeks, 28 to 32 weeks and 34 weeks and above, till their postnatal discharge from the hospital. The NORA Cohort has established locally derived and gestational age-specific reference intervals or norms for the five thyroid hormone parameters, progesterone, sFlt and PlGF. It has enabled us to test predictive robustness of new biomarkers including extracellular vesicles and sFlt/PlGF ratio for preeclampsia screening in obstetric population. It also helps to identify trajectories and patterns of antenatal depression and anxiety in women and their associations with obstetric outcomes and neonatal anthropometry. (23-29)

Translation and Implementation of Cohort Research

To deliver better support for our children and their mothers, it is important to translate research findings into practice programs, pilots and interventions. The Integrated Platform for Research in Advancing Metabolic Health Outcomes in Women and Children (IPRAMHO) was set up by KKH, SingHealth Polyclinics and the National Healthcare Group Polyclinics to develop seamless integrated model of care through optimal translation, implementation and evaluation of effective population prevention strategies from birth. In this, IPRAMHO facilitated evidence-based screening and risk management of gestational diabetes mellitus (GDM)

which has been associated with higher risk of pregnancy complications. Working with the Temasek Foundation Cares GDM Care Programme on early GDM screening and intervention for pregnant women, has resulted in lowered rate of macrosomia. (30) The team has also made significant contributions to the body of knowledge on metabolic health - both locally and internationally; by translating findings into digestible guidelines that mothers and children can follow. (31-39)

Evidence-based findings should inform service design to better support the population. The Integrated Maternal and Child Wellness Hub (IMCWH) at Singapore Punggol Polyclinic, was established by KKH, SingHealth Polyclinics and Temasek Foundation since 2019. Using a mother-child dyad care model, the hub provides integrated primary care services for both mother and child. These include child's developmental screening, and maternal screening for post-natal depression a risk factor for both mother and child. More than 500 children assessed as having higher risk of developmental delays, have been supported. (40)

Moving Life Course Approach Forward

There is now a strong momentum going forward to further pursue robust life course research, effective translation and sustainable implementation. There are currently several initiatives to move the translation needle for life course science.

The SingHealth Duke-NUS Maternal and Child Health Research Institute (MCHRI) was launched at KK Women's and Children's Hospital (KKH) by Masagos Zulkifli, Singapore's Minister for Social & Family Development and Second Minister for Health on Oct 8 2021. The MCHRI has been the result of efforts of two SingHealth Duke-NUS Academic Clinical Programmes (ACPs) - Paediatrics and Obstetrics & Gynaecology (OBGYN) to further advance clinical care, research and education on child and maternal health. The MCHRI is taking on a life-course approach for a more resilient community and to maximise human potential of the nation. The MCHRI will serve as the centre of excellence for maternal and child health research, to transform and improve national health in Singapore. Its mission is to support the growth and development of every woman and child to their fullest potential, toward optimising Singapore's human capital. (41) The Centre for Holistic Initiatives for Learning and Development (CHILD), established in NUS will provide a multi-disciplinary approach to translating critical research to intervention, to improve the health and developmental outcomes of children in Singapore and beyond.

Healthy Early Life Moments in Singapore (HELMS) is a prevention model of care that is being piloted in KKH. The goals of HELMS are to develop a life-course model of care that highlights preventive health during preconception, and to implement a system of maternal and child care that represents the clinical translation of decades of scientific evidence related to early fetal programming from preconception through pregnancy to childhood. The model of care will incorporate as its core a novel mobile platform lifestyle behavior tool. (42)

The Integrated Hyperglycemia Incentivized Postnatal Surveillance (I-HIPS) Study, a theme project on lifestyle interventions to prevent post-partum T2D in Asian women with a history of GDM, of the National Medical Research Council (NMRC) Large Collaborative Grant on Metabolic Health in Asian Women and their Children, aims to develop a model of postpartum care for GDM. The randomised controlled trial (RCT) study based in KKH, aims to study the use of wearables in lifestyle interventions to improve the quality of GDM postnatal follow-up care and achieve reduction of subsequent development of Type 2 diabetes mellitus in women with GDM. (43)

A Community-enabled Readiness for first 1000 Days Learning Ecosystem (CRADLE) aims to develop a self-learning eco-community throughout the pregnancy and early childhood to promote parenting self-efficacy among first-time parents. (44) It is a three-arm RCT that includes standard routine care; behavioural nudges (text messages) along with the use of a social media platform; and midwife-led continuity care involving individualised teleconferencing sessions, during pregnancy and post-delivery. Findings from this KKH study will provide further insights into the implementation of early parenting and mother-child care programmes.

Conclusion

Developmental concepts and hypotheses have provided the rationale for assembling birth cohorts in KKH and the world. Current worldwide interest in trans-generational population metabolic health makes it essential for us to invest in robust cohort studies, to shed more light in improving population health, as well as to develop & implement good life course interventions, programs and initiatives in Singapore and globally. This momentum should be appreciated, facilitated and accelerated by all stakeholders of maternal and child care.

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SINGAPORE INTEGRATED 24-HOUR ACTIVITY GUIDELINES FOR EARLY CHILDHOOD

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Introduction

Early childhood is a critical period for growth and development, forming the foundation for future and lifelong well-being.(1) Adopting healthy lifestyle behaviours in early childhood can potentially influence and shape behaviours later in life.(2) Frameworks have been developed, such as from the Harvard Centre on the Developing Child, and are advocated for early childhood health promotion and disease prevention;(3) these form key strategies in reducing future non-communicable diseases (NCDs). The World Health Organization's (WHO's) Global Action Plan for the Prevention and Control of Non-Communicable Diseases (2013-2020), highlighted that exposure to risk factors of NCDs often starts in early life and interventions in early childhood often offer the best protection against these NCDs.(4)

The current Singapore guidelines on physical activity for children less than 7 years were updated in 2013.(5) Over recent years, there is emergent evidence surrounding physical activity, sedentary behaviour and sleep for this group of children, and how these concepts relate to one another, within a 24-hour period, for better health outcomes.(6-10) This workgroup also integrated dietary choices and eating behaviours, which are closely linked to movement behaviours in terms of, but is not limited to optimising energy balance, which is important for obesity prevention.(11) Encapsulating all these elements, we developed the Singapore Integrated 24-hour Activity Guidelines for Early Childhood (0 to <7 years).

Health Outcomes of Lifestyle Behaviours

We present the global evidence for health outcomes of physical activity, sedentary behaviour, sleep, and diet and eating habits in children aged 0 to 5 years.

Physical activity provides many health benefits in early childhood, including motor and cognitive development, cardiometabolic, musculoskeletal and psychosocial health.(12) Children in this age group should be encouraged to regularly participate in a variety of activities regularly; those who engage in more physical activity overall and/or at a higher intensity (i.e. moderate to vigorous or vigorous intensity), consistently enjoyed favourable health benefits.(13-15) Tummy time (i.e. prone position) appears to be positively associated with motor development for infants,(16, 17) while outdoor play (under adult supervision) is reported to confer health benefits on preschoolers.(18)

Excessive sedentary behaviour and screen time can have detrimental health effects to children in their early years.(19) Prolonged sedentary screen time is adversely associated with adiposity, poor motor and cognitive development and impaired psychosocial health.(20-22) Indeed, prolonged sitting, reclining or lying are also unfavourably associated with adiposity or motor development.(23, 24)

Sleep is essential for growth and good health in the early years.(25) As a newborn grows, he/she regulates his/her sleep through the establishment of a circadian cycle with less daytime naps and more night-time sleep.(26, 27) Children of different ages require different optimal sleep durations.(28-30) However, shorter sleep in children could be the result of increased screen time around bedtime and collectively may be associated with higher levels of adiposity, poor growth and emotional dysregulation.(31)

A healthy diet provides optimal nutrition for a child's physical and cognitive development.(32) Nutritional needs and eating patterns change with each progressive stage of the childhood.(33) Setting good eating habits and shaping positive eating behaviours in the early years help form the foundation for a healthy diet, which can reduce the future risks of overweight or obesity, as well as protect against NCDs.(34)

Local studies

The Growing Up in Singapore Towards healthy Outcomes (GUSTO) study is a longitudinal cohort investigation that commenced in 2009, to investigate what influence early development has on body composition and metabolic health.(35) Studies of screen time and sedentary behaviour in the GUSTO cohort showed that the average screen-time for infants (12 months) and toddlers (2 years) was 2.0 and 2.4 hours/day respectively. (36, 37) Screen-time in infants was negatively associated with later cognition (composite IQ and verbal IQ), while for toddlers, higher screen time was associated with less physical activity and greater sedentary behaviour. (36, 38) The sleep duration of children less than 2 years of age in the GUSTO cohort was significantly associated with body length; shorter sleep duration was also associated with higher body mass index and shorter body length for those at 3 months of age. (39)

Infants in the GUSTO cohort who were fed breast milk showed better gross motor skills at 2 years and better cognitive performance at both 2 and 4.5 years of age, when compared to formula-fed infants. (40) Higher intake of sugar sweetened beverages in young children (18 months to 5 years) were associated with higher levels of adiposity and greater risk of overweight or obesity. (41) A separate cross-sectional study of 78 Singaporean preschoolers, using wrist-worn accelerometers, showed that the children spent a median of 7.8 hours/day in sedentary behaviour and 0.5 hours/day in moderate- to vigorous-intensity physical activity. The same study also revealed that the preschool teachers were not familiar with physical activity guidelines and that parents reported very little outdoor playtime with children after preschool.(42)
GUSTO also reviewed the adherence to (Canada/Australia) 24-hour movement guidelines in 864 children at 5.5 years old and results showed that few children (5.5%) met all of the movement guidelines.(43)

A more recent study examined the proportion of preschoolers meeting the WHO guidelines on physical activity, sedentary behaviour and sleep, and the effect on their quality of life. More than 2000 parents of preschoolers were surveyed and only 9.6% met all of the recommendations, while 12.6% did not meet any of the recommendations. This study also showed that the health-related quality of life increased as the preschoolers achieved more recommendations.(44) The nationally representative study in terms of ethnicity is apparently the largest prevalence study in Singapore on sleep, physical activity and sedentary behaviour among preschoolers.

Aim of Consensus Statement

This guidance provides a holistic approach for developing and maintaining good health amongst children in early childhood (i.e. pre-primary schooling age) in Singapore, by integrating physical activity, sedentary behaviour, sleep, and dietary and eating habit advice. It is equally important to understand that these activities are closely related in influencing health outcomes and time-use behaviour, and to organise them within a daily 24-hour period. Incorporating healthy dietary and eating habits with movement behaviours encourage children to practise and adopt these recommended habits and behaviours at a young age thereby conferring good health.

These recommendations are for all healthy infants (0 to <1 year), toddlers (1 to <3 years) and preschoolers (3 to <7 years), regardless of gender, cultural background or socioeconomic status. Children with special needs or medical conditions should consult a qualified medical professional for additional guidance.

Methods

The consensus workgroup included physicians (neonatologists, paediatricians, sports physicians and family physicians), allied health professionals (dietitian, exercise physiologists), academics, educators and researchers from multiple institutions and organisations.

The workgroup assessed the evidence reviews conducted for the WHO Guidelines on Physical Activity, Sedentary Behaviour and Sleep for children under 5 years of age, and the 24-Hour Movement Guidelines for children less than 5 years of age from Canada, Australia and South Africa.(6-9) Relevant evidence for children aged 5 to less than 7 years from WHO Guidelines on Physical Activity and Sedentary Behaviour and the 24-Hour Movement Guidelines for Children and Youth/Young People from Canada and Australia were also reviewed.(45-47) The literature was updated to September 2021 through an electronic search of Medline databases and the keywords used included "infant", "toddler", "preschool", "physical activity", "sedentary behaviour", "sleep", "eating habit" and "diet". The update included systematic reviews, randomised control trials and cohort studies. Only results in English language were considered. The health outcomes included cardio-metabolic health, physical fitness, bone and skeletal health, adiposity, motor and cognitive development, behaviour development and psychosocial health.

The workgroup used the GRADE-ADOLOPMENT approach,(48) which builds on the GRADE Evidence to Decision (EtD) framework,(49) to provide a structured and transparent methodology for healthcare recommendations. It evaluates the strength of recommendations from associated guidelines and the quality of evidence supporting the recommendations. Regular meetings were conducted for workgroup members to discuss and achieve a consensus on the adoption and/or adaption of the WHO guidelines for the local paediatric population.

These recommendations are intended for healthcare professionals providing holistic care to infants, toddlers and preschoolers including education and the promotion of healthy activities that form the foundation for life-long well-being. The full EtD frame work is included as supplementary material.

Consensus Statements for Infants (0 to <1 year)

Physical Activity: Be physically active several times a day, where more is better, in a variety of forms and within a safe and supervised environment. Activities should include non-screen-based interactive floor-based play and tummy time. For those not yet mobile, tummy time should start soon after birth, building up towards at least 30 minutes spread throughout the day. Planning a daily routine of physical activities may be helpful.

Supporting Paragraph

Physical activity in infants is associated with improved measures of adiposity, motor skill development, psychosocial, and cardiometabolic health indicators.(12) For infants not yet mobile, tummy time, defined as awake prone positioning on a firm surface, is positively associated with multiple developmental aspects.(6, 50) Tummy time has positive effects on global development,(51) particularly gross motor development,(52, 53) body mass index and prevention of brachycephaly.(54, 55) Infants can start on tummy time soon after birth and build up from a few minutes towards at least 30 minutes spread throughout the day. Infants above 3 months of age can aim to achieve a minimum of 1 hour of prone activities spread throughout the day. During tummy time, the infant can be encouraged to play and should be supervised by a responsible adult caregiver.

Sedentary Behaviour: Avoid restraining and leaving infants unattended for more than 1 hour at a time. Any form of screen time, including background screen time, is not recommended. When the infant is seated, reclined or lying down, caregivers are encouraged to engage the infant in singing, reading, storytelling and imaginative play. Having a daily routine for activities, sleep and meals may be useful in reducing the amount of sedentary behaviour.

Supporting Paragraph

Infants spend most of their time sleeping, which can be up to 80% in newborns.(59) Good sleep is well known to improve cognitive,(60, 61) physical,(62) and social outcomes,(63) reduce obesity as well as reduce the risk of sudden infant death syndrome.(64-66) Good quality sleep improves family well-being and is an important predictor of maternal health.(67, 68) Although there are cultural differences in sleep duration and practices,(69) setting bedtime routines and providing a conducive sleep environment can improve sleep duration.(26, 70-74) Good sleep safety practices include infants sleeping supine in their own cot and in the same room as the caregivers.(75-77)

Diet and Eating Habit: Breastfeeding is recommended for infants when possible. From 4 to 6 months of age, introduce a variety of development- and culture-appropriate solid foods of various textures and flavours, that is prepared with no added salt and sugar. Provide a daily routine of having meals spaced 2-3 hours apart in the daytime to avoid overfeeding.

Supporting Paragraph

Breast milk supports an infant's nutritional requirements during the first 6 months of life, and provides antibodies to support an infant's health, growth and development.(78, 79) It is recommended that infants are exclusively breastfed for at least the first 6 months of life, with continued use of prescribed medication or vitamin and mineral supplementation if recommended by the physician. Mothers should adhere to food safety and hygiene recommendations if breast milk is expressed and stored. Should human milk be unavailable, infants should be provided with formula milk. In support of healthy bone development, vitamin D supplementation of 400IU per day is recommended for fully and partially breast-fed infants due to the low bioavailability in breast milk.(79) With increasing energy and nutrient requirements beyond what breast milk can provide, infants should be started on complementary foods between 4-6 months of age, depending on their developmental readiness.

Iron-containing foods should be encouraged as a first line of defence to prevent deficiency in infants. These can include iron-fortified cereals, pureed meat and poultry, plain tofu or legumes, with textures suited to the infant's stage of development. Salt should not be added to foods for infants as their kidneys are immature and unable to excrete excess salt, thus presenting a safety concern. Food and drinks containing added sugars should be avoided for infants, reducing the risk of dental caries and preventing a learned preference for sugar. Overconsumption of sugar-laden food has been associated with an increased risk of becoming overweight or obese.(41, 79-81) There is no evidence that delaying the introduction of potentially allergenic food prevents food allergies.(79) Therefore, potential allergenic foods such as dairy products, egg, wheat, crustacean shellfish, fish, soy, tree nuts and peanuts should be introduced as part of complementary foods. For infants with a family history of atopy or mild eczema, it is recommended that egg and peanut be introduced one at a time, between 4-6 months of age, once the infant is able to tolerate solid food.(82)

Repeated exposure to a variety of food across all the main food groups (grains and alternatives, lean proteins and alternatives, fruits, and vegetables) is necessary to promote food acceptance and provide infants with the range of required nutrients. Caregivers should strive to recognise an infant's hunger and satiety cues that will support responsive consumption by timely initiation and termination of the feeding process.(82) Evidence reveal non-responsive caregiver feeding practices, such as the use of extremely controlling, restrictive, rewarding or pressure feeding, to be associated with a higher risk of childhood obesity. Thus, it is recommended that guidance on responsive feeding be provided to caregivers, so as to promote appropriate weight gain among infants.(83, 84)

Consensus Statements for Toddlers (1 to <3 years)

Physical Activity: Accumulate at least 180 minutes in a variety of physical activities, where more is better, at any intensity spread throughout the day within a safe environment. Daily outdoor play for toddlers is highly encouraged. Caregivers should actively participate in all forms of physical play with toddlers.

Supporting Paragraph

Toddlers should engage a spread of physical activities of light, moderate and vigorous intensities. (12) This should include a variety of physical activities that are fun and encourage exploration, involving movement skills such as walking, running, crawling, climbing, balancing, bending, dancing and playing with balls. The more active play the toddlers achieve, the better. Toddlers who engaged in at least an hour of moving freely each day had significantly stronger object and locomotor skills. (85) Caregivers should participate actively with toddler during both indoor and outdoor play, as such positive interactions are associated with better developmental skills, reduced risk for obesity, and accumulate physical activity.(86, 87)

Structured and unstructured play are important for a toddler's global development and these activities can take place in indoor and outdoor environments.(88) In childcare centres, more than half of toddler's indoor moderate to vigorous physical activities occur in modifiable open spaces and during class transitions. Enhancing childcare structure quality and inclusion of modifiable open spaces can promote physical activity and reduce sedentary time for toddlers.(89, 90) Being outdoors also increases physical activity, with more playtime and time spent engaged in moderate to vigorous physical activities. In turn, these are associated with better sleep outcomes in toddlers.(57) Furthermore, spending at least 1 hour in outdoor play daily can help prevent the early onset of myopia.

Sedentary Behaviour: Avoid restraining toddlers on a seat for more than 1 hour at a time. Screen time, regardless of the type of device, is not recommended for toddlers younger than 18 months of age, and should be limited to less than 1 hour per day for toddlers 18 months and above. When sitting or lying down, it would be most beneficial to engage the toddler in singing, reading, storytelling or imaginative play.

Supporting Paragraph

Sedentary behaviour amongst toddlers, include the use of any screen device, reading, drawing, eating, travelling in a vehicle, whilst sitting, reclining or lying.(91) Prolonged periods of being restrained in a seat or in a supine position is associated with high levels of adiposity and less favourable motor development.(19, 92) Screen-based sedentary behaviours also have unfavourable effects on motor and cognitive development, psychosocial health, social skills (ability to develop positive relationships and interact with others effectively), physical activity and poor sleep outcomes across early childhood.(19, 57) International guidelines consistently recommend that toddlers should not be restrained on their seats for more than 1 hour at a time, and those of less than 2 years of age should have no exposure to screens.(6-8, 93) Even when sedentary, engaging in interactive activities with toddlers such as reading, singing and storytelling has greater potential for cognitive and social development, compared to screen time and solitary activities.(19, 94)

Sleep: Have a daily total amount of 11-14 hours of sleep with regular sleep and wake-up times. Develop a bedtime routine and keep to a consistent bedtime. Provide a conducive sleep environment and avoid screen time 30 minutes before night-time sleep.

Supporting Paragraph

Develop a bedtime routine and keep to a consistent bedtime.(95, 96) Provide a conducive sleep environment that is dark, quiet and of comfortable temperature, and avoid screen time before night-time sleep.(97) Recent literature supports that short sleep duration during toddlerhood is associated with greater risk of depressive symptoms and poorer temperament in later childhood.(98, 99) Short sleep duration is also linked to obesogenic eating behaviours.(100-103) Toddlers with short sleep durations also tend to have higher blood pressure later in life. (104)

Regular bedtimes and routines help toddlers to sleep longer and better,(95, 96) and may be important for obesity prevention. (105) Adaptive bedtime activities like storytelling or cuddling help toddlers sleep longer and have fewer sleep problems.(106) Screens emit blue light that suppresses endogenous melatonin production, in turn resulting in shorter sleep duration, later bedtimes and longer time to fall asleep.(107, 108) Poor quality sleep environment (e.g. crowded, noisy and uncomfortable) is associated with shorter sleep durations, later bedtimes and longer sleep latency.(109, 110)

Diet and Eating Habit: Continue to increase the variety of foods offered to your toddler and wean off milk as the main source of nutrition. Introduce healthy family meals and offer whole milk and water, while establishing a structured routine for meal and snack times. Avoid screen time during meal times. Using food to soothe your toddler or as a reward is discouraged.

Supporting Paragraph

Toddlers are reliant on caregivers to establish their feeding habits. These include what, when and how food is consumed. (79, 80, 111, 112) Fresh, minimally-processed foods should be prepared with little or no added sugar and salt, with continual exposure and/or provision of foods across all major food groups that are in unison with healthy family eating habits. As established in the latest Dietary Guidelines for Americans,(79) there is no clear evidence that formula milk should be continued beyond 12 months of age. Pasteurised full cream milk, or fortified unsweetened soy milk, can be incorporated in the toddler's diet from around 12 months of age to meet protein, calcium and vitamin D requirements, accompanied by adequate solid foods.(79, 80) Sugar-sweetened beverages (e.g. juice drinks, sports drinks and regular soft drinks) and caffeinated beverages (e.g. tea, coffee and cola drinks) should not be given before two years of age, and avoided as much as possible thereafter.(79, 113) Instead, plain water should be offered to meet hydration requirements.

Establishing a structured routine for meal and snack times for toddlers is an important component of effective responsive feeding practices, where caregivers also recognise and react to hunger and fullness cues of the toddler.(111, 112) Synthesising findings from randomised-controlled trials, Perez-Escamilla et al. (2017) concluded that responsive feeding practices demonstrated improvements in weight outcomes among toddlers 1 to 2 years of age.(112) Picky eating is also

a natural occurrence in the feeding process and toddlers should not be pressured to consume new foods.(79, 80) Instead, they should be provided with regular and frequent exposure to non-preferred foods, increasing familiarity and promoting acceptance. Other toddler behaviours that affect feeding habits such as active play, screen time, sleep and techniques to soothe the toddler, are also influenced by caregivers. Poor sleep routines in the first two years of life, as well as the use of food to soothe the toddler have been associated with poor dietary quality and increased risk of obesity in early childhood,(80) and are therefore not encouraged.

Consensus Statements for Preschoolers (3 to <7 years)

Physical Activity: Accumulate at least 180 minutes of physical activity at any intensity spread throughout the day and within a safe environment. At least 60 minutes should be of moderate– to vigorous-intensity, where more is better, and the physical activities can be accumulative and take different forms. Older preschoolers (5 – 6 years of age) should be exposed to a variety of age-appropriate vigorous-intensity play and engage in muscle- and bone-strengthening activities several times a week. Daily outdoor active play among preschoolers is highly encouraged. Caregivers should participate actively with pre-schoolers during all forms of active play.

Supporting Paragraph

Physical activity engagement amongst preschoolers is associated with multiple health benefits, especially when it is moderate- to vigorous-intensity.(12, 114, 115) Evidence supports a positive association between physical activity and motor and cognitive development.(114) Studies have shown that physical activity is associated with favourable adiposity, motor development, physical fitness, psychosocial, cardiometabolic and bone health in preschoolers.(7, 12) In addition, a strong foundation in childhood movement competence is associated with lifelong participation in physical activity; therefore, preschoolers should be encouraged to participate in a variety of activities encompassing fundamental movement skills and age-appropriate/modified sports in a safe environment.(116-118) Evidence from a local study showed that lower primary children failed to demonstrate age-appropriate movement proficiency, indicating a critical need for physical activity interventions at the preschool age.(119)

The high local prevalence of myopia is a serious health concern and daily energetic outdoor play for at least 1 hour provides respite from excessive 'near-work' (e.g. reading and screen time), which helps to prevent the early onset of myopia.(120, 121) Moreover, outdoor play confers many other learning opportunities for preschoolers, caregivers and educators.(122) Parents playing with preschoolers promote parent-child bonding and create meaningful memories for both parents and preschoolers that are enduring.(123)

As preschoolers spend several hours in school on weekdays, there is scope to capitalise more on preschoolers' natural tendency for movement and physical play. Policies/guidelines should be developed to encourage physical activity throughout the day, such as incorporating it as part of all subject domains, allowing movement breaks hourly and curating learning environments that facilitate preschoolers to move and stay active in childcare centres and kindergartens.(124)

Sedentary Behaviour: Limit the total daily amount of sedentary behaviour, such as sitting, reclining or lying down, and take breaks during extended periods of time spent being sedentary. Recreational sedentary screen time, regardless of the type of screen device, should be limited to less than 1 hour per day.

Supporting Paragraph

Recreational screen-based sedentary behaviour such as television viewing and handheld device use is of particular importance.(91) The WHO evidence-based guidelines acknowledged that sedentary behaviour, and in particular recreational screen time among children aged 3-6 years, bore detrimental effects on their fitness, adiposity and behaviour or sleep.(6, 125) The detrimental effects of early-life screen viewing, regardless of the type of screen device, on movement behaviours and adiposity later in life have also been observed in prospective cohort studies among young Singaporean children.(38, 126, 127)

While sedentary behaviour, for instance during educational periods, cannot be completely eliminated, regular movement breaks, such as in the form of active play are essential to minimise adverse health effects.(128) Instead of using screen devices during recreational periods, engaging in reading, drawing, storytelling or imaginative play with a caregiver is encouraged.(19, 94) When engaging in recreational screen time, age-appropriate and engaging content for pre-schoolers is recommended.

Sleep: Have a daily total of 10-13 hours (for 3-5 years of age) or 9-11 hours (for 6 years of age) sleep. Older preschoolers may not need to nap if sufficient sleep has been obtained at night. Develop a bedtime routine and keep to a consistent bed and wake-up time. Provide a conducive sleep environment and avoid screen time 30 minutes before bed.

Supporting Paragraph

Achieving the number of recommended hours of sleep is associated with better health outcomes in terms of physical, psychological, and cognitive well-being. Shorter sleep duration is associated with higher adiposity levels,(129-133) poorer emotional regulation,(134, 135) more screen time,(136-138) higher risk of injuries,(139, 140) poorer cognitive development,(141-144) increased hyperactivity-inattention,(145) reduced physical activity,(137, 146) and poorer quality of life.(147) The total sleep duration, includes both naps and nocturnal sleep, but older preschoolers may not need the former if sufficient has been obtained at night. A bedtime routine should be developed that involves a wind-down period and avoiding screen time 1 hour before sleep. Aim to maintain this consistency across weekdays and weekends. Providing a conducive sleep environment that is dark, quiet and of comfortable temperature can help preschoolers sleep better.(97)

Diet and Eating Habit: Encourage healthy eating habits as a family, with caregivers as role models. Limit the amount and frequency of sugar-sweetened beverage consumption. Provide a structured routine for meal and snack times in appropriate portions that support growth and development. Avoid screen time during meal times. Teach your pre-schooler to recognise hunger and satiety cues.

Supporting Paragraph

Dietary habits are shaped at a young age and persist later into life. Through continuous positive caregiver modelling, a regular household eating routine provides opportunities for coordinated family meals and regulation of appetite, therefore influencing the overall diet quality of young children.(79, 148, 149) Limiting consumption of sugar-sweetened foods and beverages (including those naturally present in honey, syrups, fruit juices and fruit juice concentrates) to no more than 10% of total energy intake can curb the risk of overweight or obesity and dental caries in children.(41, 79, 81) Consuming a nutritious breakfast as part of their daily routine is strongly encouraged, as it has been associated with better diet quality and healthy body weight.(149) Structure-based or limit-setting strategies, such as serving appropriate portions, disallowing screen time during family meals, and exerting some caregiver control to moderate preschoolers' intake, can help children develop self-regulation and autonomy in eating behaviours.(79, 148)

Preschoolers are more likely to overeat when watching television or using a screen device during mealtimes and may learn unhealthy food habits from advertisements and programmes. A balance of allowance and control is needed, as being indulgent to a preschooler's food requests may override his or her ability to eat according to internal hunger and satiety cue. Equally, excessive restrain of a preschooler's food intake may unintentionally teach him or her to use food to manage negative emotions.(79, 148) Both of these may lead to unhealthy effects such as overeating and excess weight gain.(79, 148)

Consensus Statements for All Groups (0 to <7 years)

Integration: Aim to achieve most or all recommendations on physical activity, sedentary behaviour, sleep and diet for the best results

Supporting Paragraph

The recommendations for physical activity, sedentary behaviour, sleep and eating habits are closely related in terms of health benefits and making up the 24 hours of a child's day. The greatest health benefits can be achieved by meeting all the recommendations; more physical activity, less sedentary time, longer sleep duration, healthy eating habits and positive dietary choices.(10, 44, 150-152) Equivalent beneficial health outcomes can be obtained by achieving various combinations of the recommendations. Both combinations of more physical activity with longer sleep duration, and the combination of less sedentary time with longer sleep duration can improve cognitive development and reduce risks of adiposity.(6, 10) Replacing sedentary time with physical activity is associated favourably with fitness and motor development.(6, 10) Healthy and sensible dietary habits promote growth, development and maintenance of a healthy weight.(32, 34)

Conclusion

Recent evidence has shifted the international trend towards integrating physical activity, sedentary behaviour and sleep within a 24-hour period for better health outcomes in young children (i.e. infants, toddlers and preschoolers). The inclusion of diet and eating habits complement these recommendations in supporting growth and development, as well as obesity prevention. Establishing these healthy behaviours in early childhood offers them the best protection against future NCDs. However, local studies have demonstrated that a significant proportion of young children in Singapore do not adopt these recommendations and showed poorer health outcomes. Therefore, it is timely to introduce and promote these guidelines to young children and their caregivers to give them the best start in their lives.

As these young children may be cared for by various caregivers (e.g. parents, grandparents and teachers) and transit through different environments as they grow (e.g. home, infant-care, nursery and kindergarten), there is a role for these recommendations to be adopted as daily habits in family units and also as policies in child-care and preschool centres. In conclusion, infants, toddlers, preschoolers and their caregivers are recommended to adopt all domains of these guidelines to achieve the best health outcomes. Families and schools can start by identifying a domain that they can feasibly embed into their everyday life and aim to achieve all the recommendations in good time.

College of Paediatrics & Child Health of Academy of Medicine Singapore

SINGAPOREAN INTEGRATED 24-HOUR ACTIVITY GUIDELINES FOR EARLY CHILDHOOD

CONSENSUS SUMMARY STATEMENTS

For Infants (0 to <1 year)

Physical Activity: Be physically active several times a day, where more is better, in a variety of forms and within a safe and supervised environment. Activities should include non-screen-based interactive floor-based play and tummy time. For those not yet mobile, tummy time should start soon after birth, building up towards at least 30 minutes spread throughout the day. Planning a daily routine of physical activities may be helpful.

Sedentary Behaviour: Avoid restraining and leaving infants unattended for more than 1 hour at a time. Any form of screen time, including background screen time, is not recommended. When the infant is seated, reclined or lying down, caregivers are encouraged to engage the infant in singing, reading, storytelling and imaginative play. Having a daily routine for activities, sleep and meals may be useful in reducing the amount of sedentary behaviour.

Sleep: Have a daily total amount of 14-17 hours (for 0-3 months of age) and 12-15 hours (for 4-11 months of age) of sleep, including naps, to promote optimal health. It is recommended for infants to sleep on their back in their own cot, in the same room as their caregivers to ensure sleep safety. Develop a regular sleep time routine to help infants fall asleep with ease.

Diet and Eating Habit: Breastfeeding is recommended for infants when possible. From 4 to 6 months of age, introduce a variety of development- and culture-appropriate solid foods of various textures and flavours, that is prepared with no added salt and sugar. Provide a daily routine of having meals spaced 2-3 hours apart in the daytime to avoid overfeeding.

For Toddlers (1 to <3 years)

Physical Activity: Accumulate at least 180 minutes in a variety of physical activities, where more is better, at any intensity spread throughout the day within a safe environment. Daily outdoor play for toddlers is highly encouraged. Caregivers should actively participate in all forms of physical play with toddlers.

Sedentary Behaviour: Avoid restraining toddlers on a seat for more than 1 hour at a time. Screen time, regardless of the type of device, is not recommended for toddlers younger than **18 months** of age, and should be limited to less than 1 hour per day for toddlers **18 months** and above. When sitting or lying down, it would be most beneficial to engage the toddler in singing, reading, storytelling or imaginative play.

Sleep: Have a daily total amount of 11-14 hours of sleep with regular sleep and wake-up times. Develop a bedtime routine and keep to a consistent bedtime. Provide a conducive sleep environment and avoid screen time **30 minutes** before night-time sleep.

Diet and Eating Habit: Continue to increase the variety of foods offered to your toddler and wean off milk as the main source of nutrition. Introduce healthy family meals and offer whole milk and water, while establishing a structured routine for meal and snack times. Avoid screen time during meal times. Using food to soothe your toddler or as a reward is discouraged.

For Preschoolers (3 to <7 years)

Physical Activity: Accumulate at least 180 minutes of physical activity at any intensity spread throughout the day and within a safe environment. At least 60 minutes should be of moderate– to vigorous-intensity, where more is better, and the physical activities can be accumulative and take different forms. Older preschoolers (5 – 6 years of age) should be

exposed

to a variety of age-appropriate vigorous-intensity play and engage in muscle- and bone-strengthening activities several times a week. Daily outdoor active play among preschoolers is highly encouraged. Caregivers should participate actively with preschoolers during all forms of active play.

Sedentary Behaviour: Limit the total daily amount of sedentary behaviour, such as sitting, reclining or lying down, and take breaks during extended periods of time spent being sedentary. Recreational sedentary screen time, regardless of the type of screen device, should be limited to less than 1 hour per day.

Sleep: Have a daily total of 10-13 hours (for 3-5 years of age) or 9-11 hours (for 6 years of age) sleep. Older preschoolers may not need to nap if sufficient sleep has been obtained at night. Develop a bedtime routine and keep to a consistent bed and wake-up time. Provide a conducive sleep environment and avoid screen time **30 minutes** before bed.

Diet and Eating Habit: Encourage healthy eating habits as a family, with caregivers as role models. Limit the amount and frequency of sugar-sweetened beverage consumption. Provide a structured routine for meal and snack times in appropriate portions that support growth and development. Avoid screen time during meal times. Teach your preschooler to recognise hunger and satiety cues.

For All Groups (0 to <7 years)

Integration: Aim to achieve most or all recommendations on physical activity, sedentary behaviour, sleep and diet for the best results

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GLOSSARY

Cardiometabolic health	The interplay of blood pressure, blood lipids, glucose and insulin on health.
Cognitive development	The process of learning, memory, attention, concentration and language development.
Emotional regulation	An individual's ability to manage and respond to emotional experiences such as stress, anxiety, mood, temperament, hyperactivity/impulsivity.
Energetic play	Active play that is equivalent to moderate-to-vigorous physical activity, when children get out of breath and feel warm. This may take many forms and may involve other children, caregivers, objects or not.
Exercise	Physical activity that is planned, structured, generally repetitive and has purpose.
Light-intensity physical activity	LPA is equivalent to 1.5–4 METs in children, i.e., activities with energy cost 1.5 to 4.0 times the energy expenditure at rest for that child. For young children, this can include slow walking, bathing, or other incidental activities that do not result in the child getting hot or short of breath.
Metabolic equivalent of task	The metabolic equivalent of task, or simply metabolic equivalent, is a physiological measure expressing the energy cost (or calories) of physical activities. One MET is the energy equivalent expended by an individual while seated at rest.
Moderate to vigorous intensity physical activity	Moderate PA is equivalent to 4–7 METs in children, i.e., 4–7 times resting energy expenditure at rest for that child. Vigorous PA is equivalent to >7 METs. For young children, this can include brisk walking, cycling, running playing ball games, swimming, dancing etc. during which the child gets hot and breathless.
Physical activity	Movement of the body that uses energy over and above resting. For young children, this can include walking, crawling, running, jumping, balancing, climbing in, through and over objects, dancing, riding wheeled toys, cycling, jumping rope etc.
Sedentary behaviour	Any waking behaviour characterized by an energy expenditure ⩽1.5 metabolic equivalents (METs), while in a sitting, reclining or lying posture. For children under 5 years of age includes time spent restrained in car seat, high-chair, stroller, pram or in a carrying device or on a caregiver's back. Includes time spent sitting quietly listening to a story.
Tummy time	Time an infant spends lying on their front (in prone position) while awake with unrestricted movement of limbs.

Source: Guidelines on Physical Activity, Sedentary Behaviour and Sleep for Children under 5 Years of Age. Geneva: World Health Organization; 2019.

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PRACTICAL REFERENCE FOR ACTIVITIES IN EARLY CHILDHOOD

(Practical Guide)

Physical Activity

Physical activity for early childhood refers to any activity that gets children moving. All activity counts! This guide provides examples of activities that children in the early years can participate in to accumulate physical activity time throughout the day.

For infants (0 to <1 year), physical activity includes tummy time and floor-based play that are appropriate for their developmental milestones. For toddlers (1 to <3 years) and pre-schoolers (3 to <7 years), physical activity should include a **wide variety of movement experiences**, in **different environments**. This involves activities both **indoors and outdoors**, which take place in various settings **in school and out of school. Daily outdoor active play is** highly encouraged as it provides opportunities for toddlers and preschoolers to develop **fundamental movement skills** and to explore their environment.

Types of Physical Activities for Infants

For infants, physical activity includes being carried in an upright position, reaching up to swipe and swat toys when lying in supine, elevating legs off the surface to kick, play in side-lying, rolling from back to tummy and reverse, tummy time, reaching across the body to play when in sitting, crawling, pulling to stand and cruising along furniture. These activities are encouraged on a firm surface and gradually progressed to dynamic surfaces as the infant becomes more confident with the skill. Many of these activities can be incorporated into day-to-day caregiving activities.

It is especially important to remember to limit the number of hours that infants spend in containers or being restraint e.g. rockers, strollers that inhibit their freedom of movement. When infants are allowed to move, they are able to discover their bodies, explore their environment and this further motivates them to learn and move.

Activities	Tips for parents/caregivers
Carried in an upright position (This works on infant's head and trunk control)	• Try carrying infant over your shoulder when burping them after milk time.
	• At two months, carry infant facing out, you can allow infant to rest the back of their head against your chest if still wobbly, when more stable, slide infant's buttocks up your chest so that their head is not touching your chest. If you use a carrier, face them out when awake.
Reaching up to swipe and swat	• After changing infant's nappy, when lying on their back, allow infant the opportunity to reach up to swipe and swat at toys. Start with 1-2 minutes and gradually progress to 5-10 minutes.
	• If infant is unable to reach upwards, used a folded blanket under infant's shoulders and upper arm, one on each side.
Elevating legs off the surface to kick	• After changing infant's nappy, dangle a toy at infant's feet and encourage upward kicking of legs. • You may fold a blanket and place under infant's buttocks. This will further help to engage infant's core muscles during kicking.

Activities	Tips for parents/caregivers
Play in side-lying (To engage the side abdominal muscles - obliques)	• When infant is awake, perhaps whilst getting their milk ready or doing your household chores – place infant on a firm surface, lying on their side. You may use a bolster or a rolled bath towel behind their back to prevent them from rolling back. Use a book, contrast cards, or a small toy in their hand to engage them. Alternate sides.
Rolling	• When changing infant's nappy, instead of lifting legs up, bend infant's hips and knees up to 90 degrees and roll infant to the side to remove the soiled nappy. Then back again when placing the new one.
Reaching in sitting	• Once infant can sit independently for a few seconds, try placing their favourite toy in front of them so that they reach for it. Progress this by then placing the toy at the sides, encouraging them to reach across their body to get the toy. Consider a cause-and-effect toy or a container where they can put things into and take them out.
Crawling	• Crawling is initially best practiced on a firm play mat. Ensure the environment is safe and large enough to promote exploration. • Progress crawling to varied surfaces and then over pillows and cushions.
Pulling to stand	• Start this activity where infant can grip onto something to pull self-up (e.g. cot rails). • Progress this to places where gripping would be harder (e.g. sofa or a wall).
Cruising along the furniture	• Start this activity where infant can grip onto something, use a toy to encourage side stepping along the furniture. • Progress by making small gaps between the furniture.

Tips on Tummy Time for Infants
• Your infant may start tummy time as soon as they are brought home. • Place your infant on their tummy when they are awake, relaxed and rested. Place them on a firm surface like a mat or on your chest so that they may see your face. Start with 1-2 minutes per session and lengthen to 5-10 minutes a few times a day as your infant grows and becomes stronger. Face your infant whilst talking or singing to them. If they appear tired or distressed, roll them onto their backs for a rest and try again later. • If your infant finds it consistently difficult to lift their head when in tummy time, use your hand to place on their buttocks, this can give them more stability and allow them to push up a little longer. • When your infant is strong enough, they may try to roll over from their back to their tummy. You may place one or two toys on a firm surface around your infant to encourage this. • You may place the infant's favourite toy just out of reach to encourage them to reach for or creep towards the toy. • Make tummy time part of your infant's daily routine, for example for a short duration before or after diaper changes.

Types of Physical Activities for Toddlers and Preschoolers

Toddlers and preschoolers can be engaged in a wide variety of physical activities through a range of **fundamental movement skills (FMS)**. FMS underpin daily living activities and provide the foundation for participation in sports and other forms of complex movement skills as the toddler/preschooler grow up. The early years are critical for establishing this foundation.

Parents/caregivers play an important role in enhancing the FMS of their toddler/preschooler at home and in school via facilitation, motivation and personal participation. Parents/Caregivers can also facilitate learning of FMS by providing simple cues, demonstration and playing with their toddler/preschooler.

FMS are generally categorised into three main themes:

1. **Locomotor Skills** refers to body movement from one location to another. Many locomotor skills are used daily (e.g. running after a bus, leaping over a puddle), in many games and sports (e.g. jumping up to catch a ball) and during active play (e.g. crawling through a tunnel or climbing in the playground). Other examples of locomotor skills include walking, sliding, hopping, and skipping.
2. **Object Control (manipulative) Skills** require the toddler/preschooler to control an object using part of the body or using an equipment. Object control skills involve:
    - Propulsive skills – Sending an object away (e.g. throwing or kicking a ball)
    - Receptive skills – Receiving an object (e.g. catching or dribbling a ball)
3. **Stability (non-locomotor) Skills** involve a toddler/preschooler in maintaining and/or attaining balance. Stability is a key element for every human movement and necessary for all locomotor and object skills. Examples of stability skills include static and dynamic balance, bending and curling, turning, twisting, and stretching.

(Source: Fun Start Move Smart!: Fundamental movement skills for growing active learners)

Other types of physical activities to encourage participation of preschoolers include swimming, cycling and other forms of modified sport.

Older preschoolers should progress towards participating in a range of physical activities that involve age-appropriate energetic play. They are recommended to carry out moderate to vigorous physical activity (MVPA) for 60 minutes, which is a third of the recommended total daily physical activities (PAs) of 180 minutes.

MVPA should include frequent periods of energetic and dynamic play, spread throughout the day. Moderate-intensity activity refers to activity that make the child breathe harder and heart beats faster than at rest or sitting, such as walking to and from school. For vigorous-intensity activity, a useful guide is to observe if the child is huffing and puffing during the activity, or is not able to say more than a few words without pausing to catch a breath, examples include, playing tag (running or chasing playmates), ball games, skating or rapid cycling. Across an exertion scale of 10, these activities will score about 7 or 8. Examples of MVPA for the preschooler will include, playing tag (running or chasing playmates), ball games, skating or rapid cycling.

In addition to MVPA, preschoolers should also incorporate muscle and bone strengthening activities. These activities require the preschoolers to bear and lift their own body weight to work against a resistance. Examples include running, jumping, climbing activities such as scaling playground obstacles, skipping rope, dancing and playing games such as hopscotch. Dedicated resistance or weight training regimes are not necessary.

Physical activities for the toddler and preschooler may be organised broadly into two categories: i) structured physical activity with planned objectives and focus, and ii) unstructured physical activity that allows for "free" and unguided play. Both genres are synergistic (i.e. deliberate vs. self-regulated way of achieving activity goals) and should be incorporated into the toddler's/preschooler's daily physical activity routine. For example, a Physical Education session with structured and unstructured play covers lesson for a preschooler to balance on a beam and freedom to play alone or with others at a playground.

Physical Activity Out of School		
Different Environments to engage in Physical Activity	**Tips for Parents/ Caregivers**	**Suggested Activities/Examples**
At Home (Indoors)	**Create a home environment that encourages movement and exploration**	• Set up safe spaces for movement (e.g. an area for physical play) • Position furniture in a way that allows child to move freely and encourages movement around the house • House rules that encourage safe movement (e.g. a toddler is allowed to climb up and down low furniture or sofa) • Devote spaces in the house for active play (e.g. corridor for shuttle run, hopscotch, underarm rolling to a target) • Make accessible a bucket of foam balls of different sizes for children to play with • Paste pictures of favourite cartoon characters on the wall for child to aim and throw at • Hang balloon or streamers from the doorway to encourage child to jump, reach and strike • Set up obstacle course that incorporates various activities such as balancing, jumping, throwing and etc. for child to play and navigate around
	Make use of household/recycled material for activities	• Create an obstacle course or a fort with cardboard boxes, pillows, chairs, and bedsheets to crawl through or jump over • Rolled up socks, crushed newspaper or soft toys for throw and catch games • Make DIY equipment (e.g. paper plate and short stick as an implement to send and receive a balloon to and fro) • Masking tape on the floor to balance on the line (dynamic balance)
	Play with your child (parent-child games)	• Hide and seek and treasure hunt (use different locomotor skills) • Keep the balloon in the air with different body parts • Pillow fights • Simon Says • Animal movements • Alphabet poses • A game of Twister • Musical statue • Dance to music
	Involve child in household chores (even if a helper is available)	• Clean up after meals (e.g., bring plate back to kitchen or wipe the dining table) • Tidy the house (e.g., put toys/books back, return items after use) • Fold clothes and put it back in wardrobe • Water plants
On-the-go (Outdoors/ Indoors)	**Integrate as part of daily activity and commute**	• Walk up and down stairs • Walk, cycle or scoot to and from school

Physical Activity Out of School		
Different Environments to engage in Physical Activity	**Tips for Parents/ Caregivers**	**Suggested Activities/Examples**
Playground/Play gardens (Outdoors)	**Make it a routine for child to visit the playground; Encourage unstructured play**	Playgrounds present numerous opportunities for children to explore and develop FMS. Some examples include: • Balancing on a balance beam, a log or on an uneven surface • Climbing up a rock wall or rope ladders • Crawling through a tunnel • Jumping/hopping into coloured makers on the floor or on the trampoline • Sliding also involves stability skills such as bending, and transfer of weight to get down the slide
	Facilitate active play: Introduce games resulting in moderate to vigorous physical activity (MVPA)	Introduce games with simple rules and play with your child: • Create an obstacle course to challenge your child • Catching or Tag, Freeze-Tag, The Floor is Lava (use different locomotor skills)
Outdoor Spaces (e.g., basketball court, void deck, open spaces, grass fields)	**Identify available outdoor open spaces in your neighbourhood for your child to participate in MVPA**	• Games with simple rules: Catching or Tag, Freeze-Tag, What's the Time Mr Wolf? (use different locomotor skills) • Ball games (e.g. throw and catch, kicking, bat and ball, badminton) • Bubbles (run, jump and strike or catch) • Scooter, Cycle (tricycle, balance bike, two-wheel bike), Roller skate
Parks/ Nature Parks/Beach (Outdoors)	**Immerse your child in a new environment to engage in active play over the weekend**	• Nature walks or hike • Walk, run, jump, hop, skip bare feet on different surfaces (e.g., grass, sand) • Walk on uneven ground • Balance on logs • Build sandcastles • Water play/ Wade in the water
Sport Facilities (e.g., stadiums, swimming pools, badminton courts, climbing gym) (Outdoors/ Indoors)	**Let your child experience a variety of sports according to his/her interest**	• Participating in a range of sports with an age-appropriate programme helps develop FMS. Some examples include: o Football o Athletics o Gymnastics o Basketball o Tennis o Hockey o Martial arts o Swimming o Rock climbing

Physical Activity in School

As toddlers and preschoolers spend many hours in school on weekdays (especially those in childcare centres), preschool educators play a significant role in getting toddlers/preschoolers to be active in physical activity throughout the day. Besides classes that directly involve movement (e.g. Music and Movement, Motor Skills Development), educators should provide other opportunities for toddlers/preschoolers to increase body movements throughout the day. Some suggestions include:

- **Modifying the physical environment to** increase movement of the toddlers/preschoolers as part of their daily routine. Introduce
  - o **Active Navigation Routes** – Design spaces and pathways linking different areas of the school using floor markers; install attractive signage to encourage toddler/preschooler to jump, hop, balance etc. to get from one part of the school to another.
  - o **Active Play Corners** (e.g., Giant game board that gets toddler/preschooler to perform various FMS)
- Incorporate **movement as part of core curriculum** (e.g., numeracy with movement)
- Introduce **outdoor learning or MVPA in a different environment**
- Introduce **Brain breaks** after every hour of sedentary time or when toddlers/preschoolers are restless. This involves quick and simple activities to get toddlers/preschoolers out of their seats to move (e.g., stretching, action songs, animal movements)

Physical Activities within a Preschoolers' Day

There are many ways in which a preschooler is capable of fulfilling the physical activity recommendations on any given day. The following suggestions and examples aim to illustrate a typical school day and a weekend.

On weekdays:

- Preschool: Over 2 hours, 1 hour can be structured physical education class, and the remaining 1 hour covers other curriculum such as music or dance class, active involvement in story-telling

- Home (1 hour)
  - o Playground after school (as part of daily routine, 45-60min)
  - o Walk to school, climb up/down stairs (20min)
  - o Active play at home.

On weekends

- o Beach/Park (picnic, walking in nature, cycling); park connector
- o Organised sport with modified games
- o Playing at activity facilities (playground, water-park, beach)

Resources
Tummy time 1. https://polyclinic.singhealth.com.sg/Documents/GrossMotorSkills.pdf **Play activities for infants** 1. https://polyclinic.singhealth.com.sg/Documents/3month%20DA.pdf 2. https://polyclinic.singhealth.com.sg/Documents/6month%20DA.pdf 3. https://polyclinic.singhealth.com.sg/Documents/12month%20DA_v2.pdf 4. https://www.healthhub.sg/live-healthy/2030/activity-ideas-to-get-tot-moving **Outdoor play for toddlers & preschoolers** 1. https://activeparents.myactivesg.com/activities/ap/lets-go-play-outside-5-unique-playgrounds-around-singapore-to-train-your-childs-fundamental-movement-skill 2. https://www.ecda.gov.sg/Educators/Pages/Outdoor-Learning.aspx **ActiveSG programmes for preschoolers** 1. www.myactivesg.com/programmes/academy 2. www.activeparents.myactivesg.com **Active screen-based physical activity for preschoolers** 1. https://raisingchildren.net.au/preschoolers/play-learning/screen-time-healthy-screen-use/screen-time-physical-activity

Sedentary Behaviour

Parents, caregivers, and teachers can help young children to reduce their sedentary behaviour and to engage in active lifestyles. Consider the following:

Infant	• Talk and sing gently to your infant whilst holding them. When talking, try using a changing tone of voice and vary your expressions. • Read books that have simple, repetitive words and clear pictures to your infant, especially those with rhymes or songs. • Stimulate your infant with toys that are colourful or make noise, encouraging them to reach out for the toy. Encourage your infant to explore toys of different textures (soft, hard, rough) for exploratory play. Household objects like cups, spoons or boxes can be used. Blocks are useful for open-ended play. • Play peek-a-boo with your infant with your hands or another object like a book or napkin. • You may bring your infant outdoors to explore their surroundings. • When playing with your infant, follow their lead and change activities based on their needs. • Avoid restraining your baby in containers e.g. strollers and rockers for prolonged periods.
Toddler	• Playtime is a powerful way of showing love and connecting with your toddler. • Allow your toddler to take on unstructured, free play. It enables them to develop creativity and learn at their own pace. • A device cannot replace you. Your interaction with your toddler will benefit them extensively. • For toddlers >2 years old, if you allow screen time, consider setting consistent rules and limits (e.g. less than 1 hour of screen time per day). Ensure access to high quality educational programs for your toddlers • Co-view and share screen time with your toddler and talk about what he/she is watching. • Face-to-face interactions is much preferred, which include talking, reading and singing.

Toddler	• Avoid screen device use while eating meals, in the hour before bedtime, playing with toys or during family interactions. • Parents should be aware of their own screen usage and avoid using screens while spending time with your toddler.
Preschooler	• Active play and physical activity are important, and curb sedentary time when possible. • When sedentary behaviour cannot be avoided, break up extended periods of sitting or lying down with frequent breaks for movement. • Encourage a variation of postures and avoid sustained positions to avoid muscular aches and pain. • While sedentary, engage in interactive activities together, such as storytelling, playing games and singing. • Minimize the amount of screen viewing as much as possible. • If screen time cannot be avoided, set rules and boundaries and consider setting a family media plan for screen usage, ensure age-appropriate content, avoid screen device use while eating meals, in the hour before bedtime and playing with toys or during family conversations. • Remove TV's and other screen devices from the preschooler's bedroom. • Monitor media content and select high-quality programs appropriate to the preschooler's age, engage in conversations with the preschooler about the media content and co-view with them as much as possible. • Parents should be aware of their own screen usage and avoid using screens while spending time with your toddler.

Resources

Play activities for infants

1. https://polyclinic.singhealth.com.sg/Documents/3month%20DA.pdf
2. https://polyclinic.singhealth.com.sg/Documents/6month%20DA.pdf
3. https://polyclinic.singhealth.com.sg/Documents/12month%20DA_v2.pdf
4. https://www.healthhub.sg/live-healthy/2030/activity-ideas-to-get-tot-moving

Movement/Fun activities at home

1. https://www.nuh.com.sg/our-services/Specialties/Paediatrics/Documents/Activity%20Resource%20Book%20-%20PLAY.pdf
2. https://www.nuh.com.sg/our-services/Specialties/Paediatrics/Documents/Movement%20activities%20at%20home%20for%20your%20child.pdf

Advice about screen time

1. https://www.nuh.com.sg/our-services/Specialties/Paediatrics/Documents/NUH%20CDU%20Screen%20Time%20E-Brochure.pdf
2. https://www.healthychildren.org/English/family-life/Media/Pages/Healthy-Digital-Media-Use-Habits-for-Babies-Toddlers-Preschoolers.aspx
3. https://childmind.org/article/media-guidelines-for-kids-of-all-ages/
4. https://raisingchildren.net.au/preschoolers/play-learning/screen-time-healthy-screen-use/managing-screen-time-3-11-years
5. https://raisingchildren.net.au/toddlers/play-learning/screen-time-media/screen-time

Family media plan

1. https://www.healthychildren.org/English/media/Pages/default.aspx

Sleep

Parents, caregivers, and teachers can help young children to meet the sleep recommendations. Consider the following:

Infant	• Set a consistent, calming bedtime routine to establish infant's sleeping behaviours. A regular pre-bedtime plan can include bathing, infant massage, swaddling and dimming lights. • Learn to look out for body language indicating tiredness and need for sleep (e.g. rubbing eyes, arching back and infant not focusing). • Put infant to bed while drowsy but not completely asleep. Avoid nursing infant to sleep after the first few months, to allow infant to learn to fall asleep independently. • If infant is unsettled, provide rhythmic patting to calm infant, but not to the point of sleeping. • If infant remains restless, providing a pacifier may help. However, avoid carrying infant or rocking infant to sleep. • Provide infant opportunities to self soothe when he wakes up. Your infant might fuss or cry before finding a comfortable position and falling asleep. • Allow sufficient daytime naps, as infant may not sleep well at night if overtired.
Toddler	• Develop a bedtime routine that involves a wind-down period, which helps to relax and anticipate bedtime (e.g. reading a book, a relaxing shower, listening to music). • Avoid screen time (e.g. smart phones, tablets, computers) 1 hour before sleep. • Avoid naps close to bedtime as it may prevent the toddler from falling asleep or staying asleep. • Set and maintain a consistent bedtime across weekdays and weekends. • Prioritise your toddler's sleep over other activities – practise good time management to ensure there is enough time for bedtime routine and that the toddler gets the recommended number of hours of sleep. • Provide a conducive sleep environment that is dark, quiet and of comfortable temperature. • Keep the bed only for sleep and rest. • Avoid stimulating and vigorous activities such as exercise and consumption of caffeinated food (e.g. soft drinks, chocolates) or beverages before bedtime. • May consider providing the toddler with an item that the toddler feels secure with (e.g. a favourite pillow, blanket or stuffed toy).
Preschooler	• Develop a bedtime routine that involves a wind-down period. • Avoid screen time **30 minutes** before sleep. • Set and maintain a consistent bedtime across weekdays and weekends. • Prioritise your preschooler's sleep over other activities – practise good time management to ensure there is enough time for bedtime routine and that the preschooler gets the recommended number of hours of sleep. • Provide a conducive sleep environment that is dark, quiet and of comfortable temperature. • Keep the bed only for sleep and rest. • Avoid stimulating and vigorous activities such as exercise and consumption of caffeinated food (e.g. soft drinks, chocolates) or beverages before bedtime. • Be a sleep role model for your preschooler, i.e. sleep sufficiently yourself, during sleep time phones should be on silent mode, switched off, or not be brought into the bedroom.

Resources
Helping infant sleep 1. https://www.healthhub.sg/live-healthy/1660/helping-baby-sleep 2. https://www.healthxchange.sg/news/bedtime-options-for-babies 3. https://polyclinic.singhealth.com.sg/Documents/GoodSleepHabitsBabies.pdf 4. https://www.healthhub.sg/live-healthy/1195/baby-time-to-unwind 5. https://www.healthhub.sg/live-healthy/1936/how-can-i-get-my-baby-to-sleep-well-and-safely **Tips on good sleep** 1. https://www.healthhub.sg/programmes/117/goodsleep

Eating Habit and Diet

Parents, caregivers, and teachers can help young children to meet the eating habit and diet recommendations. Consider the following:

Nutrition for Breastfeeding Mothers
It is important to have a nutritionally-balanced diet, and of adequate portions, as this may affect the quality and quantity of breastmilk. Nutritional requirements during breastfeeding can be found on: a. Integrated Maternal and Child Wellness Hub (SingHealth Polyclinics) web link: • https://polyclinic.singhealth.com.sg/Documents/NutritionDuringBreastfeeding.pdf b. SingHealth YouTube channel web link: • https://www.youtube.com/watch?v=NXEDiK0D0Is&list=PLwKZdOHmwfHG_SfEKdpApjarcQEvrXKbY&index=7

Nutrition for Young Children		
Nutrition-related information for parents	For information on breastfeeding, childhood nutrition and recipes according to various age groups. It includes other information on general care, growth and development, sleep and activity, as well as parenting tips. Web link: • https://www.healthhub.sg/programmes/183/parent-hub • https://www.youtube.com/watch?v=Zu-0WnjRzA8&list=PLwKZdOHmwfHG_SfEKdpApjarcQEvrXKbY&index=8	Search in browser: "Parent Hub HPB" "SingHealth Baby Feeding Tips"
Early Childhood Nutrition	For information on early nutrition according to the following age groups: - 0 to 4 months - 4 to 6 months - 6 to 12 months - 12 to 24 months Resource guides include recommended amount for each food group per day and recipes. Contact of helplines and support groups available.	QR code:

College of Paediatrics & Child Health of Academy of Medicine Singapore

SINGAPORE INTEGRATED 24-HOUR ACTIVITY GUIDELINES FOR EARLY CHILDHOOD (BRIEF)

Consensus Statements for Infants (0 to <1 year)

Physical Activity: Be physically active several times a day, where more is better, in a variety of forms and within a safe and supervised environment. Activities should include non-screen-based interactive floor-based play and tummy time. For those not yet mobile, tummy time should start soon after birth, building up towards at least 30 minutes spread throughout the day. Planning a daily routine of physical activities may be helpful.

- Regular physical activity in infants can improve their health and development.
- Include 30 minutes of tummy time for infants who are non-mobile.
- A safe and supervised environment should be provided in the presence of a responsible caregiver.

Sedentary Behaviour: Avoid restraining and leaving infants unattended for more than 1 hour at a time. Any form of screen time, including background screen time, is not recommended. When the infant is seated, reclined or lying down, caregivers are encouraged to engage the infant in singing, reading, storytelling and imaginative play. Having a daily routine for activities, sleep and meals may be useful in reducing the amount of sedentary behaviour.

- When sedentary, it is encouraged to engage infants in interactive activities such as singing and reading.
- Screen time in infants may adversely affect their health, including psychosocial health and cognitive development.
- Any form of screen time is not recommended.

Sleep: Have a daily total amount of 14-17 hours (for 0-3 months of age) and 12-15 hours (for 4-11 months of age) of sleep, including naps, to promote optimal health. It is recommended for infants to sleep on their back in their own cot, in the same room as their caregivers to ensure sleep safety. Develop a regular sleep time routine to help infants fall asleep with ease.

- Good quality sleep improves family well-being and child sleep is an important predictor of maternal health.
- Setting bedtime routines and providing a conducive sleep location can improve sleep duration
- Good sleep safety practices include supine sleeping in their own cot and in the same room of the caregivers.

Diet and Eating Habit: Breastfeeding is recommended for infants when possible. From 4 to 6 months of age, introduce a variety of development- and culture-appropriate solid foods of various textures and flavours, that is prepared with no added salt and sugar. Provide a daily routine of having meals spaced 2-3 hours apart in the daytime to avoid overfeeding.

- It is recommended that fully and partially breast-fed infants be supplemented with 400IU of vitamin D soon after birth.
- Complementary foods should be started for infants when they are between 4 to 6 months of age, depending on developmental readiness.
- There is no evidence that delaying the introduction of allergenic foods prevents food allergies.
- It is recommended that guidance on responsive feeding practices is provided to caregivers.

Consensus Statements for Toddlers (1 to <3 years)

Physical Activity: Accumulate at least 180 minutes in a variety of physical activities, where more is better, at any intensity spread throughout the day within a safe environment. Daily outdoor play for toddlers is highly encouraged. Caregivers should actively participate in all forms of physical play with toddlers.

- Participate in physical activities comprising of both light activities and moderate to vigorous physical activities.
- Caregivers should encourage and/or participate actively with the child during play.
- Both structured indoor and outdoor activities are equally important.

Sedentary Behaviour: Avoid restraining toddlers on a seat for more than 1 hour at a time. Screen time, regardless of the type of device, is not recommended for toddlers younger than 18 months of age, and should be limited to less than 1 hour per day for toddlers 18 months and above. When sitting or lying down, it would be most beneficial to engage the toddler in singing, reading, storytelling or imaginative play.

- When sedentary, it is encouraged to engage toddlers in interactive and non-screen-based activities as these promote cognitive and social development.
- Prolonged periods being seated or spent on any screen device should be avoided as it is harmful for a child's physical, psycho-emotional and social health.

Sleep: Have a daily total amount of 11-14 hours of sleep with regular sleep and wake-up times. Develop a bedtime routine and keep to a consistent bedtime. Provide a conducive sleep environment and avoid screen time 30 minutes before night-time sleep.

- Regular bedtime and bedtime routine help toddlers sleep longer and better, and may be important for obesity prevention.
- Develop a bedtime routine such as reading bedtime stories or listening to lullaby.
- Provide a conducive sleep environment that is dark, quiet and of comfortable temperature
- Avoid screen time 30 minutes before bed.

Diet and Eating Habit: Continue to increase the variety of foods offered to your toddler and wean off milk as the main source of nutrition. Introduce healthy family meals and offer whole milk and water, while establishing a structured routine for meal and snack times. Avoid screen time during meal times. Using food to soothe your toddler or as a reward is discouraged.

- Caregivers decide what, when and how food is consumed at home.
- With increasing focus on a variety of minimally-processed foods across all major food groups, toddler should be weaned off milk as their main source of nutrition.
- Sugar-sweetened beverages and caffeinated beverages should not be given before two years of age and avoided as much as possible thereafter.
- Caregivers are encouraged to recognize and respond to hunger and fullness cues of the toddler, and should not pressure the toddler to eat new foods nor use food as reward.

Consensus Statements for Preschoolers (3 to <7 years)

Physical Activity: Accumulate at least 180 minutes of physical activity at any intensity spread throughout the day and within a safe environment. At least 60 minutes should be of moderate– to vigorous-intensity, where more is better, and the physical activities can be accumulative and take different forms. Older preschoolers (5 – 6 years of age) should be exposed to a variety of age-appropriate vigorous-intensity play and engage in muscle- and bone-strengthening activities several times a week. Daily outdoor active play among preschoolers is highly encouraged. Caregivers should participate actively with preschoolers during all forms of active play.

- Regular physical activity, especially that which is moderate- to vigorous-intensity, is associated with multiple health benefits in preschoolers.
- Include at least 60 minutes of moderate-to-vigorous-intensity, preferably engaged outdoors.
- A strong foundation in movement competence in childhood is associated with lifelong participation in physical activity.

Sedentary Behaviour: Limit the total daily amount of sedentary behaviour, such as sitting, reclining or lying down, and take breaks during extended periods of time spent being sedentary. Recreational sedentary screen time, regardless of the type of screen device, should be limited to less than 1 hour per day.

Sedentary behaviour and in particular recreational screen time among children aged 3-6 years bore diverse detrimental effects on health and development.

- When sedentary behaviour cannot be avoided, regular movement breaks can minimize adverse health effects.
- Recreational screen time should be limited and age-appropriate content should be preferred.

Sleep: Have a daily total of 10-13 hours (for 3-5 years of age) or 9-11 hours (for 6 years of age) sleep. Older preschoolers may not need to nap if sufficient sleep has been obtained at night. Develop a bedtime routine and keep to a consistent bed and wake-up time. Provide a conducive sleep environment and avoid screen time 30 minutes before bed.

- Achieving the recommended hours of sleep is associated with multiple health benefits and may be important in prevention of obesity.
- Develop a bedtime routine that involves a wind-down period and avoid screen time 30 minutes before sleep.
- Maintain a consistent bedtime across weekdays and weekends.
- Provide a conducive sleep environment that is dark, quiet and of comfortable temperature.

Diet and Eating Habit: Encourage healthy eating habits as a family, with caregivers as role models. Limit the amount and frequency of sugar-sweetened beverage consumption. Provide a structured routine for meal and snack times in appropriate portions that support growth and development. Avoid screen time during meal times. Teach your preschooler to recognise hunger and satiety cues.

- A regular household eating routine provides opportunities for coordinated family meals and regulation of the child's appetite.
- Limiting consumption of added sugars, food products with natural sugars (e.g. honey) and sugar-sweetened beverages can curb the risk of overweight and dental caries in children.

- Consuming a nutritious breakfast as part of daily routine is strongly encouraged as it has been associated with better diet quality and healthy body weight.
- Caregivers can help children regulate their intake by serving appropriate portions, disallowing screen time during family meals and exerting some caregiver control to moderate their intake.

Consensus Statements for All Groups (0 to <7 years)

Integration: Aim to achieve most or all recommendations on physical activity, sedentary behaviour, sleep and diet for the best results

These recommendations may seem daunting. However once one can make this a way of life over each 24-hour day, it will become easier, more natural, and you will reap bountiful benefits, both physically and psycho-emotionally.

- Start with one or any combination of the recommended behaviours as you can achieve similar health benefits through the same number of recommendations in various combinations.
- Do this together as a family or with friends and encourage each other to achieve all the recommendations for the best health benefits.

FACULTY BIOGRAPHIES – CHAIRPERSONS, PANEL MEMBERS & SPEAKERS (LIST IS IN ORDER OF APPEARANCE AT THE CONFERENCE)

Professor Alex Sia

Prof Alex Sia is the Chief Executive Officer of KK Women's & Children's Hospital, whose mission is to deliver excellent, holistic and compassionate healthcare for women and children. He is concurrently Professor of Duke NUS Medical School and Clinical Professor of Yong Loo Lin School of Medicine. After completing his under-graduate study at NUS Faculty of Medicine, he achieved specialist accreditation in Intensive Care Medicine and Anaesthesiology before earning his Master of Business Administration from Singapore Management University under the Ministry of Health Holdings Hospital Administration Scholarship Scheme. As the immediate past Chairman of KKH's Medical Board, he is a strong advocate of better and safer care for all.

He firmly believes in the importance of joy at work and constant practice improvements to enhance the delivery of value-driven care. His pursuit of advancing safety and reliability of patient care has led to the development of closed-loop, automated and computer integrated administration of medications. He has been granted three patents by USPTO (United States Patent & Trademark Office) in this regard. He is also involved in the research of the pharmacogenomics of pain, particularly in relation to the safe use of opioids. 'Every life counts, every child matters' is the principle that has guided his professional journey in the last three decades.

Professor Satoshi Kusuda

Prof Kusuda MD, PhD is Clinical Professor at Tokyo Health Care University and Director Neonatal Research Network of Japan. He is President of Federation of Asia and Oceania Perinatal Societies. He is a neonatologist working at Kyorin University. He graduated medical school in Osaka, Osaka City University. After completing his pediatrics residency, he started specialty training at Children's Hospital at Osaka City and completed his training at Osaka City General Hospital. He is on the Board of the Japanese Society for Perinatal and Neonatal Medicine.

His primary research interests include neonatal management of respiratory and cardiac disorders and quality improvement. He is one of the founders of the Neonatal Research Network of Japan, and currently, he is a director of the network. The number of very preterm infants registered on the network database has reached more than 75 thousand. (http://plaza.umin.ac.jp/nrndata/indexe.htm)

Assistant Professor Derek Tse Wan Lung

Dr Derek Tse is Deputy Chief Executive Officer, SingHealth Polyclinics (SHP). He is a Family Physician by training and holds the academic appointment of Clinical Assistant Professor at the Duke-NUS Medical School.

Dr Tse first joined SHP as a Family Medicine trainee in 2000. He completed his post-graduate training in 2004 (MMed Family Medicine 2001, FCFPS 2004). He is currently a fellow of the College of Family Physician Singapore and Academy of Medicine Singapore.

He has held various leadership positions in SHP, including Clinic Deputy Director (Tampines, SengKang), Clinic Director (Sengkang), Assistant Director Clinical Service (Clinical Integration and Clinical Support), Director Clinical Services and then most recently, Director Regional Clinical Services (East), overseeing collaboration between SHP and regional health and social care partners in the east. He currently helms the developmental efforts in establishing team-based care and oversees various clinical areas e.g., maternal and child wellness, preventive care etc, as well as dental services in SHP.

Associate Professor Lourdes Mary Daniel

A/Prof Lourdes Mary Daniel is senior consultant and Head of Department in the Department of Child Development, KKH. She is a paediatrician who is trained both in Neonatology and Child Development. She received her neonatal postgraduate training in Singapore and Australia and her child development training in the USA (Kennedy Krieger Institute [Johns Hopkins Hospital], Boston Children's Hospital and the Harvard Graduate School of Education). She has worked with high risk children in KK Women's and Children's Hospital from the antenatal period, through delivery, the Neonatal Intensive Care Unit, childhood and into primary school for the last 35 years.

Associate Professor Chan Yoke Hwee

A/Prof Yoke Hwee Chan is the Chair, Division of Medicine at KK Women's and Children's Hospital and the Chair, Paediatric Academic Clinical Program (ACP) at the Singapore Health Services. She is also Clin Associate Professor at both the Duke-NUS Graduate School of Medicine. With her role as the Chair, Division of Medicine and Paediatric ACP, Dr Chan interest is in the shaping of the Child Health landscape in Singapore. She was a core member of the Transformation of Paediatric Services Taskforce commissioned by the Ministry of Health, Singapore. She is also core member of the Regional Health Systems at the Singapore Health Services. She is currently a member of the National Task Force on Child and Maternal Health and Wellbeing. In collaboration with SingHealth Polyclinics, Dr Chan piloted a new model of maternal and child wellness hub within the polyclinic setting to provide holistic care to the mother-child dyads.

As a paediatric intensive care physician by training, Dr Chan has special interest in paediatric home ventilation and played an important role in the establishment of the paediatric homecare programme in Singapore. Dr Chan was the Director of the KKH Home Care Program from 2006 to 2017 during which the program grew to benefit more than 1500 technology dependent children and expanded to include other patient with complex medical needs. Dr Chan also established the Neonatal-Paediatric Extracorporeal Membrane Oxygenation Programme at the KK Women's and Children's Hospital. She also has special interest in extracorporeal therapies in the intensive care unit, namely continuous renal replacement therapies and ECMO. Dr Chan is also passionate about patient safety and clinical quality. After serving her term as a board member of the World Federation of Paediatric Intensive and Critical Care Societies (WFPICCS), she is currently serving as a member of the Education Subcommittee.

Dr Pratibha Agarwal

Dr Pratibha Agarwal is a Senior Consultant and Head of Clinical Services in the Department of Child development at KK Women's and Children's Hospital, Singapore. The department offers specialised diagnostic and intervention services for preschool children with developmental or behavioral concerns.

Dr Agarwal's major areas of interest are in the area of formulating guidelines for developmental screening for preschool children to enable early identification of developmental delays. She is keen to evaluate and develop screening tools customized for the Singapore population both in the community for primary care and also at Dept of Child Development. Her other area of strong interests is in developing a pathway for screening and intervention for mental health and socio-emotional competence for the mother-child dyad in the preschool children. In addition, Dr Agarwal would be keen to develop evaluation of executive function in pre-schoolers coming to the Department as this is a relatively unexplored area.

Dr Elaine Chew Chu Shan

Dr Elaine Chew has been working as a specialist in paediatric medicine and adolescent health since 2011 and completed a specialist training in adolescent medicine in Children's Hospital at Westmead, Sydney. Her research interest is in child and adolescent obesity and eating disorders. She is the principal investigator of several peer reviewed grants to develop family-based interventions and use of mobile application in children and adolescents with obesity. She has published peer-review articles in international journals on obesity and eating disorders in adolescents. She is involved in mentoring students and residents in developing research projects and publications. Through her clinical, research and educational work with international collaborators and community partners, she hopes to further improve the quality of care of children and adolescents in Singapore.

Associate Professor Helen Chen Yu

A/Prof Helen Chen has been in the forefront of maternal mental health, having set up the Women's Mental Wellness Service at KKH 15 years ago. As director of the Postnatal Depression Intervention Programme, she has championed the needs of mothers suffering from maternal mental illness, and in the recent five years, has focused on building expertise in the area of perinatal infant mental health, in recognition of the importance of addressing child psychosocial needs. As part of the GUSTO study investigation team, she has also been involved in key papers that have provided robust evidence into the link between maternal mental health and child health and developmental outcomes. She has led the PND domain for the IMCWH, supporting Prof Chan YH and her team in advancing maternal mental healthcare in primary health.

Dr Guo Xiaoxuan

Dr Guo Xiaoxuan is the co-lead of the Integrated Maternal and Child Wellness Hub (IMCWH) and Clinic Director of the SingHealth Polyclinics – Punggol, where the IMCWH programmed is based. She is also the co-lead for the Mental Health Workgroup at SingHealth Polyclinics (SHP), developing and implementing mental health programmes such as the Health Wellness clinic at SHP

Assistant Professor Benny Loo Kai Guo

Dr Benny Loo is a Consultant Paediatrician working in General Paediatrics Service and Sports Medicine Service at KK Women's and Children's Hospital (KKH), Singapore. He graduated with MBBS in 2007 from the National University of Singapore (NUS) and obtained Masters of Medicine (Paediatric Medicine) from the NUS and Membership of the Royal College of Paediatrics and Child Health (United Kingdom) in 2014. He completed his SingHealth Paediatric Medicine Residency Programme in 2017 and joined the General Paediatrics Service.

In 2020, he joined the Sports Medicine Service in KKH as part of the SingHealth Duke-NUS Disease Centre (Sport & Exercise Medicine). Dr Benny is an IPRAMHO Investigator and the Co-Chair of the Organising Committee of Asia Pacific Maternal & Child Health Conference & IPRAMHO International Meeting 2022. He chaired the Workgroups on the development of the Singapore Integrated 24-Hour Activity Guidelines for Children and Adolescents (7 to 18 years), and for Early Childhood (0 to 6 years).

Associate Professor Benedict Tan Chi'-Loong

A/Prof Ben Tan graduated in 1991 with a medical degree from the National University of Singapore and obtained his Masters in Sports Medicine in 1997 from the world-renown Australian Institute of Sport. He is a Fellow of the Academy of Medicine Singapore (FAMS) and American College of Sports Medicine (FACSM). Dr Tan is presently Chief of Sport and Exercise Medicine at Changi General Hospital. The Department runs three of Singapore's leading Sport & Exercise Medicine Centers – Singapore Sport & Exercise Medicine Centre @ CGH (SSMC@CGH), SSMC@Novena, and SSMC@SSI. In 2005, Dr Tan chaired the Sports Medicine Workgroup (Specialist Accreditation Board) that culminated in Sports Medicine being gazetted as a subspecialty in Singapore in 2011, and he continues to develop and grow the field of Sports Medicine as Chair of the Sports Medicine Subspecialty Training Committee and Head of the SingHealth Duke-NUS Sport & Exercise Medicine Centre (SDSC). A/Prof Tan chairs the Advisory Board of the NTU Lee Kong Chian School of Medicine's Graduate Diploma in Sports Medicine. Dr Tan also plays a pivotal role in the global Exercise is Medicine (EIM) movement, started by the American College of Sports Medicine, as chair of EIM Singapore and Asia. Globally, Dr Tan contributes to the sports ecosystem as a Member of the International Olympic Committee (IOC) Medical and Scientific Commission, Chair of World Sailing's Medical Commission, and Vice President of the Singapore National Olympic Council.

A former Nominated Member of Parliament, Dr Tan's main sport is sailing, where he won an Asian Games Gold and four consecutive SEA Games Golds, and represented Singapore at the 1996 Olympics. He has also completed more than 20 marathons, including all six World Marathon Majors, with a personal best of 2:56 hours. The books he authored, namely *The Complete Introduction to Laser Racing* (Benedict Tan, ed. The Complete Introduction to Laser Racing. Singapore: FSTOP Pte Ltd for Singapore Sports Council, 2000) and *Run for Your Life! The Complete Marathon Guide* (Benedict Tan, ed. Run for Your Life! The Complete Marathon Guide. Singapore: Marshall Cavendish Editions, 2009) feature the use of the sports sciences and medicine in training and competition. Another of his books, *Fight the Fat - What You Must Know and Do to Lose Weight* (Benedict Tan, ed. Fight the Fat – What You Must Know and Do to Lose Weight. Singapore: Marshall Cavendish Editions, 2007) forms the backbone of the SSMC Weight Loss Programme.

Dr Miriam Lee

Dr Miriam Lee graduated from the University of Western Australia with a Bachelor of Science (Exercise and Health Science) with Honours and went on the pursue her PhD at the National Institute of Education, Nanyang Technological University, Singapore. Her area of specialisation is in motor control and learning for children. She is currently a Senior Manager at Sport Singapore where her work focuses on building the physical literacy of young children through various programmes and initiatives.

Dr Aaron Sim

Dr Aaron Sim is a passionate advocate for better health through physical activity, exercise and sport. He is currently an Assistant Director in the physical activity division at the Health Promotion Board where he plays an integral role in driving physical activity programming efforts for the children and youth. He is a qualified Exercise Physiologist and Strength & Conditioning Specialist, holds a BSc(Hon) and PhD in Exercise and Health Science from the University of Western Australia and had previous stints at A*STAR and the Nanyang Technological University as a Research Fellow.

Dr Teresa Tan Shu Zhen

Dr Teresa Tan is a Consultant in the Division of General Ambulatory Paediatrics and Adolescent Medicine at the Khoo Teck Puat - National University Children's Medical Institute, National University Hospital. She achieved First Class Honours for her intercalated BSc degree in Immunology in 2006, followed by MBBS in 2008, from Imperial College, London. She obtained Masters of Medicine (Paediatric Medicine) from NUS, and Membership of the Royal College of Paediatrics and Child Health in 2013. She completed Specialist Accreditation for Paediatric Medicine in 2017, and Adult Palliative Medicine in 2020.

She was part of the workgroup who developed the Singapore Integrated 24-Hour Movement Guidelines for Children and Adolescents in 2020. In addition to General Paediatric work, Dr Tan is setting up a Paediatric Palliative Care service at NUH, striving to provide holistic and multidimensional care for children with life-limiting illnesses. She is also part of the Paediatrics Ethics and Advocacy Centre (PEACe) at the institution.

Dr Cai Shirong

Dr Cai Shirong is a principal investigator at SICS. Her main research interest is in early childhood sleep as a modifiable target for health interventions and the risk factors that shape early childhood sleep.

Presented with the opportunities to access developmental cohorts such as GUSTO and S-PRESTO, strategically positions her to study sleep in early childhood alongside subsequent developmental stage outcomes such as cognition, mood, behaviours, growth, adiposity and cardio-metabolic health. Dr Cai is also interested in maternal sleep, especially in relation to how it impacts perinatal maternal and child health.

Aside from sleep, she also has a keen interest in multidisciplinary research, linking psychology and neuroscience with metabolic conditions such as gestational diabetes. Dr Cai received her PhD from the NUS Yong Loo Lin School of Medicine.

Assistant Professor Mary Chong Foong Fong

A/Prof Mary Chong's main research is on Maternal and Child Nutrition. Trained as a clinical dietitian, she attained her PhD at the University of Oxford, U.K. and is currently Assistant Professor at the Saw Swee Hock School of Public Health, National University of Singapore. She is also Principal Investigator at the Singapore Institute for Clinical Sciences, A*STAR.

She is the Nutrition Lead for the Growing Up in Singapore Towards Healthy Outcomes (GUSTO) study, a mother-offspring cohort study in Singapore and is involved in two pre-conception studies, SPRESTO and NiPPeR.

A/Prof Chong has a special interest in diet and lifestyle behaviours and has been researching in this area with web-based technologies in both children and adults. Her current work includes investigating behavioural determinants of health in children, from which her team has developed a web-based, time-use application (MEDAL) to assess diet and lifestyle in school children.

She has been invited to speak at national and international conferences and has published over 150 papers in peer-reviewed journals. She is currently a member of the Advisory Panel on Parenting for the Ministry of Social and Family development and a committee member for the Physical Education Syllabus Review and Development, Ministry of Education.

Professor Tan Kok Hian

Prof Tan Kok Hian is Head, Perinatal Audit & Epidemiology and Senior Consultant, Maternal Fetal Medicine in KK Women's & Children's Hospital, Singapore. Prof Tan has active teaching faculty appointments in 3 medical schools (Duke-NUS as Professor; and both YLL-NUS & LKC-NTU medical schools as Adjunct Professor). He is the Benjamin Henry Sheares Professor in Obstetrics and Gynaecology since 2019. Prof Tan is the Lead for Gestational Diabetes Mellitus (GDM), SingHealth Duke-NUS Diabetes Centre and the Lead Principal Investigator, NMRC Integrated Platform for Research in Advancing Metabolic Health Outcomes of Women and Children (IPRAMHO). He is President of Perinatal Society of Singapore and Past President of the Obstetrical & Gynaecological Society (OGSS) of Singapore. He is Chairman of the Congress Trust Fund of OGSS.

Prof Tan initiated and led in the implementation of universal GDM screening and also introduced the new IADPSG criteria in KKH and SGH since January 2016. He is the champion of GDM universal screening, which has now been adopted in all hospitals in Singapore with obstetric service. As Chairperson of College of Obstetricians & Gynaecologists, Singapore GDM Committee 2017-2018 and Chairperson, Expert Group GDM Appropriate Care Guide of The Agency for Care Effectiveness (ACE), Ministry of Health 2017-18, he was instrumental in leading GDM management. He facilitated the Asia Oceania Consensus in Gestational Diabetes in January 2018; the Perinatal Society of Singapore guidelines on Optimal Perinatal Nutrition in 2019 and Physical Activity & Exercise in Pregnancy in 2020; and consensus for Optimal Perinatal Nutrition, and Physical Activity & Exercise in Pregnancy for the Asia Pacific region.

Prof Tan is the Lead for RIE2020 NMRC Collaborative Centre Grant - Integrated Platform for Research in Advancing Metabolic Health Outcomes of Women and Children (IPRAMHO) which builds core research capability & capacity in metabolic health for women and children of Singapore and Asia. He is currently PI for the Integrated Hyperglycaemia Incentivised Postnatal Surveillance Study (IHIPS) which is a RCT on lifestyle and wearable interventions to prevent post-partum diabetes in Asian women with a history of GDM, under Singapore NMRC 2021-2025 LCG grant

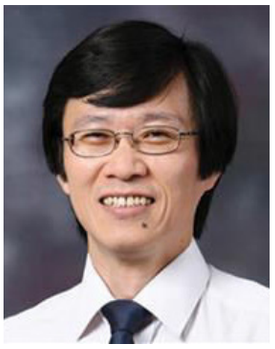
Prof Tan received many awards for his academic & clinical contributions. These included World Health Organization - UAE Health Foundation Prize 2009 as KKH Integrated Perinatal Care Project Team Leader and the inaugural Singapore National Outstanding Clinical Quality Activist Award in 2010. He serves as a WHO consultant for Patient Safety and initiated the Global Action for Leaders & Learning Organizations on Patient Safety (GALLOPS) program to support the WHO Global Patient Safety Action Plan 2021–2030.

Professor Lee Yung Seng

Professor Lee Yung Seng is the Group Director of Paediatrics, National University Health System, and concurrently the Head of the Khoo Teck Puat-National University Children's Medical Institute, National University Hospital; He is a practicing Senior Consultant Paediatrician of the Division of Paediatric Endocrinology, Department of Paediatrics, Khoo Teck Puat-National University Children's Medical Institute, National University Hospital.

Prof Lee is the Head of Department, Department of Paediatrics, Yong Loo Lin School of Medicine, National University of Singapore. He is the president of the Asia Pacific Paediatric Endocrine Society (APPES), and the president of the College of Paediatrics and Child Health, Academy of Medicine, Singapore. Professor Lee has 216 peer reviewed publications in the area of childhood obesity, developmental origins of heath and disease, and paediatric endocrinology.

Professor Tan Hak Koon



Prof Tan Hak Koon is the Chairman of OBGYN-ACP, Duke-NUS Medical School and the Chairman of Division of Obstetrics and Gynaecology in KK Women's & Children's Hospital from 2020. He was the Head of Department of Obstetrics & Gynaecology of Singapore General Hospital from 2010 to 2019. He is also the Designated Institutional Official (DIO), of SingHealth Residency since 1 June 2018.

Besides general obstetrics and gynaecology, he specializes in high-risk pregnancy and ultrasound scans. He is a Clinical Professor for Duke-NUS Medical School. He was President for College of Obstetrics & Gynaecology Singapore from 2013 to 2015. He has been Chief, Section of Fetal Maternal Section (O&G) in SGH, (2003-2019). He is Associate Dean, Residency Education, Office of Academic and Clinical Development, Duke-NUS Medical School. He was awarded National Outstanding Clinician Educator Award 2021. He is an IPRAMHO investigator.

Associate Professor Derrick Chan

A/Prof Chan is Senior Consultant, Neurology Service, KK Women's and Children's Hospital. He is also Programme Director, SingHealth Duke-NUS Clinician-Innovator Development Programme (CINDP), Deputy Director (Education), SingHealth MedTech Office and Director KK Research Centre.

Dr Chan has raised Paediatric Neurology at KKH to world-class standards, with trainees applying from the ASEAN region, Africa, the Middle East and Europe and recognition from Australia and the United Kingdom as a training centre. He mentored the SingHealth team for the 2017 Health Service Development Programme funded program "PINS: Paediatric Integrated Neurorehabilitation Service – Integrating tertiary and community care"

Associate Professor Ng Kee Chong

A/Prof Ng Kee Chong graduated from the Faculty of Medicine, National University of Singapore in 1989. He pursued specialty training in Paediatrics and joined KK Women's and Children's Hospital (KKH) in 1997. He was awarded a Ministry of Health (Singapore) fellowship in post-graduate training (1998-1999) at the Hospital for Sick Children in Ontario, in Paediatric Emergency Medicine. He earned his Master in Business in Business Administration in 2015 from Singapore Management University.

Assoc Prof Ng was Chair of the Emergency Preparedness Committee at KK Women's and Children's Hospital (KKH) from 1997 to 2016, setting up KKH's mass casualty response plans for both civil & Hazmat emergencies. He also led the hospital's disaster responses including the Indian Ocean tsunami in 2004.

He was Head of the Children's Emergency at KKH from 2005 to 2016, and co-chair of the Ministry of Health Toxicology Clinical Practice Guidelines Workgroup from 2009 to 2011. With the setting up of the Paediatrics SingHealth Academic Clinical Programme (PAEDS ACP), Assoc Prof Ng was appointed as Chair of PAEDS ACP from 2011. He was a member of the Duke-NUS Medical School Admissions Committee till 2018.

Assoc Prof Ng was previously Chairman, Division of Medicine, KKH, from 2012-2017, and Campus Director of KKH Medical Innovation & Care Transformation from 2015 to 2017. He is currently Chairman Medical Board since 1 May 2017.

He is a member of the Ministry of Health National Trauma Committee (NTC) & Co-Chair of the "Emergent Issues" subcommittee in NTC. He is currently Vice-President of the MOH Singapore Resuscitation & First Aid Council (SRFAC) and has been a member of the International Liaison Committee on Resuscitation (ILCOR) Pediatrics Life Support (PLS) Taskforce since 2011 and is currently Chair of the ILCOR PLS Taskforce.

Assoc Prof Ng is a Clinical Associate Professor with the Duke-NUS Medical School, Yong Loo Lin School of Medicine and is currently the President of the College of Paediatrics & Child Health, Singapore. He is a member of the MOH Paediatric Residency Advisory Committee (RAC) as well as examiner for the Royal College of Paediatrics & Child Health in UK.

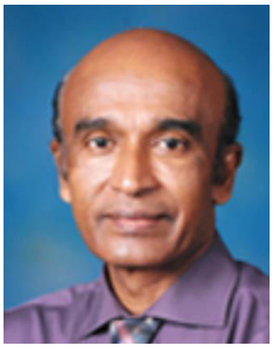
He has led various regional outreach teams to teach paediatric resuscitation using the train-the-trainer frameworks in Cambodia, Laos, Myanmar and in China. His interests include paediatric disaster response & planning; paediatric resuscitation; paediatric toxicology and regional clinical outreach and training.

Associate Professor Tan Lay Kok

A/Prof Tan is a Senior Consultant in Obstetrics and Gynaecology with an interest and many peer-reviewed publications in high risk pregnancy and obstetric medicine. He is Head of KK Women's and Children's Hospital, Department of Maternal Fetal Medicine, following a 16-year stint helming a maternal fetal medicine team and establishing a multi-disciplinary tertiary centre dedicated to clinical care, research and continuing medical education in high risk pregnancies.

He is also previously Vice-Chair (Clinical) and presently Vice-Chair (Education) of the SingHealth OBGYN Academic Clinical Programme, with a proven track record in excellence in undergraduate and postgraduate residency medical education. A/Prof Tan is committed to improving patient safety, clinical care and educational innovation. He is also a Past President of the Obstetrical and Gynaecological Society of Singapore, and the current President of the College of Obstetricians and Gynaecologists Singapore, as well as, a council member, International Society of Obstetric Medicine (ISOM)- lead for Advocacy.

Professor Victor Samuel Rajadurai



Prof Samuel Rajadurai is a Senior Consultant in the Department of Neonatology at the KK Women's and Children's Hospital, Singapore. He is an Adjunct Professor of Paediatrics at Duke-NUS and also a visiting Professor to Tianjin Central Hospital, China. He has had extensive experience in Neonatology for more than 30 years. Currently, he is the President of the Perinatal Society of Singapore and Chairman of the IPOKRaTES Group in Singapore. In the past he has served as President of the College of Paediatrics and Child Health. He was the founding Director of the National Expanded Newborn Screening Programme. Prof Sam's research interests are perinatal asphyxia, PPHN, chronic lung disease of prematurity, neonatal nutrition, hypoglycaemia, and newborn screening. He is President-Elect for FAOPS.

Prof Sam has participated as a collaborator in a number of international multicenter randomized control trials including the OSECT trial, RAST study, UKOS trial, N3RO trial and OPTIMIST-A trial. He has been invited to speak at several national and international conferences and has also conducted Seminars / Workshops in Malaysia, Indonesia, Bangladesh, India, Japan, Cambodia and Myanmar. He is a visiting Professor to People's Republic of China and has been invited to lecture in several cities including Beijing, Shanghai, Guangzhou, Tianjin, Shijiazhuang, Shenzhen, Chengdu and Yinchuan for the past 12 years. His publications include 3 chapters in books, 120 abstracts and over 100 articles in journals. He is an IPRAMHO investigator.

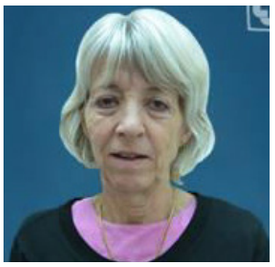
Professor Shakila Thangaratinam

Prof Shakila Thangaratinam is Professor of Maternal and Perinatal Health at University of Birmingham, and leads the Maternal and Reproductive Health Theme (Jan 2020-). She is the co-Director of WHO Collaborating Centre for Global Women's Health and academic lead for Women's Health in Birmingham Health Partners. As Consultant Obstetrician she is involved in the care of high-risk mothers at Birmingham Women's and Children's NHS Foundation Trust.

In her previous role as Professor at Queen Mary University of London (2012-2019), Professor Thangaratinam established the Barts Research Centre for Women's Health (BARC). She established Katie's Team, a dedicated Patient and Public Involvement group in East London, whose members contribute to NIHR Boards and studies. More recently, she established the Dame Hilda Lloyd Network, which brings together medical and midwifery students and trainees, School students, and senior clinical academics involved in Women's Health research in West Midlands.

Professor Thangaratinam's work focuses on prediction, prevention and treatment of complications in mothers with pre-eclampsia, epilepsy, diabetes, and obesity. She leads large global collaborative networks such as the NIHR-funded International Weight Management in Pregnancy (i-WIP) collaborative group (40 researchers, 16 countries, >50,000 women), with the largest live repository of individual data and the IPPIC (International Prediction of Complications in Pregnancy) collaborative network (73 collaborators, 21 countries, >5 million pregnancies). She has accrued research income of over £12 million, and published in first or last author position in Lancet (2019, 2015, 2012), BMJ (2021, 2020, 2017, 2016, 2012, 2011), Lancet Global Health (2017), Lancet Haematology (2021), and multiple HTA monographs. Prof Thangaratinam was awarded the NIHR Senior Investigator Award in March 2021.

Dr Ann Wright



Dr Ann Wright trained in St Thomas's Hospital Medical School. She completed her specialist training in Wales and worked as a consultant there for more than twelve years before coming to South East Asia. She has an interest in all aspects of general Obstetrics and Gynaecology especially high-risk pregnancy and Labour Ward management. She has worked in the MFM department in KKH for seven years and became Head of Peripartum Unit for the past 2 years.

Dr June Tan Vic Khi

Dr June Tan is the Head & Senior Consultant of the Obstetric Ultrasound & Prenatal Diagnosis Unit and she is also the Director of the Antenatal Diagnostic Centre (ADC) in KK Hospital. Dr Tan graduated with MBBS at the National University of Singapore and MRCOG from Royal College of O&G, United Kingdom. She underwent one-year post-graduate training on fetal echocardiography at 2 European centres, The National Centre of Fetal Medicine in Trondheim, Norway & the National Heart & Lung Institute at the Royal Brompton Hospital in London, UK, as part of the MOH, Human Management Development Program. At these centres, Dr Tan trained to provide specialised fetal echocardiography scans together with Professor Sturla Eik-NES, & Dr Julene Carvalho, paediatric cardiologists who specialises in fetal cardiology.

Dr June Tan's professional training in Obstetrics and Gynaecology has been largely in Maternal Fetal Medicine Department in KK Hospital. In the field of obstetrics, Dr Tan has been focused on fetal medicine & obstetric ultrasound. Together with the team of fetal medicine specialists and obstetric sonographers, KKH ADC now offers specialised fetal heart screening for all pregnancies including Low and high-risk pregnancies, screening for fetal heart abnormalities in the first trimester of pregnancy.

Dr Tan strongly believes that teaching and training are the cornerstones of continuing and improving the current practice of obstetrics. She has been involved in teaching of medical students from the Yong Loo Lin School of Medicine in the form of mentoring, conducting tutorials & lectures and conducting clinics with the medical students.

In the area of audit and research, Dr Tan leads in maintaining the department's antenatal Birth Defect Clinic and Registry. She is Principal Investigator of the First-Trimester Screening and prevention of pREeCLAmpSia Trial (FORECAST) in KKH. The multi-center study aims to evaluate the efficacy, acceptability and safety of first trimester screening and prevention of preterm-preeclampsia.

Dr Jonathan Choo Tze Liang

Dr Jonathan Choo is a paediatric and fetal cardiologist at KK Women's and Children's Hospital. He was trained in both paediatrics and cardiology in Singapore. His research interests are in cardiac genetics, developmental origins of cardiac disease and health, vascular disease and echocardiography. He is also involved in clinical ethics, being on ethics committees at hospital and national levels.

Dr Ku Chee Wai

Dr Ku Chee Wai is a Clinician-Scientist Resident in the SingHealth Obstetrics and Gynecology Residency Program. His primary research interest includes early pregnancy complications, preconception and reproductive health. Dr Ku is currently pursuing a PhD in Clinical Sciences, at Duke-NUS, with the Healthy Early Life Moments in Singapore (HELMS) study to develop the 6P assessment. The 6P tool is a key intervention in HELMS, which adopts a life-course approach to lifestyle interventions from preconception to postpartum periods, to improve metabolic health and promote virtuous cycles of health in overweight and obese women.

Associate Professor Tan Ngiap Chuan

A/Prof Tan Ngiap Chuan is the Director for the Department of Research in SHP and the Vice Chair, Research in FM ACP. He is a practising Family Physician at SHP-Pasir Ris and graduated with a Master in Clinical Investigation from the National University of Singapore in 2010.

Clinical Associate Professor Tan has written more than 160 scientific articles in peer-reviewed journals and two book chapters. He was a recipient of the SingHealth Publish Award for Family Medicine in 2015. He spearheads the FM ACP Signature Research Programmes, which focus on health services and outcomes research, health promotion and prevention care research, as well as innovations in primary care.

Associate Professor Tang Wern Ee

A/Prof Tang Wern Ee is a Family Physician, Senior Consultant and Director of the Clinical Research Unit at the National Healthcare Group Polyclinics. She is also Assistant Dean, Family Medicine at the Lee Kong Chian School of Medicine. She completed her basic medical education and Masters in Medicine (Family Medicine) at the National University of Singapore and her Masters in Health Professions Education at the MGH Institute of Health Professions (Boston). She is also a Fellow of the College of Family Physicians, Singapore. She has special interests in chronic disease management, health literacy and health services research in primary care. Under IPRAMHO, she is currently leading a team studying health education materials and resources for women who have had gestational diabetes. She is a Co-Lead for IPRAMHO.

Ms Asmira Bte Mohamed Rahim

Ms Asmira graduated as Registered Staff Midwife and served in KKH Delivery Suite caring for the laboring mothers of high and low risk groups. She obtained her Bachelor Degree in Science (Nursing) from Curtin Technological University in 2010.

She was appointed in KKH Obstetric Day Care (ODAC) to run the department as Nurse Clinician and Nurse Navigator, caring for the Gestational Diabetes mothers in achieving optimal blood sugar throughout pregnancy and prevent complications; and developing a model system to guide and improve the care of GDM.

Ms Asmira completed her Specialist Diploma in Diabetes Management in 2017. With the role of Diabetes Nurse Educator, she focuses on helping diabetic patients achieve behavioural change through lifestyle modifications and cope with demand of diabetes. She was a member of the Temasek Foundation Cares Gestational Diabetes Program team, as a Nurse Navigator. Ms Asmira was involved in the Transforming Care for Gestational Diabetes Programme (TC-GDP), a transformative model of Gestational Diabetes Mellitus (GDM) Care and follow-up to improve and maintain the health of Singapore's Community. She implemented departmental changes in new GDM workflows as well care of high-risk pregnancies.

Currently she still practices as a Nurse Navigator for a programme called SingHealth High Risk Metabolic Postnatal Surveillance (SHRIMPS) under SingHealth Regional Health System (RHS), where she follows up with postnatal GDM women. She ensures postnatal education are given, bringing awareness on the importance of postnatal follow ups.

Dr Ng Lai Peng

Dr Ng Lai Peng is a Family Physician, Consultant, in SingHealth polyclinic and a clinical core faculty member of the SingHealth Residency Family Medicine program. She has been the clinical workgroup lead for the SingHealth polyclinic women's health multidisciplinary workgroup. She oversees programs related to women's health in the polyclinic and develop training resources for primary care doctors. She is also one of the expert group members of the MOH Appropriate Care Guide (ACG) on Gestational Diabetes Mellitus, 2018.

Dr Poon Zhimin

Dr Poon Zhimin graduated as a medical practitioner from National University of Singapore (MBBS NUS) in 2010 and is a family physician with the Family Physician Registry in Singapore. She has completed the Master programme in Family Medicine, MMed (FM) NUS in 2014 and has recently obtained her Fellowship of the College of Family Physician in Singapore in 2021. Dr Poon trained under the SingHealth Family Medicine Residency and was awarded SingHealth Best Resident and Outstanding Resident Representative in 2012.

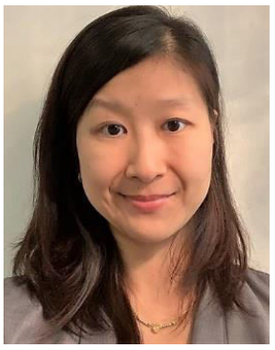
Dr Poon has a keen interest in medical education and is currently a clinical tutor with the Graduate Diploma of Family Medicine, a clinical lecturer with Lee Kong Chian School of Medicine, a clinical instructor with SingHealth Duke-NUS FM Academic Clinical Programme as well as a Physician Faculty with the SingHealth Family Medicine Residency programme.

Dr Andrew Tan Yen Siong

Dr Andrew Tan graduated from the Yong Loo Lin School of Medicine in 2015, and had recently completed the SingHealth Family Medicine Residency Programme. He also holds an International Olympic Committee (IOC) Diploma in Sports Medicine.

He has a keen interest in chronic diseases such as diabetes mellitus and hypertension, and is a firm supporter of community-based medicine - through empowering patients and their primary care physicians.

Dr Elaine Quah Phaik Ling



Dr Elaine Quah is currently a Senior Research Fellow and an investigator on the IPRAMHO team at KK Women's and Children's Hospital, Singapore. She obtained her PhD in 2013 from the National University of Singapore with her thesis entitled "Soluble mediator profiles of cord blood mononuclear cells in early onset childhood allergic disorders". She next spent 6 years at the Singapore Institute for Clinical Sciences, A*Star working with the Growing Up in Singapore Towards healthy Outcomes (GUSTO) team, and its industry collaborators investigating the "The life-course approach to nutrition and the impact of behavioral nutrition (i.e., eating behavior and feeding practices) on child health outcomes later on in life".

With 27 publications to date, experience with clinical studies, laboratory work, and epidemiology cohort studies, she is now delving into intervention studies focusing on improving maternal and child metabolic health outcomes at KKH.

Asst Prof Yeleswarapu Sita Padmini

Dr Padmini Yeleswarapu is a Developmental Paediatrician trained in UK and is currently a Senior Consultant in the Department of Child Development at KK Women's and Children's Hospital.

She is very passionate about addressing the needs of high-risk families and using a family centred approach to support children and families with adverse childhood experiences., She was one of the trainers for the level 3 child protection training programme conducted by Alder Hey Children's hospital, UK. With this strong background in Child Protection, Dr Padmini is the program lead for the ANCHOR program since 2019– an initiative led by KKH and funded by Temasek Foundation that aims to support young children who have sustained maltreatment and their families.

She also has a keen interest in teaching and is the departmental educational lead, overseeing the DBP fellowship programme, as also the teaching and training of the medical students and residents posted to the department. She had helped develop various training resources to be used for the teaching sessions both within the department and also for medical students' examinations. She believes that every teaching opportunity should be an interactive session with the creation of a positive learning environment, where the students have the opportunity to be able to express their views and share their experiences with ease.

Her other area of major interest is in development screening and she is a key member of the developmental arm of the Integrated Maternal and Child health initiative run by KKH and SingHealth Punggol polyclinic with support from Temasek Foundation.

Professor Sachith Mettananda

Professor Mettananda is currently the Professor of Paediatrics and Head of the Department of Paediatrics at the University of Kelaniya and a Consultant Paediatrician at Colombo North Teaching Hospital, Ragama, Sri Lanka. He is a leading researcher in Paediatrics in Sri Lanka and has conducted several pre-clinical, translational and clinical research studies in collaboration with the Universities of Oxford and Cambridge in the UK. He has authored over 75 scientific publications, of which many are in high impact journals that include *Blood, Nature Communications, British Journal of Haematology* and *Nature Scientific Reports*.

He has won many awards for outstanding research including President's Award for Scientific Publications in 2011, 2015, 2016 and 2018 and Ten Outstanding Young Persons Award in 2016. He is also an Associate Editor in *BMC Pediatrics* and an editorial board member in *Ceylon Medical Journal* and *Sri Lanka Journal of Child Health*. His qualifications are: MBBS(Col), DCH(Col), MD-Paediatrics(Col), DPhil(Oxon), FRCPCH(UK), FRCP(Edin).

Professor Muhammad Yazid Jalaludin

Professor Dr Muhammad Yazid Jalaludin is currently Deputy Dean (Undergraduate Studies) at the Faculty of Medicine, University Malaya, after serving as the Head of Department of Paediatrics UM from 2016 to 2021. He works as a Senior Consultant Paediatrician and Senior Consultant Paediatric Endocrinologist at the University Malaya Medical Centre (UMMC) and as a Professor at the Faculty of Medicine, University Malaya. He completed his fellowship in Pediatric Endocrinology and Diabetes at Children's Hospital of Philadelphia (CHOP), USA after obtaining his MBBS and Masters in Paediatrics, both from University Malaya.

He is currently the Immediate Past President of the Asia Pacific Paediatric Endocrine Society (APPES 2020-2022) and the Malaysian Paediatric Association (MPA 2019-2021). He is also a member of The Endocrine Society USA, International Society for Paediatric and Adolescent Diabetes (ISPAD) and Malaysian Endocrine and Metabolic Society (MEMS).

Prof Jalaludin main research interest is in growth (nutrition), obesity and type 2 diabetes mellitus, and vitamin D in children. He is one of the Principal Investigator (Clinical) for MyBFF@school, co-PI for MyHeARTs and co-investigator in Co-PoWR and DEWI projects. He holds many national and international research grants. He acts as Scientific Advisor for many multicentre international researches for type 2 diabetes in children. His work has been published in various academic journals including in the New England Journal of Medicine (NEJM) and as textbook chapters.

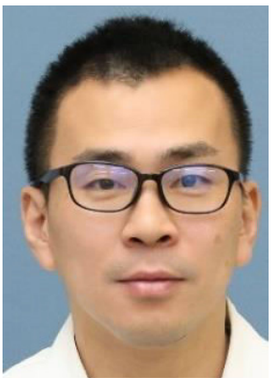
Associate Professor Betty BUT

A/Prof Wai Man, Betty BUT graduated from the Faculty of Medicine, University of Hong Kong. She was trained in Paediatrics and Paediatric Endocrinology in Queen Elizabeth Hospital, Hong Kong. She worked as visiting fellow in the Department of Endocrinology and Diabetes, Royal Children Hospital, Melbourne under the Robert Black Scholarship for six months during the period from January till June 1993. She is attached to the Department of Metabolic Medicine as visiting consultant under the Corporate Scholarship from the Hospital Authority, Hong Kong for 3 months during the period from April till June 2016. She is particularly interested in Paediatric Endocrinology and Metabolic Medicine.

Her present position is Consultant Paediatrician of the Department of Paediatrics at Queen Elizabeth Hospital, Hong Kong. She is currently the Chairman and Programme Director of the Paediatric Endocrinology Subspecialty Board under the Committee for Subspecialty Board of the Hong Kong College of Paediatricians. The Subspecialty of Paediatric Endocrinology was recently established in 2019 in Hong Kong. The Department of Paediatrics, Queen Elizabeth Hospital is one of the training centres for Paediatric Endocrinology.

Dr But is former President of the Hong Kong Society of Paediatric Endocrinology and Metabolism and former Vice-President of the Hong Kong Society of Inborn Errors of Metabolism. She is appointed as Honorary Clinical Associate Professor of the University of Hong Kong and the Chinese University of Hong Kong. She is the host examiner for the MRCPCH clinical examination of the Royal College of Paediatrics and Child Health conducted in Hong Kong.

Associate Professor Nobuhiko Nagano



Associate Professor Nagano is from Department of Pediatrics and Child Health, Nihon University School of Medicine, Tokyo, Japan. He received his M.D. from Nihon University School of Medicine, Tokyo, Japan and a Ph.D. (Doctorate of Medical Science), Nihon University Graduate School of Medicine, Department of Pediatrics, Tokyo, Japan.

His current research interests include neonatology, lipid metabolism, growth and development.

Professor Ichiro Morioka

Professor Morioka is from Department of Pediatrics and Child Health, Nihon University School of Medicine, Tokyo, Japan. He received his M.D. from Nihon University School of Medicine, Tokyo, Japan and a Ph.D. (Doctorate of Medical Science), Kobe University Graduate School of Medicine, Kobe, Japan.

His current research interests include neonatology, mother-to-child infectious disease (especially congenital cytomegalovirus infection, congenital toxoplasmosis), growth and development in small-for-gestational age children.

Associate Professor Pongsak Noipayak

A/Prof Pongsak Noipayak MD is a lecturer in developmental and behavioural paediatrics at faculty of medicine Vajira Hospital, Navamindradhiraj University. He has been working with children and families for more than 30 years. Assoc. Prof. Dr Pongsak has accomplished his qualification in Paediatrics from Chiangmai University, Developmental and Behavioral Paediatrics from Thai Medical Council, Epidemiology from London School of Hygiene and Tropical Medicine and Child and Adolescent Mental Health with Merit from King's College London. Currently, he has been appointed to be a Vice President of Navamindradhiraj University which is the University of Bangkok Metropolis for 5 years.

Professor MKC Nair

Prof Nair, is a true leader in both his vision and actions. Very early in his career Prof Nair had recognised the social, economic and cultural value of child development in the nation's life. He relentlessly worked towards developing new screening tools and innovative training methods for over three decades and is now globally acknowledged as a pioneer in the field. Trivandrum Developmental Screening Chart (TDSC), is one such example which forms the backbone of the national child health program Rashtriya Bal Swasthya Karykram (RBSK).

Prof Nair, who had a long research career with 173 National/International Journal Publications and 22 Medical Books as Author/Editor, took several decisions in his professional career where outcome was uncertain. Child Development Centre (CDC) was his dream, which is now considered a national asset for research, teaching and training in child and adolescent development, with 25 years follow up of Low Birth Weight babies, leading on to the award of the first "Doctor of Science (DSc)" degree awarded to any medical person in 80 years history of University of Kerala. His 41 years of counselling experience helped him immensely in establishing "Student Guidance & Support" program in all colleges during his latest stint as Vice Chancellor of Kerala University of Health Sciences. Prof Nair has established national benchmarks in the process.

Prof Nair DSc, has been elected "Fellow of the National Academy of Medical Sciences (FAMS) in the year 2020". Currently he is working as Director, NIMS-Spectrum-Child Development Research Centre (CDRC), Nims Medicity Campus, Thiruvananthapuram.

Dr Zhao Yanjun

Dr Zhao Yanjun is currently an Attending Physician at the Department of Child Health Care, Shanghai Children's Hospital, Shanghai Children's Hospital Affiliated to Shanghai Jiao Tong University. She was previously a visiting scholar at the University of Compton in Spain and the University of Amsterdam in the Netherlands. She is a Lecturer, Department of Developmental-Behavioral Pediatrics, Shanghai Jiao Tong University School of Medicine. Her research focuses on maternal and child health epidemiology, especially the perinatal environmental and hereditary factors and their effects on maternal and fetal health.

Dr Divina Cristy Redondo-Samin

Dr Divina is the Chairperson, Medical Nutrition and Weight Management Center, Premiere Medical Center, Nueva Ecija, Philippines. She is also Chairperson, Hospital Research Committee, Dr Paulino J. Garcia Memorial Research and Medical Center, Nueva Ecija, Philippines. She is a Research Coordinator and Member, Training Core, Clinical Nutrition Fellowship Program, St. Luke's Medical Center, Quezon City, Philippines

Senior Professor Anthony Okely

Prof Anthony Okely is a Senior Professor in the School of Health and Society at the University of Wollongong, Australia. He is a NHMRC Leadership Fellow (Level 2), and Theme Leader at the Illawarra Health & Medical Research Institute.

His research focuses on movement behaviours (physical activity, sedentary behaviour, and sleep) in children, with a particular focus on low- and middle-income countries.

Prof Anthony led the team that developed the Australian 24-hr Movement Guidelines for Children birth to 5 years. He was part of the Guideline Development Group for the WHO Global guidelines on physical activity, sedentary and sleep behaviours in children under 5 years of age, and for similar guidelines in South Africa, Canada and the United Kingdom.

He currently leads an international study of movement behaviours in the early years called SUNRISE, which involves 41 countries, 25 of which are low- or middle-income. He has published over 300 peer-reviewed journal articles which have been cited over 23,000 times. He has a h-index of 79.

Professor Aman Pulungan

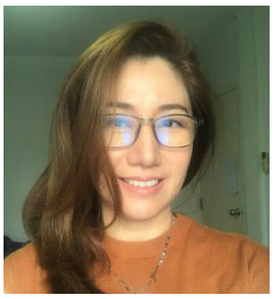
Prof Aman Pulungan is the President of Indonesian Pediatric Society, President of the Asia Pacific Pediatric Association, Executive Committee member of the International Pediatric Association, Senior Consultant in Pediatric Endocrinology, Faculty of Medicine, University of Indonesia, Committee member for medical specialist deployment Ministry of Health (MOH) Republic of Indonesia, NCD Child Governing Council, and past president of the Asia Pacific Paediatric Endocrine Society (APPES). For the past 19 years, he has been involved in many programs for diabetes in Indonesia and in the region, amongst others, the project leader for the World Diabetes Foundation type 1 DM in Indonesia, and as a member of the advisory board of the Physician International Society for Pediatric and Adolescent Diabetes.

He has been awarded by the Indonesian MOH as one of the most eminent persons who has been actively involved in the national immunization program, as an honorary fellowship by the Turkish National Pediatric Association for dedication and contribution to child health, and as an honorary fellow of the Royal College of Physicians of Ireland (RCPI). He is also a member of the health advisory board of The Australia-Indonesia Centre and media and communications division of The Global Pediatric Endocrinology and Diabetes.

He initiated the formation of IKADAR, an organisation for families with diabetic children which includes patients, doctors and educators. He took important roles in the formation of Foundation for Congenital Adrenal hyperplasia Families (KAHAKI), Families Forum for Osteogenesis Imperfecta (FOSTEO), Turner Society Indonesia (TSI). He is a member of various international organizations such as APPES, ESPE, ISPAD, International Fellow of American Academy of Pediatrics, GPED, DOHAD Society, and the Endocrine Society. He is part of the editorial board of International Journal of Pediatric Endocrinology and The Annals of Pediatric Endocrinology & Metabolism.

His research interests include the genetic profile of Pygmies Rampasasa in Flores, short stature and stunting, congenital hypothyroidism, early life and metabolic syndrome, as well as global health. He is the copyright holder of the Indonesian National Growth Charts.

Dr Areekul Amornsriwatanakul



Dr Areekul Amornsriwatanakul is currently a lecturer at Sports Sciences and Technology, Mahidol University, and adjunct lecturer at School of Human Sciences (Sport Science, Exercise, and Health). She is also a Project Manager of Children and Youth Physical Activity Studies (CYPAS). Her research interests include physical activity in children and youth, health promotion policy and advocacy. During 2015-2016, Areekul was the Co-Principal Investigator of Thailand Physical Activity Children Survey conducted in almost 17,000 children from 336 primary and secondary schools across 9 regions in the country. She was the Country Leader of the Thailand's 2016 report card on physical activity for children and youth when the country participated in the multinational collaborative project (Global Matrix 2.0). Previously, she was a senior researcher at the International Health Policy Program (Ministry of Public Health).

Dr Huynh Manh Nhi

Dr Huynh Manh Nhi graduated from University of Medicine and Pharmacy of Ho Chi Minh City in 1992 as a general practitioner, attending residency of pediatric orthopedics surgery in 1993-1996 and has practiced as a pediatric orthopedic surgeon at Hospital for Traumatology and Orthopedics since 1997. He noted a rising rate of child obesity in his patients and many related issues of child obesity, including children's eating habits and changes in economy. He wishes to contribute efforts to a sustainable program addressing child obesity in Vietnam.

Dr Thiyagar Nadarajaw

Dr Thiyagar is a Consultant Paediatrician & Adolescent Medicine Specialist. He is currently the head of Paediatric Department in Hospital Sultanah Bahiyah, Alor Setar & State Consultant for paediatric services in Kedah, Malaysia.

He graduated from University Science Malaysia in 1990 and subsequently completed his postgraduate training in Paediatrics in the year 1998. He pursued his Adolescent Medicine subspecialty fellowship at the Centre for Adolescent Health, Royal Children's Hospital Melbourne in 2006.

He is the Past President of Malaysian Paediatric Association (2015/2017) and the current Vice President of the Malaysian Association for Adolescent Health. He also serves as an Adjunct Professor at the AIMST University, teaching the medical students in their clinical years.

Associate Professor Azriyanti Anuar Zaini

Dr Azriyanti Anuar Zaini is a Consultant Paediatric Endocrinologist and Consultant and Senior Lecturer in the Department of Paediatrics, University Malaya Medical Centre, Kuala Lumpur Malaysia.

Professor Chia Yong Hwa Michael

Prof Michael Chia is a full professor of Paediatric Exercise Science at the National Institute of Education, a first for Singapore. His graduate and post-graduate training emanated from Loughborough University (BSc Hons 1st class, Physical Education & Sports Science) and Exeter University (PhD, Health & Exercise Sciences) in the UK. As an academic, he received several awards for his teaching, research and leadership roles. He leads an international research on screen media use, physical activity, and sleep among preschool children with 20 countries in Asia, Europe and the USA (iissaar.com). In recent times, his research featured on BBC World Service and the Straits Times in Singapore. He enjoys his work and his play tremendously, oftentimes, confusing work and play as the same. Like many Singaporeans, he could do with more sleep!

Dr Mohammad Ashik

Dr Mohammad Ashik obtained his basic medical and postgraduate qualifications from the National University of Singapore and the Royal College of Surgeons of Edinburgh in UK. He received his fellowship training in sports surgery in Germany and Paediatric Orthopaedics in Austria. Dr Ashik's areas of clinical and research interests are;

1) Sports injuries in children and adolescents
2) Arthroscopic (keyhole) surgeries of the hip, knee, ankle, shoulder and elbow
3) Cartilage repair and preservation
4) Patella dislocation and reconstructive surgery
5) Paediatric and adolescent trauma
6) Lower limb length discrepancies and malalignment

Dr Chan Poh Chong

Dr Chan is the Head, General Ambulatory Paediatrics and Adolescent Medicine Division, Department of Paediatrics, Khoo Teck Puat National University Children's Medical Institute, National University Hospital, Singapore.

Associate Professor Falk Mueller-Riemenschneider

Dr Falk is Associate Professor at the Saw Swee Hock School of Public Health, National University of Singapore. He qualified as a medical doctor from the University of Cologne, Germany and subsequently worked in General Medicine and Cardiology at the Royal London Hospital and Oxford Radcliffe University Hospitals, United Kingdom. He completed a doctorate degree at the University of Cologne and a Master's degree in Public Health at the London School of Hygiene and Tropical Medicine.

Falk's work focusses on the prevention of non-communicable diseases, with a particular emphasis on physical activity and movement behaviours among children and adults, as well as the application of digital technologies in public health research.

Dr Dinesh Sirisena

Dr Sirisena is based at Khoo Teck Puat Hospital (Singapore) as a Consultant in Sports Medicine, providing specialist MSK, medical screenings, rehabilitation and educational services to the local and international community. He also provides diagnostic ultrasound imaging and interventions, such as shoulder hydro-dilatations, nerve root and facet joint injections, high volume and tendon stripping procedures and PRP and polo-therapy treatments.

Dr Ratnaporn Siriamornsarp

Dr Ratnaporn Siriamornsarp is a Family Physician at Tampines Polyclinic. She graduated with a Doctor of Medicine (M.D) from Thammasart University, Thailand in the year 2000. She then moved to Singapore and worked at KK Woman's and Children's Hospital as a Medical Officer for the first few years of her career here. She went on to pursue a Master of Medicine in Family Medicine at National University of Singapore. She was conferred the degree in 2008.

She has since been working at Tampines Polyclinic and is committed to providing holistic care to her patients in the primary health care setting. She has a special interest in Pediatric care and is appointed, Clinical lead of the Child health work group, SingHealth Polyclinic since 2014. As lead of the workgroup, she has been involved in implementation of multiple projects targeted at improving the deliverance of care to the pediatric population. She also represents her institution in various external collaborations. Dr Ratnaporn also holds a Bachelor's of Science degree in biology.

Ms Ethel Lim

Ms Ethel Lim has been a clinical dietitian at KKH for about 6 years, with the main duty of assessing and providing medical nutrition therapy for patients, while working collaboratively within multidisciplinary care teams.

She graduated from Flinders University (Adelaide, South Australia) with First Class Honours, and has a special focus in eating disorders, paediatric weight management and the ketogenic diet in epilepsy treatment.

Dr Nirmal Kavalloor Visruthan

Dr Nirmal Kavalloor Visruthan is a Consultant at the Department of Neonatology at KK Hospital, pursuing his interests in neonatology and neonatal neurology. He developed an interest in Neonatology during his post-graduation training in Paediatrics. Subsequently Dr Nirmal completed his Advanced Specialist Training in Paediatrics & Neonatology.

After joining the Neonatology department, he further developed subspecialist interest in Neonatal Neurology & continued to study the developing brain, especially at the transition from fetus to a neonate. He was selected for a human manpower development award for neurodevelopmental care in premature and term babies as well as newer neuromonitoring technologies.

Dr Nirmal trained in this area at St Thomas hospital (Evelina Children's), London in 2017. Currently he runs the Neuro Clinic & coordinate the whole-body cooling program for neonates at KKH.

Dr Moira Chia

Dr Moira Chia is a paediatrician with interest in community child health. She works with primary healthcare partners, nurses, early childhood educators and parents on various community projects to improve child health and development. She also works with the Health Promotion Board on parent health education.

Dr Nur Adila Ahmad Hatib

Dr Nur Adila is a consultant paediatrician with the General Paediatrics service, KK Women's and Children's Hospital and the 'Paediatrics by KKH' service at Sengkang General Hospital. She is also a clinical assistant professor with the SingHealth Duke-NUS Paediatric Academic Clinical Programme. Her qualifications include MBBS (Singapore), Master of Medicine (Paediatric Medicine) and Member of the Royal College of Paediatrics & Child Health (UK).

Aside from managing children with acute illnesses, she has a keen interest in the development of community paediatrics in Singapore. Her work encompasses continued engagement with the primary health sector to improve knowledge and skills in child health, nutrition and development.

Associate Professor Teoh Oon Hoe

Dr Teoh is Head and Senior Consultant of the Respiratory Medicine Service, and Deputy Head of the Department of Paediatrics at KK Women's & Children's Hospital. He also serves as the Deputy Head of the SingHealth Duke-NUS Sleep Centre.

Dr Lee Le Ye

Dr Lee Le Ye graduated from the National University of Singapore and obtained her speciality qualifications in paediatrics and sub-specialised in neonatology since 2009. She is currently a senior consultant with the Department of Neonatology at the National University Healthcare System, Singapore. Her work involves managing both inpatient and outpatient neonatal care. Her clinical interests include neonatal screening programmes and nutritional management of Very Low Birth weights (VLBWs) infants as well as term neonates. She holds the title of Assistant Professor and is on the teaching paediatric faculty for the Yong Loo Lin School of Medicine, National University of Singapore.

She had obtained numerous grants on neonatal jaundice, hepatitis B transmission and also newborn nutrition. She has published on these topics in both local and international peer reviewed journals as well as book chapters. She continues to participate in active research of these newborn topics. Her current research is on newborn infections, vaccine efficacy, newborn screening as well as improving neonatal nutrition for VLBWs. She hopes to mentor and motivate more young doctors to participate in active research to improve the care and health delivery to neonates born in Asia.

Dr Mya Sandar Thein

Dr Mya Sandar Thein is the senior Consultant Pediatrician at Yangon Children Hospital. She received numerous awards for "Training course for Pediatric Endocrinology (2011)", "Dr LEE Jong-wook Fellowship (2014)" and "Clinical Fellowship from European Society of Pediatric Endocrinology (2018)".

As a Consultant Pediatrician, she has been teaching both undergraduate and post graduate medical classes every week at Yangon Children Hospital from 2014. Moreover, she usually teaches classes of Family Medicine, Diploma Nursing and other post graduate classes run at Yangon Children Hospital. The teaching topics are both General Pediatric and Pediatric Endocrine. It also involves the Pediatric Endocrine training for postgraduate students from Magway Medical University, Defense Medical Service and as the supervisor of postgraduate master thesis since 2014.

Dr Gade Waqa

Dr Waqa has more than 20 years' experience in the public health sector, initially in community nursing and then in research; this experience has provided the basis for ongoing engagement with government, health services, researchers and communities in Fiji. She has a nursing background prior to joining the Research team at the College of Medicine Nursing and Health Sciences.

She is a strong advocate for NCD prevention in Fiji and the Pacific region. Dr Waqa is an experienced research project manager who has worked across multiple research projects including the Fiji-based Obesity Prevention in Communities project followed by the research translation; this knowledge broking role has included delivering workshops related to acquiring, analysing and adapting evidence, supporting participants to develop policy briefs and coordinating data collection.

Professor Rachel Novotny

Professor Novotny examines maternal and child nutrition and health in remote regions of the world, and among culturally diverse populations, studying lifestyle patterns in diverse settings and populations that inform strategies to improve nutrition and health. Prof Novotny was a member of the 2020 United States Dietary Guidelines Advisory Committee, which forms the foundation of US food policies. She serves as Associate Editor for Nutrition Reviews Journal. Prof Novotny has obtained more than $40 million dollars as Principal Investigator of federal grants, including the $25 million-dollar Children's Healthy Living Program and, now Center of Excellence in Food System Resiliency for Children's Healthy Living. The project extends across 7 time zones and diverse political affiliations in the Pacific. She has published more than 150 peer reviewed papers and successfully trained more than 50 higher degree candidates, and 15 post-doctoral candidates, in Nutrition and Epidemiology.

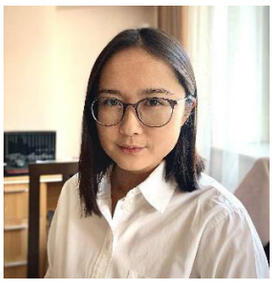
Professor Novotny is Chair of the Nutritional Sciences graduate programs in the Department of Human Nutrition Food and Animal Science Department of the College of Tropical Agriculture and Human Resources at the University of Hawaii at Manoa, where she has also served as Department Chair and Interim Dean. Prof Novotny has worked in Costa Rica, Peru, Ecuador, the Dominican Republic, Indonesia, the Republic of Palau, the Republic of the Marshall Islands, the Federated States of Micronesia, the territories of Guam and American Samoa, the Commonwealth of the Northern Mariana Islands, and in the state of Alaska. Professor Novotny holds a Bachelor's degree in Environmental Biology from Beloit College and Masters and Doctoral degrees in Global Nutrition from Cornell University. She conducted maternal child public health post-doctoral work at the School of Public Health at the University of Hawaii at Manoa, where she also obtained a Registered Dietitian's License.

Associate Professor Mohammad Sorowar Hossain

Dr Hossain is a researcher with multi-disciplinary experiences in academia and industry combined. He has been working in the area of biomedical/public health research for over 20 years. After completing a PhD in Molecular Biology from National University of Singapore, he was Postdoctoral Research Fellow at DUKE-NUS Graduate Medical School and National Cancer Centre Singapore. Later, he returned to his home country, Bangladesh and served in various capacities including Senior Manager (Head, R&D) at Incepta Pharmaceutical Ltd. (Biotech division) and Assistant professor at BRAC University.

Dr Hossain is currently contributing to Biomedical Research Foundation as Executive Director. He is also serving as an Associate Professor at School of Environment and Life Sciences, Independent University, Bangladesh. He has been also appointed as an Honorary Principal Fellow at the University of Wollongong, Australia. Dr Hossain is highly dedicated to community-based research efforts to solve public health-related problems. His current research interest encompasses public health aspects of emerging (dengue) and neglected diseases (childhood obesity, thalassemia) in the context of resource-limited settings.

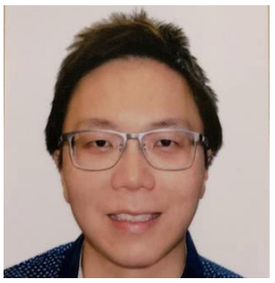
Ms Ankhmaa Byambaa



Ms Byambaa is currently a researcher at the National Center for Public Health of Mongolia, Department of Biotechnology and Innovation. She graduated from the Moscow State of University of Food Production majoring in Biotechnology in 2014. Since then, she has been working at the National Center for Public Health of Mongolia. She has participated and worked as a research team member of 3 scientific projects, in the field of communicable diseases funded by Science and Technology Fund of Mongolia and Ministry of Health.

She is a 2020 Australia Awards Mongolia awardee. She is currently working on SUNRISE international study of 24-hour movement behaviours in early years among Mongolian pre-school children. Starting from 2022, she will study at the University of Wollongong, Australia for the Master's degree in the field of Public Health.

Dr Ryan Lee Wai Kheong



Dr Ryan Lee graduated from Imperial College London in 2008 with a Bachelor of medical sciences (Honours) and obtained (MBBS) (Distinctions) at St Bartholomews and the Royal London, University of London in 2009. He later obtained Masters of Medicine (O&G) and became a Member of the Royal College of Obstetricians and Gynaecologists (MRCOG) in 2015. He was awarded the NMRC health research scholarship in 2016 and graduated with a Masters of Clinical Investigation from the National University of Singapore in 2018. Subsequently, he became the first inaugural graduate from the clinician scientist residency in 2019. He is currently a consultant in the department of Maternal-Fetal medicine at KKH.

His main research interests are in epidemiological studies on interventional lifestyle changes including exercise and diet control to improve obstetric outcomes in pregnant women with gestational diabetes. He is a principal investigator of several research projects and was also awarded a KKH health endowment fund grant in 2014 and NMRC clinician scientist seed fund grant in 2017 for research in sub-fertile women with recurrent implantation failure. He was awarded the 2019 ASPIRE best international poster presentation for his research work on the immunological effect of endometrial injury in women with recurrent implantation failure.

Besides research, he has an incessant passion for teaching and was previously awarded the inspiring resident-educator award. He is currently appointed as a SingHealth residency physician facilitator and clinical tutor to students from Duke-NUS, YLL and LKC School of Medicine where he continues to receive commendable accolades from his students. Ryan is an IPRAMHO investigator (I-PROFILE & I-PHENOTYPE).

Dr Loy See Ling

Dr Loy is an Assistant Professor with Duke-NUS Medical School and working as a Senior Research Fellow in KK Women's and Children's Hospital. She attained her PhD in Human Nutrition in year 2014 and with special interest in life course epidemiology and nutritional epidemiology. She has received multiple international awards, fellowships and travel grants. Till date, she has published in more than 50 journals and is the journal reviewer for many international journals. She has been awarded the NMRC Young Individual Research Grant in 2018, aiming to investigating the effect of maternal chrononutrition on pregnancy outcomes. She is actively involved in various research studies (locally or internationally), particularly cohort studies related to mother-offspring health.

Associate Professor Wu Ting

Dr Wu Ting is an associate professor of Department of Nutrition, Chengdu Women's and Children's Central Hospital, School of Medicine, University of Electronic Science and Technology of China, Chengdu, China. Previously as a Postdoctoral Fellow she had worked at Key Laboratory of Birth Defects and Related Diseases of Women and Children (Sichuan University), Ministry of Education and Ministry of Education - Shanghai Key Laboratory of Children's Environmental Health, Xinhua Hospital Shanghai Jiao Tong University School of Medicine Shanghai, China. She had been to Boston Children's Hospital and Schneider Children's Medical Center of Israel for academic visit. Her research focuses on the effects of perinatal environmental factors, especially nutrition, during pregnancy on maternal, fetal and children's health.

Associate Professor Busadee Pratumvinit

Dr Pratumvinit graduated from Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand in 1999. She received the Board Certificate in Internal Medicine and the Board Certificate in Clinical Pathology given by the Medical Council of Thailand. She is currently an associate professor at the Department of Clinical Pathology, Faculty of Medicine Siriraj Hospital, Mahidol University, Thailand, and serves as the committee and secretary of the Thai Society of Clinical Pathology. Since 2007, Dr Pratumvinit has been actively involved in clinical laboratory research. She has over 15 years of experience in clinical laboratory service, education, and research with over 30 articles published to date. Her achievements have been recognized through several career awards.

Professor Milind Shah

Dr Shah is a Consultant OBGYN at Naval Maternity & Nursing Home, India and Consultant OBGYN practicing in India since last 32 years. Apart from very extensive experience as clinician he has many organizational credentials like past President of ISOPARB (Indian Society of Perinatology & Reproductive Biology), past Vice President of FOGSI (Federation of all gynecological Societies of India), and Deputy Secretary General of FAOPS (Asia Oceania Federation of all Perinatal Societies).

He has teaching experience of last 32 years as Professor and HOD of department of OBGYN at GNRH Medical College. He is often invited by Government for his expert opinion while taking policy decisions. He has contributed many chapters in various textbooks and published a book on Hypertensive Disorders in Pregnancy & Pelvic Organ Prolapse. He is peer reviewer for Journal of Obstetrical & Gynecology of India.

Associate Professor Yit Siew Chin

A/Prof Yit Siew Chin is the Head of Community Nutrition Unit, Faculty of Medicine and Health Sciences, and was formerly appointed as the Head of the Research Centre of Excellence Nutrition and Non-Communicable Chronic Disease (RCOE-NNCD), in Universiti Putra Malaysia (UPM). She serves on the Editorial Boards of BMC Public Health and Malaysian Journal of Nutrition (MJN).

Her field of specialization in community nutrition has prompted research interests that include i) child nutrition and body composition, ii) body image, disordered eating and obesity, and iii) nutrigenetics and metabolic syndrome. To date, she led 17 research projects that were supported by both private and public funds, with various international and local publications, which have more than 60 scientific citation-indexed journal articles, intervention modules and education materials, recipe book, as well as articles in newspapers and magazines. She has supervised more than 25 graduate students in nutrition field.

As a community nutritionist, she has been actively organizing various physical and online nutrition and health promotion programmes in different community settings. She was also invited to give public lecture and talks on various nutrition and health topics. She is the Management Team Lead of NSM Nutrition Roadshows 2.0, and she has involved in various research-driven community programmes, such as Healthy Kids Programme, *Program Cara Hidup Sihat* (Healthy Lifestyle Programme), Good Nutrition – Key to Healthy Children Program, and "Eat Right to Play Right" Programme. She also involves in consulting and developing national policy and guidelines on public health nutrition. She is the Hon. Secretary of both Nutrition Society of Malaysia (NSM) and Malaysian Society of Body Composition (MSBC).

Dr Raden Tina Dewi Judistiani

Dr Raden Tina Dewi Judistiani, SpOG is currently a lecturer at Faculty of Medicine Universitas Padjadjaran (FMUP), Bandung, Indonesia. She graduated as a medical doctor (1994), an obstetrician and gynecologist (2002), as well as doctorate degree (2011) at FMUP had lead her as an active researcher in perinatal epidemiology until now. She has published several research articles on the subject of her interests, i.e. Maternal Anemia, Vitamin D deficiency and Fetal growth. She also played an important role in curriculum development for undergraduate education in medicine and midwifery from year 2002 until now, especially in obstetrics, epidemiology and research methodology. She is also an active member of the Indonesian Society of Obstetrician and Gynecologist, and has been actively involved in the committee for reproductive infection.

Professor Tiran Dias

Professor Tiran Dias is currently working as a Professor in Fetal Medicine in the Department of Obstetrics and Gynaecology Faculty of Medicine University of Kelaniya. He is also an honorary consultant Obstetrician and Gynaecologist at North Colombo Teaching Hospital, Ragama. He is an accredited Fetal Medicine specialist. His research interests are in small for gestational age, fetal surgery, and multiple pregnancy. His clinical interests are invasive prenatal diagnosis/ therapy, high risk pregnancy and medical problems in pregnancy. He has had his Fetal Medicine sub-specialty training in the United Kingdom. He is a member of the editorial team of the CMJ and he was the editor in chief of the Sri Lanka Journal of Obstetrics and Gynaecologists between 2013 and 2016. He has published 26 peer-reviewed articles and 2 book chapters. He is an IPRAMHO International investigator and has published jointly an international paper on GDM with IPRAMHO.

Associate Professor Dittakarn Boriboonhirunsarn

Associate Professor Dittakarn Boriboonhirunsarn is an obstetrician at the Department of Obstetrics and Gynaecology, Faculty of Medicine Siriraj Hospital. He is also an administrative member and the chairperson of Subcommittee on Research of The Royal Thai College of Obstetricians and Gynaecologists.

A/Prof Dittakarn and his colleagues are the pioneer in setting up a clinical practice guideline for GDM and a GDM patient care team in Siriraj Hospital. He and his team were involved in GDM care in Siriraj Hospital for almost 20 years. He is also a member of Siriraj Center of Excellent on Diabetes as a representative for the obstetric team.

A/Prof Dittakarn and his colleagues have regularly published researches related to GDM in national and international journals. Majority of the researches on GDM are related to clinical practice, including baseline clinical information, screening and diagnosis, risk identification, prevention and prediction of clinical outcomes, and care process improvement. He is an IPRAMHO International investigator.

Professor Swe Swe Myint

Dr Swe Swe Myint is a Professor (Obstetrics & Gynaecology) in Central Women's Hospital (CWH), Yangon, Myanmar. She received MBBS in 1991 and Master Degree in Obstetrics and Gynaecology in 1999 from University of Medicine 1, Yangon, Myanmar. She studied in the UK from 2003 to 2006 and became a member of Royal College of Obstetrician and Gynaecologists in 2006. She is a member of perinatal audit in CWH.

She is also a member of Myanmar Medical Association (OG Society) and took part in implementing current guidelines (Obstetrics and Gynaecology) which was led by Myanmar Medical Association (OG Society). She got Dr.Med.Sc (Obstetrics & Gynaecology) in 2017 from University of Medicine 1, Yangon and FRCOG (UK) in 2019. Dr Swe Swe Myint is an IPRAMHO International investigator.

SPEAKER ABSTRACTS

Asia Pacific Maternal & Child Health Conference & IPRAMHO International Meeting 2022

SYMPOSIUM I - MATERNAL AND CHILD WELLNESS

A New Model of Holistic Maternal and Child Health Care - The Integrated Maternal and Child Wellness Hub

Chan Yoke Hwee
Children's Intensive Care Unit, KKH, Singapore

Maternal and child health are key priorities recognised globally and spelt out in the United Nations' Millennium Development Goal 3: Ensure healthy lives and promote wellbeing for all at all ages. There is increasing evidence that epigenetic factors play a critical role in the health of the child. Early childhood has a major role in shaping health later in life. Healthcare, social and education sectors play major determinant role in maintaining health. Also of note is that the mother-child dyad is inseparable in its interdependency on health outcomes and wellbeing, especially in the early childhood years. To deliver these priorities for child health, an integrated approach focused on building healthy behaviour as well as preventive care through screening and early intervention, has to be adopted.

The Maternal and Child Wellness Hub at Punggol Polyclinic is a collaborative pilot project between SingHealth Polyclinics and KK Women's and Children's Hospital. It aims to transform the delivery of maternal and child health through a comprehensive, integrated and coordinated provision of healthcare, social and education services in close partnership with the community and families, at the primary care setting.

This talk will focus on some of the key learnings and findings from this programme in the domains of developmental assessment, postnatal depression screening as well as growth and nutrition in the child

Advancing Child Developmental Assessment for Early Intervention

Pratibha Agarwal
Department of Child Development, KKH, Singapore

The first 1,000 days of life are increasingly recognised as being vital in a child's development in view of the plasticity and vulnerability of the developing brain, with a strong influence of risk and protective factors on subsequent outcomes into school age and adult life.

Early identification of and intervention for developmental delays in this period are critical in optimizing outcomes both in childhood and into adult life, with deleterious consequences in education, health, earning potential, and socio-emotional domains being reported for those with delayed intervention.

Early intervention (EI) enables working towards the shared long-term goal for families and professionals of ensuring that children maximize their potential and become productive and valued members of society. EI also contributes to an efficient and effective use of health resources.

Given that the prevalence of developmental delay is 5–15%, in preschool children, developmental screening is being increasingly recommended in primary care public health systems. The American Academy of Pediatrics (AAP) recommends developmental surveillance at all pediatric visits and formal screening at 9, 18, and 30 months of age. However, early identification may be limited, with not more than 30% of children with developmental problems being identified before school age. Evidence-based standardized screening tools have been shown to increase the detection of possible developmental delays from 16% to 62%. Thus, having a valid, easy-to-use tool to assess development in the early years is critical.

There have thus been efforts to introduce the effective use of screeners in low-risk populations for accurate identification of children at risk of delay and to reduce unnecessary referrals and formal expensive diagnostic assessments in children with normal screening results. Identification of high-risk groups for targeted intervention can be both effective and efficient.

In recent years, the use of parent-completed screeners, such as the Parents' Evaluation of Developmental Status (10) and the Ages and Stages Questionnaire—Third Edition, have become increasingly popular due to their reliability, acceptable psychometric properties, lower cost, and ease of use with minimal training.

Parent-led developmental screening may also enhance communication between parents and healthcare providers and encourage parents to be active partners in assessing their child's needs and progress with involvement in subsequent evaluations and interventions, which are essential for optimizing outcomes.

Setting The Foundation with Good Nutrition in Early Childhood

Elaine Chew Chu Shan,
Adolescent Medicine Service, KKH, Singapore

Childhood obesity continues to be on the rise in Singapore with long term cardiometabolic consequences. Breastfeeding, proper weaning diet with close growth monitoring are important modifiable factors that can reduce the prevalence of childhood obesity. The aim of the nutrition domain of the Integrated Maternal and Child Wellness Hub (IMCW) is to improve the assessment of growth and provision of nutrition advice in infancy and early childhood to reduce the prevalence of childhood obesity. The aims are achieved through the enhancement of current breastfeeding support, weaning advice and introduction of standardized measurement techniques and growth assessment with development of workflows to streamline the process of growth assessment.

Postnatal Depression Screening and Intervention in Primary Healthcare

Helen Chen Yu
Department of Psychological Medicine, KKH, Singapore

Postnatal depression is a major public health concern, with an estimated 1 in 10 women having varying severity. With well-established evidence of its impact on maternal sensitivity, breastfeeding and child neurodevelopment and wellbeing, early identification is crucial to ensure optimal child health outcomes for our children in Singapore. Implementing postnatal depression screening opportunistically at well child visits is a strategy that can break barriers, maximize outreach, and optimize healthcare resources. With active engagement and partnership with community partners, the landscape of maternal mental healthcare can shift to better addressing the needs of mothers, as they care for their children.

SYMPOSIUM II - NURTURING HEALTHY BEHAVIOURS IN EARLY CHILDHOOD

Are Our Children Moving Enough? A Physical Activity Guide for the Early Years

Miriam Lee[1] and Aaron Sim[2]
[1]Sport Singapore, Singapore
[2]Health Promotion Board, Singapore

Physical activity participation in young children is associated with multiple health benefits such as improved adiposity, motor and cognitive development, physical fitness, psychosocial, cardiometabolic and bone health. In addition, a strong foundation in movement competency in childhood is associated with lifelong participation in physical activity. Yet, there are increasing levels of physical inactivity and obesity even among young children (stats/reference to demonstrate local issue/trend?). Young children in the early years are encouraged to participate in a wide variety of physical activities including fundamental movement skills and a range of modified sports, preferably outdoors. It is crucial for policy makers, health care professionals, practitioners, and caregivers to work together to ensure the physical activity needs of children are met. This session aims to discuss the benefits and trends of physical activity for the early years in the Singapore context. Participants can also look forward to a brief sharing on the physical activity recommendation based on Singapore's Integrated 24-Hour Activity Guidelines for Early Childhood and practical suggestions on getting children to be more active.

Sedentary behaviour: Finding the right balance and seeking the best even when still

Teresa Tan Shu Zhen
General Ambulatory Paediatrics and Adolescent Medicine, NUH, Singapore

Sedentary behaviour is known to be associated with adverse health effects. With the ongoing pandemic, there have been many shifts in the activity profile of children in Singapore. What are reasonable limits of sedentary behaviour? With the various limitations, is it possible to not be sedentary? We will discuss the adverse effects of sedentary behaviour and excessive screen time for young children, and suggest practical ways of finding the "right balance".

Association between breastfeeding and sleep patterns in infants and preschool children

Cai Shirong
Singapore Institute for Clinical Sciences, Singapore

Sleep is important for cognitive and socio-emotional development, growth and dietary intake during childhood. At the same time, breastfed children enjoy health benefits such as lower rates of infections and better cognitive outcomes compared to formula-fed children. However, current research on breastfeeding and infant sleep lacks consistency. Many studies reported more night awakenings and night sleep disruption in breastfed infants compared to formula-fed infants, while

others did not observe such associations. Some studies observed shorter night sleep duration, while others reported longer duration of night sleep in breastfed infants. Moreover, few studies examined the association of breastfeeding and longitudinal sleep trajectories across infancy and early childhood. The present study used data from the Growing Up in Singapore Towards healthy Outcomes (GUSTO) cohort of typically-developing multi-ethnic Asian children to investigate the longitudinal associations between breastfeeding status (at 3 months of age) and early childhood sleep development using day-, night- and total- (group-based) sleep trajectory data based on the variability and duration of children's sleep over the ages of 3 to 54 months.

Nourishing Our Next Generation

*Mary Chong **Foong**-Fong*
Saw Swee Hock School of Public Health, National University of Singapore, Singapore

Good nutrition from infancy and during childhood sets the foundation and trajectory for lifelong health and wellness. Achieving the right balance of foods, together with positive caregivers' feeding practices, can help children reach their full growth and developmental potential to perform well.

Growing evidence points to the importance of examining how lifestyle factors such as diet, physical activity, sleep and sedentary behaviour are inter-related and may work in additive or synergistic ways to influence health.

This presentation will highlight some of the key diet recommendations introduced in the *Singapore Integrated 24-Hour Activity Guidelines for Early Childhood*, illustrate local and international evidence supporting these recommendations and explain the role of diet as an integral part of our 24-hour daily activities.

IPRAMHO Initiatives for Maternal & Child Health

Tan Kok Hian
Lead, IPRAMHO, Singapore

Integrated Platform for Research in Advancing Metabolic Health Outcomes of Women and Children (IPRAMHO) is a Singapore National Medical Research Council (NMRC) funded joint collaborative pot centre grant awarded to KK Women's and Children's Hospital (KKH), SingHealth Polyclinics (SHP) & National Healthcare Group Polyclinics (NHGP). This is a unique collaborative centre grant 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 collaborative metabolic health research in women and children, aligning with RIE2025 goals. IPRAMHO as a research platform, seeks to develop a seamless integrated model of care through optimal translation, implementation and evaluation of effective population prevention strategies; and diabetes, weight reduction and lifestyle programmes for women and children.

Besides seeding grants to generate pilot data and nurturing healthcare research and implementation science professionals, IPRAMHO has been leading in building consensus for Singapore to improve metabolic health of mothers and children. Four local Guidelines initiated by IPRAMHO on GDM; Perinatal Nutrition; and Physical Activity & Exercise in Pregnancy are available:

1. Tan KH, Tan T, Chi C, Thian S, Tan LK, Yong TT. Guidelines for the Management of Gestational Diabetes Mellitus. College of Obstetricians and Gynaecologists, Singapore. Singapore Journal of Obstetrics & Gynaecology. 2018; 49(1):9-13
2. Chua MC, Tan T, Han WM, Chong MFF, Ang SB, Rajadurai VS, Khin LW Chi C, Lee J, Tan KH. Guidelines for Optimal Perinatal Nutrition. Perinatal Society of Singapore. Singapore Journal of Obstetrics & Gynaecology. 2019; 50(1):10-12
3. Lee R, Thain S, Tan KH, Ang SB, Tan EL, Tan B, Aleste MN, Lim, I Tan LK. Guidelines on Physical Activity & Exercise in Pregnancy. Perinatal Society of Singapore. Singapore Journal of Obstetrics & Gynaecology. 2020; 51(1):9-16
4. Integrated 24-Hour Activity Guidelines for Children and Adolescents Study Group. The Singapore Integrated 24-Hour Activity Guidelines for Children & Adolescents (7-18 Years). College of Paediatrics & Child Health of Academy of Medicine Singapore, January 2021

In addition, the IPRAMHO was involved in 4 Asia Pacific consensus statements on GDM; Perinatal Nutrition; and Physical Activity & Exercise in Pregnancy, all have been published:

1. IPRAMHO Hyperglycemia in Pregnancy Consensus Working Group. Asia & Oceania Federation of Obstetrics and Gynaecology, Maternal Fetal Medicine Committee's consensus statements on screening for hyperglycemia in pregnancy. J Obstet Gynaecol Res. 2018 Nov;44(11):2023-2024.
2. Tan KH, Tan TYT, Chua MC, Kor-Anantakul O, IPRAMHO Study Group. Asia Pacific Consensus on Perinatal Nutrition and Breastfeeding. Ann Nutr Metab. 2019;75(1):86-87.
3. Lee R, Thain S, Tan LK, Teo T, Tan KH, IPRAMHO Exercise in Pregnancy Committee. Asia-Pacific consensus on physical activity and exercise in pregnancy and the postpartum period. BMJ Open Sport & Exercise Medicine 2021;7:e000967. doi:10.1136/ bmjsem-2020-000967

4. Loo BKG, Okely AD, Pulungan A, MY Jalaludin, IPRAMHO Asia-Pacific 24-Hour Activity Guidelines for Children and Adolescents Committee. Asia-Pacific Consensus Statement on integrated 24-hour activity guidelines for children and adolescents. British Journal of Sports Medicine. Published Online First: 08 November 2021. doi: 10.1136/bjsports-2021-104527

A recent IPRAMHO survey on Integrated Early Childhood 24- Hour Activity for infants, toddlers and preschoolers 0-6 years old by Quah et al showed poor parenting practices, and suboptimal lifestyle behaviours in infants, toddlers and preschoolers. The study supports the need for an integrated 24-Hour activity guideline for early childhood to help better monitoring and improvement of these behaviours.

The Singapore Integrated 24-Hour Activity Guidelines for Early Childhood (0-6 Years) to promote optimal activity is timely. In line with WHO global actions, national guidelines or recommendations on physical activity for the general population or specific population groups (e.g. early childhood) are important to educate the population on the frequency, duration, intensity and types of physical activity necessary for health. The dissemination, ownership & implementation of these guidelines can improve population metabolic health of children, enhancing and optimise the potential of every child born in Singapore and our region.

Singapore Integrated 24-Hour Activity Guidelines for Early Childhood

Benny Loo Kai Guo

Chairperson, Singapore Integrated 24-Hour Activity Guidelines for Early Childhood Workgroup

The Singapore Integrated 24-Hour Activity Guidelines for Early Childhood provide a holistic approach towards improving the metabolic and general health in the young paediatric population, aged 0 to 6 years old, by integrating major activities of daily living – physical activity, sedentary behaviour, sleep, and eating habits and diet. These recommendations are developed by incorporating the latest international evidence and local research of Singaporean infants, toddlers and preschoolers. In the modern fast-paced society, the context of these recommendations is framed within a fixed resource – time. Therefore, the recommendations serve to guide healthcare providers and general public on prioritising and balancing pivotal activities for good health within a 24-hour period.

The consensus workgroup included physicians (neonatologists, paediatricians, sports physicians and family physicians), allied health professionals (dietitian, exercise physiologists), academics and researchers from multiple institutions and organisations. This national partnership allows a smooth transition of research to clinical expertise and provides the complementary perspectives from primary to tertiary care. Regular physical activity improves motor and cognitive development, cardiometabolic, musculoskeletal and psychosocial health in the young paediatric population. Prolonged sedentary behaviour and screen time exposure is associated with a range of adverse health effects, such as obesity and poor cognitive development. Insufficient sleep is also associated with higher levels of adiposity, poor growth and emotional dysregulation. Healthy eating habits and dietary choices provide optimal nutrition for a child's physical and cognitive development.

Starting with one or any combination of the recommendations can achieve equivalent health benefits. Integrate these recommendations as the child's way of life and he or she will reap bountiful benefits, both physically and psycho-emotionally. We hope that these recommendations will encourage every infant, toddler and preschooler to eat smart, move more, sleep well and live life!

SYMPOSIUM III - SINGHEALTH DUKE-NUS MATERNAL & CHILD HEALTH RESEARCH INSTITUTE FORUM

Learning Health Ecosystem for Maternal & Child Health Excellence

Ng Kee Chong

Chairman of Medical Board, KKH, Singapore

On the cusp of the setting up of the SingHealth Duke-NUS Maternal & Child Health Institute (MCHRI), we must now actively embark on developing a self-informing and Realtime learning ecosystem to continually improve and enhance maternal & child health.

Our MCHRI uses a life-course approach to better understand the issues, challenges and unmet needs in maternal, child and family health. We must never medicalise health. Health issues involve social, psycho-social, educational and economic dimensions. There must be active collaboration with various agencies, governmental and non-government to better understand

collectively what the needs are in the maternal and child sphere. This collaboration must involve sharing of data and information so that we can collectively understand, learn and improve maternal & child health as one Singapore community.
An integrated maternal & child health registry should be set up to help us gather real local world data. This should be a nationally integrated registry with various key health-related agencies as serve as our Singapore "Maternal & Child Health Registry". There must also be regional & international collaborations and the setting up and collaborations with regional and international maternal & child health registries, so that we can not only learn within but learn and share outside of Singapore.
The internet of things and technology in general is a great enabling tool to further actively drive and enrich this maternal and child health learning ecosystem. Sensible use of digital phenotyping, either opportunistically or planned & targeted with the necessary informed consent, protection of privacy & anonymization will enable us to gather real world data and determine real world evidence so that we can devise and implement solutions to address these emerging and unmet maternal & child health needs that matter to our maternal and child population and to our population as a whole.

TRACK I: SYMPOSIUM IV – IPRAMHO EDUCATION SESSION: TRAINING PROGRAM FOR DOCTORS AND RESIDENTS – EXCELLENCE IN PERINATAL HEALTH

Perinatal Epidemiology: Advancing Perinatal Health Standards in Singapore

Tan Kok Hian
Perinatal Audit & Epidemiology, KK Women's and Children's Hospital

KK Women's & Children's Hospital (KKH), the former world's largest maternity hospital, is a leading modern maternity institution and tertiary perinatal centre in the world. KKH witnessed remarkable improvement in maternal and perinatal mortality rates, quite unmatched in the history of obstetrics of the world. The maternal mortality rate dropped dramatically from 760 per 100,000 births in 1930 to about 10 per 100,000 births since 1990s and the perinatal mortality rate decreased from above 50 per 1000 births in 1940s to less than 5 per 1000 births since 1990s, achieving and maintaining world class standards. KKH perinatal outcome set the high standards for Singapore which surpassed those in UK and USA. Perinatal Medicine and Maternal Fetal Medicine has emerged as a neonatal/obstetric subspecialty that focuses on high-risk pregnancies. The process in Singapore has been enhanced by the setup of Department of Maternal Fetal Medicine in KKH since 1990. KKH was awarded The World Health Organization United Arab Emirates (WHO-UAE) Health Foundation Prize 2009 for its Integrated Perinatal Care Project. This in recognition of the outstanding contribution of KKH, largest maternity hospital in Singapore which had decreased maternal mortality and eclampsia rates.

Hypertensive diseases in pregnancy (pre-eclampsia and eclampsia) are a major problem of pregnancy. Incidence in KKH from 1999 to 2003 was 3.64% of total deliveries. The incidence of eclampsia in KKH also had shown a significant reduction over the years (1:348 in 1957, 1:715 in 1968 and 1:2207 in period from 1990 to 1993) due to increased and early booking of patients, intense antenatal surveillance and adherence to eclampsia and severe preeclampsia protocol. The KKH protocol was introduced the use of magnesium as the drug of choice in eclampsia in 1995. The decline in the incidence of eclampsia in Singapore was rapid and KKH study in 2015 'Epidemiology of pre-eclampsia and eclampsia at the KK Women's and Children's Hospital, Singapore' was quoted by many studies as having the lowest eclampsia rate for a tertiary maternity hospital. This highlighted the success of our pre-eclampsia programme. SingHealth (O&G) both KKH and SGH participated in the international MAGPIE trial (in 2000-2002) where the use of magnesium for preeclampsia was evaluated and changed the management of pre-eclampsia worldwide. KKH also participated in PROGNOSIS ASIA women with suspected preeclampsia were enrolled at 25 sites across Asia from 2014 to 2016 and important information of new biomarkers sFlt & PlGF were gathered.

Gestational diabetes is another common disease in pregnancy, accounting for 5 to 10% of pregnancy. The outlook for the newborn of the diabetic mother has changed dramatically over the years and both perinatal mortality and morbidity rate have declined as a result of pre-pregnancy preparation and meticulous control of maternal blood glucose throughout pregnancy. Home glucose monitoring in management of diabetes in pregnancy in Singapore became popular from the 1980s. In 1996, KKH was involved in the landmark Hyperglycemia and Adverse Pregnancy Outcomes (HAPO) study, as one of the 15 study centres in the world. This study provided the first global evidence-based criteria for the optimal screening for GDM. A KKH study showed it was cost effectiveness for routine GDM screening using the HAPO/IADPSG criteria in 2015/2016 and KKH pioneered routine/universal GDM screening with IADPSG criteria in Singapore, launching first in KKH and SGH. This changed decades-old clinical practices in Singapore. The implementation of universal/routine GDM screening programme and adoption of the new IADPSG Criteria in two Singapore hospitals, KKH and SGH, commenced in January 2016. This pilot

programme of routine/universal GDM screening for all pregnancies with 3-point HAPO-IADPSG criteria has been assessed to be effective, and all other private and public hospitals in Singapore have since followed suit.
Spontaneous preterm labour remains a major obstetric problem (11.1% of the 15,025 births in KKH 2002 were less than 37 weeks and 2.5% less than 34 completed weeks) because of the high incidence of neonatal mortality or long-term handicap associated with it. The increase in multiple pregnancies from Assisted Reproductive Techniques has increased the incidence of prematurity, compounding the problem. Cervical cerclage and progesterone have been examined to reduce premature births. With optimal antenatal care and timing of delivery as well as improved neonatal care, survival rates of premature babies have improved over the years. A recent KKH study showed the survival rates of premature babies delivered at 24-week gestation was 76.3%.

Metabolic Health in Pregnancy: Guidelines and reality

Shakila Thangaratinam
WHO Collaborating Centre for Global Women's Health, UK

The talk will focus on the challenges of metabolic disease in pregnancy on mother and baby, the guidelines informing practice, and the realities on their implementation and impact on clinical practice.

Safe Maternity and Childbirth - A Multidisciplinary and Multifaceted Effort

Tan Lay Kok
Department of Maternal Fetal Medicine, KK Women's and Children's Hospital, Singapore

As Singapore's leading maternity hospital delivering over 11 thousand babies annually, ensuring, sustaining and improving patient safety while providing clinical and service quality within finite resources is a considerable challenge. The clinical environment is also constantly changing: rapid increase in medical knowledge and evidence, more demanding patient expectations, doctors wearing multiple hats of responsibility, a still evolving covid19 pandemic are just some examples. Safety requires careful coordination of the various specialty services, training, and above all effective communication across the various disciplines involved in delivering maternity care. A committed mindset to patient safety also requires continuous audits which identify areas requiring attention and redress, as well as a culture which values safety as integral to achieving excellence in care. We will share the experience in KK, as well as the initiatives by the Department of Maternal Fetal Medicine, working alongside our colleagues in General Obs and Gynae, in promoting safe maternity care.

Learning points:

1. Maternity care is becoming increasing complex. A multidisciplinary and inter-professional approach is vital to effective operations and safety.
2. Safety is essential to excellent patient care.
3. A safe environment for staff to share and speak up is crucial to cultivating a safety mindset and culture.
4. Communication is key- many safety lapses often have an element of poor or miscommunication.
5. Continuous effective audit and feedback among stakeholders are necessary to keep abreast of the emerging safety issues and to enable adaptations to the constantly evolving clinical environment.

Communication, Collaboration and Consensus: Role of the Multidisciplinary Team in optimising Mother and Child health Care in high and low resource settings

Ann Wright
Peripartum Unit & Department of Maternal Fetal Medicine, KKH, Singapore

Talk will cover how multidisciplinary team working within a healthcare setting can benefit both patients and healthcare providers regardless of the resources available and look at the various ways it can work depending on the setting. Talk will aim to show how regional AMC's have a role in facilitating the setting up of MDTs within a region and demonstrate some of the MDT working arrangements in KKH.

Perinatal Birth Defect Clinic

June Tan Vic Khi
Antenatal Diagnostic Centre & Department of Obstetrics and Gynaecology, KKH, Singapore

Birth defects, congenital structural and genetic abnormalities are a leading cause of perinatal morbidity and mortality. Advancements in prenatal ultrasound detection, diagnosis, assessment, monitoring and Genetic Testing can lead to accurate antenatal diagnosis, counselling and management and improved clinical care and outcomes. The Perinatal Birth Defect Clinic in KK Hospital has been in operation on a weekly basis for the past 20 years. It comprises a multidisciplinary team of

medical and surgical specialists including the obstetrician, maternal fetal medicine specialists, neonatologist, radiologists, and other paediatric specialists like paediatric cardiologist, paediatric cardiothoracic surgeon, paediatric geneticist and other paediatric specialists depending on the type of congenital anomaly diagnosed. The team also comprises the indispensable input of paraclinical and laboratory-based specialists like sonographers, genetic counsellors, cytogeneticists, laboratory scientific officers and nurse clinicians. During the Birth Defect Clinic meeting, ultrasound images and laboratory reports like karyograms are reviewed by the team and this discussion and interpretation of the findings and subsequent management is an ideal platform for the doctors, paraclinical staff and residents to participate in the discussion and contribute to their training experience. The meeting also includes a section where the postnatal outcomes of antenatally diagnosed abnormalities are presented and discussed, giving insight to the team into the outcome of the patients, thereby allowing an audit process of the management protocols recommended by the Birth Defect Clinic team.

Perinatal - Neonatal Care in the Developed & Developing Countries

Victor Samuel Rajadurai
Department of Neonatology, KKH, Singapore

In spite of the encouraging downward trend of infant and under-5 childhood mortality rates in developing countries over the past two decades, two critical indicators of a nation's health viz. maternal and newborn mortality rates have made little change. In most developing countries in Asia, the interventions to reduce neonatal mortality are not high on the list of priorities. Under-reporting of stillbirths and early neonatal deaths up to 40% or more (Antony Costello, Centre for International Child Health, Institute of Child Health) is not uncommon. During the 2020 UN Millennium Submit it was recommended to reduce the deaths of children under 5 by two-thirds, but this would be impossible to attain without reducing the newborn deaths which account for nearly 40% of all under-5 deaths.

One of the major reasons for this neglect is the false notion that perinatal-neonatal care depends on interventions that are costlier and expensive technological supports. The leading causes of neonatal mortality are perinatal asphyxia, prematurity and intrauterine growth-restriction, sepsis, and severe jaundice resulting in Kernicterus. The presentation will cover some of aspects of modern perinatal care in developed nations and compare them against some the evidence-based low cost strategies to improve perinatal outcome.

Optimizing care of Infants with Congenital Heart Disease in the Perinatal Period

Jonathan Choo Tze Liang
Cardiology Service, KK Women's and Children's Hospital, Singapore

Congenital heart disease is the major cause of infant mortality. Critical congenital heart disease can now be diagnosed antenatally. The antenatal diagnosis of congenital heart disease for example Transposition of Great Arteries, and maternal transfers to tertiary cardiac units have been associated with improved outcomes. We share the experience of KK Women's and Children's Hospital Fetal cardiac program in the perinatal management of congenital heart disease.

Perinatal Mental Health - Understanding the Mind of a Mother

Helen Chen Yu
Psychological Medicine, KKH, Singapore

Maternal mental illness is a prevalent public health issue, with implications on child health development, and family health. A good understanding of the etiology, course and interventions of these conditions is crucial for training of doctors, nurses and allied health professionals across the disciplines of obstetrics and gynecology, paediatrics, psychiatry, and family medicine. Key to the development of academic knowledge and skills set is the recognition of the needs as perceived by the patient, in the pursuit of evidence-based medicine and patient-centric care. For the professional in training, the joy of learning comes from making sense of the real-world experience of patients - the mother and her child - and our role is providing care and healing.

Development of a Nutrition and Physical Activity Assessment and Intervention Tool to Support Preconception, Pregnant and Postpartum Women Who Are Overweight or Obese

Ku Chee Wai
Division of Obstetrics and Gynaecology, KKH, Singapore

Preconception health is most pertinent to the high-risk groups, namely obese women who are trying to conceive. Obesity, together with diabetes and cardiovascular disease, are the top non-communicable diseases that represent a global pandemic. Adopting a life-course approach to disease prevention, from preconception through pregnancy, infancy,

childhood through adulthood, is key to break the vicious cycle of metabolic disease and improve maternal – child health in general. The fundamental gaps in addressing the obesity pandemic includes a lack of timely intervention, which is currently mostly treatment of secondary disease rather than prevention, a weak foundational knowledge of nutrition and physical activity, and the lack of a structured coordinated care for obesity prevention. To address these challenges, we developed and validated a novel digital dietary and physical activity behaviour intervention tool, known as the 6P tool, to be used for promoting healthy eating and physical activity among overweight and obese women. The 6P tool is designed based on the mental model principle by conceptualizing a healthy nutrition framework into six discrete components, namely Portion, Proportion, Pleasure, Phase, Physicality and Psychology. This involves real-time feedback, goal-setting, and personalized nudges, in order to raise awareness of eating habits and activity, and promote self-directed behavioural change. The 6P tool has been shown to be easy to use, acceptable, relevant and useful. Short-term follow-up with personalized nudges has shown a positive change in dietary habits. This will bring about an improvement in metabolic health in these women, resulting in positive outcomes during preconception, pregnancy and postpartum periods.

TRACK 2: SYMPOSIUM V – PROMOTING OPTIMAL PRIMARY HEALTH & POSTNATAL MANAGEMENT

SingHealth High Risk Metabolic Postnatal Surveillance (SHRIMPS): Postnatal GDM Management

Asmira Rahim
Obstetric Day Care, KKH, Singapore

Introduction

Guidelines for management of women with history of gestational diabetes mellitus (GDM) post pregnancy lagged in uptake in previous years. Attendance for postnatal follow up were poor. Only estimated 10% attended postnatal OGTT appointments at 6 weeks in KKH. The rate of women who later developed Type 2 diabetes later in life were also unknown as there are no surveillance done postnatally. We sought to identify the barriers to follow up screening.

KKH introduced SingHealth High Risk Metabolic Postnatal Surveillance (SHRIMPS) under RHS, with the aim to improve postnatal GDM attendance rate and achieve annual reduction in women with GDM into developing Type 2 diabetes. This programme enables the nurse navigators to continue GDM education, track postnatal GDM women and to collaborate with polyclinics for postnatal GDM follow up.

Methods

Nurse navigators followed up with postnatal GDM women in ward after delivery. Education on postnatal GDM management given emphasis on the importance of performing OGTT at 6 weeks follow up and annually.

Using health care system's electronic medical records, we tracked their attendance. Calls were made to women who defaulted their appointment and arrangement were made to reschedule their missed appointments. For annual diabetes screening follow ups, SMS reminders were sent to postnatal women informing about the referral to polyclinic. Referrals were made online and polyclinic staff contacted these women to schedule the appointment.

Results

GDM women were educated and made aware that history with GDM had lifelong chances of developing Type 2 diabetes. More postnatal GDM women were receiving education, bringing awareness on the importance of DM screening postnatally. There were improvements in the number of postnatal attendance rate in KKH for 6 weeks postnatal GDM review. In 2020, the rate increase to 66% (1214/1839) comparing previously only around 10%. 76% (921) of the women with normal postnatal OGTT results were referred for annual follow up in primary care. 24% (293) with abnormal postnatal OGTT results were given earlier follow up appointment for Type 2 diabetes surveillance.

With implementation of SMS reminders for annual follow up, more patients found it useful. With their busy schedules, they might have forgotten about the follow up. Since the start of our programme in collaboration with primary care clusters, ODAC has referred out about 1300 postnatal GDM women for annual diabetes screening in different polyclinic clusters. However, in view of different system structures among the clusters and concerns on PDPA, there ae challenges in collating the data for attendances in different polyclinics.

Conclusion

Women with GDM have livelong risk of developing diabetes. Some women find it difficult to continue with the changes of diet and exercise which they adopt during pregnancy. Therefore, early detection and treatment is important to detect diabetes. Proactively contacting patients via phone calls, education programs or SMS reminders were associated with high postnatal attendance rate. With good collaboration between KKH and polyclinics, postnatal GDM women received good continuity of care.

Management of Postnatal Mothers with GDM at the Secondary - Primary Care Interface

Ng Lai Peng
SingHealth Polyclinics, Singapore

A history of GDM is a significant risk factor for later development of type 2 diabetes mellitus. Locally, 4 in 10 women with GDM develop pre-diabetes or diabetes within 5 years. Continuity of care of patients in the postpartum period with reinforcement on lifestyle measures can prevent or delay the onset of full-blown diabetes in these young women in the reproductive age group. Regular screening for cardiovascular risks is essential for chronic disease prevention in the longer term. A smooth transition from postpartum to primary care may encourage long term adherence to follow up and screening. We share our experience in the transition of care of patients with history of gestational diabetes from postpartum to primary care. We look at the feasibility of provision of long-term continuity of care in our primary care clinics with right siting of care to family physician and advanced practice nurse.

Experiences of Primary Care Physicians Managing Postpartum Care. A Qualitative Research Study.

Poon Zhimin
SingHealth Polyclinics, Singapore

Background
The postpartum period is redefined as 12 weeks following childbirth. Primary care physicians (PCP) often manage postpartum women in the community after uneventful childbirths. Postpartum care significantly impacts on the maternal and neonatal physical and mental health. However, evidence has revealed unmet needs in postpartum maternal care.

Aim
The study aimed to explore the experiences of PCPs in managing postpartum mothers.

Methods
Four focus group discussions and eleven in-depth interviews with twenty-nine PCPs were conducted in this qualitative research study in urban Singapore. PCPs of both gender and variable postgraduate training background were purposively enrolled. Audited transcripts were independently coded by two investigators. Thematic content analysis was performed using the codes to identify issues in the "clinician", "mother", "postpartum care" and "healthcare system & policy" domains stipulated in "The Generalists' Wheel of Knowledge, Understanding and Inquiry" framework.

Findings
PCPs' personal attributes such as gender and knowledge influenced their postpartum care delivery. Prior training, child caring experience and access to resource materials contributed to their information mastery of postpartum care. Their professional relationship with local multi-ethic and multi-lingual Asian mothers was impacted by their mutual communication, language compatibility and understanding of local confinement practices. Consultation time constraint, awareness of community postnatal services and inadequate handover of care from the specialists hindered PCPs in the healthcare system.

Discussion
Personal, maternal and healthcare system barriers currently prevent PCPs from delivering optimal postpartum care.

Conclusion
Interventions to overcome the barriers to improve postpartum care will likely be multi-faceted across domains discussed.

A cross sectional study of the common facilitators and barriers to post-partum diabetes mellitus screening among Singaporean mothers with a recent history of gestational diabetes mellitus (GDM)

Andrew Yen Siong Tan, Chong Soon Daniel Lim, Ashley Wu, Ai Choo Seah, Cecilia Sharon Chong, Peipei Gong, Eileen Yi Ling Koh, Martyn Gostelow, Ngiap Chuan Tan
SingHealth Polyclinics, Singapore

Introduction
Gestational diabetes mellitus (GDM) is an increasingly common disorder for mothers worldwide. Mothers with GDM are at higher risk of developing type 2 diabetes mellitus (T2DM) and cardiovascular diseases after pregnancy. Frequency of postpartum screening remains suboptimal due to a variety of reasons such as: perceived unimportance of post-partum

screening, disease denial, competing maternal priorities and negative previous OGTT experience. It is important to identify factors influencing the uptake of DM screening so as to develop solutions to address the gaps. This study aimed to understand the barriers and facilitators to post-partum screening for mothers with GDM in Singapore.

Methods

This study was carried out among post-partum women with GDM at two study sites – Punggol and Sengkang Polyclinics. Recruited participants were diagnosed with GDM in their most recent pregnancy and were up to 6 months post-partum to reduce recall bias. A self-administered cross-sectional survey was used to collect demographic information, obstetric history, knowing any personal friends or relatives with T2DM or GDM, knowledge and source of information about GDM, post-partum T2DM screening status, and reasons for doing or not doing the post-partum OGTT. Outcome measures included participants' attendance and intention to complete post-partum OGTT. Associations between risk factors and OGTT completion were analysed by chi-square test, multivariate logistic regression was used to assess predictors of OGTT completion.

Results

Of the 240 women that completed the questionnaire, 176 (73.3%) completed the post-partum OGTT. These women were more likely to have their OGTT appointment scheduled as part of follow up, think earlier is better than later to know of their diabetes diagnosis, and completed OGTT to see if they could return to their normal lifestyles. 30 (12.5%) women did not intend to go for OGTT, half of them were not given any OGTT appointments and did not know that they had to do OGTT post-delivery. 56.6% of respondents cited medical staff as their main source of information related to GDM, followed by 15.8% quoting their family and friends, and 12.5% going to online groups for their information. Most of our survey respondents (79.2% - 92.5%) had correctly answered the knowledge questions in the survey. Multivariate logistic regression analysis revealed that delivery at a public hospital is an independent predictor of completion of post-partum OGTT after adjusting for confounders.

Conclusion

Prevalence of post-partum OGTT attendance among women with GDM among our study sample was high. Recognition of factors that influence mothers' accessibility to post-partum OGTT screening is important for early detection to reduce GDM related complications. Facilitation strategies aimed at increasing awareness of postpartum diabetes risks and the necessary follow-up should be implemented to improve post-partum diabetes screening rates.

Postnatal DM Screening of Mothers with GDM: Results of an Innovation to Improve Uptake

Andrew Tan Yen Siong

SingHealth Polyclinics, Singapore

Early diagnosis of pre-diabetes based on blood sampling for the oral glucose tolerance test (OGTT) is crucial for intervention but multiple barriers, such as the inconvenience of the test, hinder its uptake. A novel method of self-administered capillary OGTT was trialled at Punggol and Sengkang Polyclinics among participants with a history of GDM or pre-diabetes. They self-administered the capillary-OGTT and concurrently their venous glucose samples were obtained for precision analysis. They also filled a questionnaire to collect their demographic information, views of their capillary-OGTT, and their preferred site of the test.

Among 30 participants enrolled in this feasibility study, 93.3% of them felt confident of performing the capillary-OGTT themselves, and 70.0% preferred the test at home. Older, less educated participants found it less acceptable. Mean capillary glucose values were significantly higher than venous glucose values, with mean difference at 0.31mmol/L (95%CI:0.13-0.49) at fasting, and 0.47mmol/L (95%CI:0.12-0.92) 2-hours post-OGTT. Capillary and venous glucose measurements were correlated for fasting ($r=0.95$; $p<0.001$) and 2-hour-post-OGTT ($r=0.95$; $p<0.001$). The Fleiss-Kappa score (0.79, $p<0.0001$) indicated fair agreement between the two methods. The capillary-OGTT had excellent sensitivity (94.1%) and negative predictive value (NPV=91.7%) in identifying pre-diabetes or T2DM status, compared to venous glucose samples.

Self-administered capillary-OGTT is thus feasible and acceptable, especially among younger adults, with excellent sensitivity and NPV compared to plasma-based OGTT.

Integrated Hyperglycaemia Incentivised Postnatal Surveillance Study (I-HIPS) – Design of Wearable Devices (CGM & Activity Tracker) RCT for Postpartum Women

Elaine Quah Phaik Ling

Division of Obstetrics and Gynaecology, KKH, Singapore

A systematic review of Western diabetes prevention programs showed that lifestyle interventions implemented in women with a history of gestational diabetes mellitus (GDM) produced a reduction in subsequent Type II Diabetes (T2D) risk, and

effects are best when initiated within 6 months after delivery. There is a lack of data on such intervention studies for Asian populations given the differences in dietary, lifestyle habits, health beliefs and healthcare systems, when compared to western societies. Furthermore, the use wearable devices such as the continuous glucose monitoring (CGM) sensor, and an exercise tracker has not been thoroughly explored in any Asian postpartum diabetes prevention study trials. To the best of our knowledge, the I-HIPS study trial will be the first in Asia to design such a post-partum intervention study which provides a combination of two different wearable devices: a CGM sensor for self-monitoring of glucose profiles, and an exercise tracker for self-monitoring of physical activity levels. In addition, participants in the intervention group will also have access to an online goal-setting platform, nutritional and exercise workshops and education content on achieving a healthier lifestyle. The I-HIPS study will run up to 4 years where the primary outcome of interest which is the development of T2D will be examined in the participants receiving this intervention and those in the control who will be receiving only standard medical care.

Anchor, An Inter-Agency Collaborative Programme for Children Exposed to Maltreatment

Yeleswarapu Sita Padmini
Department of Child Development, KKH, Singapore

Children who have been exposed to maltreatment including relational and other traumas during their early developmental years coupled with ongoing neglect have complex developmental gaps which requires appropriate assessment and responses. Management of such children has been mainly from a safety perspective. Anchor, a Temasek Foundation funded home visitation programme and led by KK Hospital was initiated in order to bridge the gaps in the management of children who have been maltreated in order to achieve optimal short and long terms outcomes for the children. This includes a holistic evaluation of the child and family in order to identify needs early and provide the necessary interventions such as integrating care with the community agencies supporting the children and their families. The presentation will describe the framework of the Anchor programme.

TRACK 3 – CHILD HEALTH: ASIA PACIFIC CONSENSUS WORKSHOP ON INTEGRATED 24-HOUR ACTIVITY GUIDELINES FOR EARLY CHILDHOOD

Physical Inactivity and Screen Device Usage by Children and Adolescents in Sri Lanka

Sachith Mettananda
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Sri Lanka is a lower middle-income country with a population of approximately 22.5 million situated in South Asia. Of the total population, 24% is aged between 0-14 years, and 14% is aged between 15-24 years. Physical inactivity, lack of exercise and increase use of screen devices are important public health concerns among children and adolescents in Sri Lanka.

In a recent descriptive study, we found that 95% of pre-school children in Sri Lanka used electronic devices. The use of different devices was; television-86%, smartphone- 63%, laptop- 16%, tablet- 8% and desktop-6%. Of these children, 20.9% used devices for more than 2 hours, and 18.7% commenced using devices before one year. Higher paternal education, maternal employment and being the only child were significantly associated with electronic device use.

A recent global survey reported that 82% of boys and 89% of girls in Sri Lanka have insufficient physical activity. Importantly, the rates of insufficient physical activity are similar in both urban and rural populations and across all income categories. However, a significantly higher proportion of children who had insufficient physical activity are overweight or obese. The prevalence of obesity among Sri Lankan children is 3-6%. Two recent studies done in semi-urban populations reported prevalence of metabolic complication in Sri Lankan adolescents as; impaired fasting glucose-1.3%, hypertriglyceridemia-3.9%, hypercholesterolaemia-15.1%, non-alcoholic fatty liver disease-8.4% and metabolic syndrome-1.6%. Therefore, it is timely that measures are taken to promote physical activity and limit the screen device use among children and adolescents in Sri Lanka.

Nutritional Status of Children (Age < 5 Years Old) in Malaysia

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Nutritional status is one of the important indicators of overall health status in children and may have a long-term health impact in their future life. Malnutrition is defined as failure of the body to obtain appropriate amount of energy and nutrients in order to maintain healthy tissues and organ function.

While malnutrition in the form of stunting, wasting and underweight can result from an inadequate intake of energy and nutrient intakes, overweight and obesity problems are a result of excessive energy intake.
Among children less than 5 years, the national prevalence of stunting (height-for-age: < -2SD) was 20.7%, wasting (BMI for age< -2SD) was 11.2%, underweight (weight-for-age: < -2SD) was 13.7% and overweight (BMI for age >+2SD) was 6.4%. The prevalence of under nutrition among Malaysian children under five was much higher than the prevalence of overweight that warranted urgent and more extensive strategies to address these problems.

Prevention of Iodine Deficiency in Hong Kong

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Iodine is an essential micronutrient which is required for the production of thyroid hormone to support growth, development and cellular metabolism. The World Health Organisation (WHO) considers iodine deficiency as the single most important preventable cause of brain damage in childhood and recommends a daily intake of 150 ug for adolescents and adults, and 250 ug for pregnant and lactating women.
In Hong Kong, a consensus statement on iodine deficiency disorders has been published in 2003. It stated that borderline iodine deficiency existed in the expectant mothers and a steering group involving all stakeholders should be formed to advise on the strategy of ensuring adequate iodine intake. The Centre for Food Safety (CFS) conducted a preliminary study to understand more about the local dietary intake of iodine in 2011 and found the median daily intake might be probably below the recommendation by WHO.
The Department of Health (DH) commissioned the Chinese University of Hong Kong (CUHK) to conduct an Iodine Survey to assess iodine status of the three vulnerable groups namely school-aged children, pregnant women and lactating mothers in recent years. The Iodine Survey found that iodine status of school-aged children and pregnant women with iodine supplement at least 150 ug/day were classified as adequate, iodine status of pregnant women with iodine supplement less than 150 ug/day and those without iodine supplement were classified as insufficient while iodine status of lactating mothers with or without iodine supplement were insufficient.
A working group involving all stakeholders has reviewed the latest scientific evidences and recommends that health education on iodine intake among pregnant and lactating women should be strengthened. Pregnant and lactating women should take iodine-containing supplement at least 150 ug/day, consume food with more iodine as part of a healthy balanced diet and use iodised salt.

The Development and Impact of Australian 24-hour Movement Guidelines for the Early Years

Anthony Okely
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In November 2017, the Australian Government released the Australian 24-hour movement guidelines for the early years (birth to 5 years). These were the first set of integrated movement behaviour guidelines that were endorsed as the official government guidelines for these age groups. These guidelines take a 24-hour approach with recommendations for physical activity, sedentary behaviour and sleep for infants, toddlers, and preschoolers.
The GRADE-ADOLOPMENT approach was used to develop the guidelines. A Leadership Group was formed and existing credible guidelines identified. The *Canadian 24-Hour Movement Guidelines for the Early Years* best met the criteria established by the Panel. These were evaluated based on the evidence in the GRADE tables, summaries of findings tables and recommendations from the Canadian Guidelines. Updates to each of the Canadian systematic reviews were conducted and a Guideline Development Group was assembled to review the evidence for each behaviour separately, and in combination, deciding to adopt or adapt the Canadian recommendations for each behaviour or create *de novo* recommendations. An online survey was then conducted (n=302) along with five focus groups (n=30) and five key informant interviews (n=5) to obtain feedback from stakeholders on the draft guidelines.
Based on the evidence from the Canadian systematic reviews and the updated systematic reviews in Australia, the Guideline Development Group agreed to adopt the Canadian recommendations and, apart from some minor changes to the wording of good practice statements, maintain the wording of the guidelines, preamble and title of the Canadian Guidelines. The Australian Guidelines provide evidence-informed recommendations for a healthy day (24-Hours), integrating physical activity, sedentary behaviour (including limits to screen time), and sleep for infants (<1 year), toddlers (1-2 years) and preschoolers (3-5 years).
To our knowledge, this was the first time the GRADE-ADOLOPMENT approach was used to develop movement behaviour guidelines for the early years. The judgments of the Australian Guideline Development Group did not differ sufficiently to change the directions and strength of the recommendations and as such, the Canadian recommendations were adopted with only very minor alterations. This allowed the Australian Guidelines to be developed in a shorter time frame and

at a lower cost. We recommend the GRADE-ADOLOPMENT approach, especially if a credible set of guidelines, with all supporting materials and developed using the GRADE process, is available. Other countries may consider this approach when developing and/or revising national movement guidelines.
This presentation will also present updated evidence on the associations between meeting the 24-hour guidelines and health and development among preschoolers in Australia and the Asia-Pacific region, including novel compositional analyses which can show the best mix of movement behaviours for a given health outcome.

Prevalence of Metabolic Syndrome Among Filipino Children and Adolescents Seen in A Weight Management Center

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Objective
The aim of the study is to report the prevalence of overweight, obesity and metabolic syndrome among Filipino children seen in a weight management center in the Philippines.

Methods
This cross-sectional study was conducted in a medical nutrition and weight management center in Northern Philippines, among referred patients of both sexes aged 5-17 years. Demographic and clinical data such as dietary intake, body mass index (BMI), waist circumference (WC), and blood pressure were measured along with the fasting blood glucose, and lipid levels measurements. Metabolic syndrome was defined based on the criteria proposed by International Diabetes Federation (IDF).

Results
A total of 38 children were referred for weight management, of which all were overweight and obese. Based on IDF criteria, the overall prevalence of metabolic syndrome was 34.2%. A history of cardiovascular disease, diabetes, and hypertension in the family was present in 78.9% and a family history of obesity was present in 68.4 %. The mean calorie and protein intake from their regular diet for males is 2365 cal (±894), 105 gm (± 48) and for females is 2040 cal (±783) and 89 gm (±30). Waist circumference ⩾ 90th percentile, high triglyceride level and high blood pressure were the top most common constituent of metabolic syndrome.

Conclusion
These findings pose a growing concern to the future health of these children in a developing country. It is therefore recommended that early interventional programs focused on weight management be properly promoted and fully implemented among health care professionals to prevent chronic diseases of these children in their adulthood.

Pre-conception Counselling: NIMS-Spectrum-CDRC Model

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WHO endorses pre-conception care and counseling as investing in preconception care give good dividends later on. The goal of pre-conception counselling (PCC) is to reduce the risk of adverse health effects to the woman, fetus and neonate by addressing modifiable risk factors and by providing education about healthy pregnancy. The components of CDRC model of pre-conception counseling developed over many years of research are;

a. Family Life & Life-skill Education for adolescents: Training among 11,501 adolescents showed consistent improvement in knowledge even after a gap of 6 months [1].
b. Immunizations – Rubella, Hep. B, HPV
c. Preconception folic acid intake that can prevent at least 70% of neural tube defects.
d. Body image/cosmetic concerns, dental care- 40% of children with 1 obese parent become obese while 70% with 2 obese parents become obese [2].
e. Medical, Breast & Gynecological consultation with ultrasound abdomen examination. Preconception Care for Epilepsy include; Select the safest antiepileptic drug; In general valproate is to be avoided; For generalized epilepsy- newer AEDs like lamotrigine and levetiracetam and for focal epilepsy, sodium channel blockers such as carbamazepine, oxcarbazepine or lacosamide are preferred [3].
f. Screening for menstrual, PCOS, Genito-Urinary infection: Among 3,443 adolescent girls, 13.1% had irregular menses and among them 73% had PCO on ultrasonography [4]; increased risk of PCOS observed with increasing BMI (OR 3.5) and insulin resistance (OR 10.8) [5]; The prevalence of Metabolic Syndrome in PCOS among nursing students aged 18-24 years as defined by NCEP ATP III criteria was estimated to be 20.3% (95% CI 15.2-26.5) [6]. Among 3932 adolescent girls between 10 and 19 years, 8.25% reproductive tract infections were clinically confirmed by a consultant gynecologist [7].

g. Screening for anxiety, depression, and suicidal ideation: 14.4% (DSM-IV-TR criteria) community adolescents had anxiety disorder with 1/4th of them having concurrent depressive disorder [8].
h. Sexuality skills, understanding needs–Self & partner: Risk factors for pregnancy among 362 unmarried adolescents & young adults were; lack of appropriate parental control (OR 9); poor Intra family relationship (OR 7) and lack of sexual reproductive health knowledge (OR 5) [9].
i. Partner relationship counseling using Partner relationship Assessment Scale Trivandrum (PAST) [10].
j. Self-counseling to develop coping skills - Emotional self-awareness, Social self-awareness, Sexual self-awareness, spiritual self-awareness, physical self-assessment, Reproductive and mental health.

Gestational Age-Dependency of Body Mass Index Trajectories During the First 3 Years in Japanese Small-For-Gestational Age Children

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Gestational age (GA)-specific trajectories in body mass index (BMI) and early appearances of adiposity rebound (AR) have not been fully investigated in a cohort of Japanese small-for-gestational age (SGA) children. A longitudinal cohort study was conducted with 1063 SGA children born in Kobe, Japan, with sufficient records from birth to 3 years of age. Subjects were divided into subgroups based on GA: 39–41 weeks GA (n=723), 37–38 weeks GA (n=256), 34–36 weeks GA (n=62), and <34 weeks GA (n=22). BMI was assessed at 4 months, 9 months, 1.5 years, and 3 years of age. The BMI trajectory during the first 3 years was also GA-dependent, with a change in GA dependency at a boundary of 37 weeks GA. Approximately 7% of SGA children had already developed AR before 3 years of age. In conclusion, growth patterns during infancy and early childhood in SGA children differ depending on GA.

Update: Recommendations of Physical Activity for Thai Children Aged 0–6-Year-Old

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Changing lifestyle and decreasing physical activities among Thai children lead to the increase in the number of children with metabolic syndrome. Physical activities have been recommended as a part of treatment, prevention, health promotion and rehabilitation for normal and children with metabolic syndrome to attain optimal physical and mental well-being. In 2021, the Royal College of Paediatricians of Thailand has reviewed recommendations of child health supervision which include physical activities for children from birth to adolescence. The recommendation has been used as guidelines to maximize growth and development of Thai children for families, health care personnel and caretakers.

The Association Between Mode of Delivery and Children Neuropsychological Development: A Birth Cohort Study

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Objective

To explore the association between mode of delivery and neuropsychological development in children.

Methods

Neuropsychological development in 651 children of 12 months old and 24 months old was evaluated using the Ages and Stages Questionnaires from five functional areas including communications skills, gross motor, fine motor, problem solving and personal social in a prospective maternal infant cohort study. The children delivered by cesarean section were included in the exposure group, and children delivered by vagina were included in the control group. Multivariate logistic regression analysis was used to evaluate the correlation between delivery mode and children's neuropsychological development as well as the strength of the association.

Results

The incidence of neuropsychological development retardation in children of 12 months old and 24 months old was 3.94 % and 13.1 % respectively. Cesarean section has no significant effect on neuropsychological development of children aged 12 months. After adjusting for the confounding factors such as gestational hypertension, gestational diabetes, family income, and maternal alcohol consumption during pregnancy, the children delivered by cesarean section had a significantly increased risk of developmental retardation in the communication skills at 24 months of age, 3.37 times higher than that in the vaginal delivery group (95%CI: 1.02~10.5, P<0.05).

Conclusion
Cesarean section may increase the risk of developmental retardation in the communication skills at 24 months of age.

Eliminating the double burden of malnutrition: The Indonesian experience

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Non-communicable diseases (NCDs) make up a significant portion of the global disease burden; in Indonesia, NCDs are estimated to account for around 71% of all deaths. In 2017, more than 2.1 billion children were affected by NCDs, and NCD risk factors have a negative impact on children's well-being and development. One of the great challenges in pediatric health in developing countries is the double burden of malnutrition (DBM), where a high prevalence of undernutrition coexists with overnutrition. Current global estimates show around 150 million children are stunted, and around 40 million are overweight. Africa and Asia bear the greatest share of all forms of malnutrition. In 2018, more than half of all stunted children and almost half of all overweight children under 5 lived in Asia. In 2019, the WHO estimated 31.8% of children under 5 years of age in Indonesia were affected by stunting. Despite high numbers, public awareness and nutrition literacy are low. Problems in malnutrition in Indonesia include stunting, obesity, and insulin resistance.

Indonesia has one of the largest prevalence of stunting in the world. Stunting is a major concern because it affects intellectual ability, poor school achievement, and increases the risk of metabolic disorders and cardiovascular diseases. Growth monitoring and diagnosing growth disorders using inappropriate growth charts and mistargeted interventions can contribute to increasing the load of the malnutrition double burden. It is important to emphasize the role of nutrition in the first 2 years of age as the window of opportunity to prevent undernutrition.

According to the International Diabetes Federation's Diabetes Atlas, Indonesia is in the top 10 countries with the highest prevalence of diabetes, and the total diabetes-related health expenditure in Indonesia is expected to reach around 5 billion US dollars in 2030. In 2019, Indonesia was ranked third in countries with the largest number of adults aged 20-79 years with impaired glucose tolerance, and around 8 million people had undiagnosed diabetes. Overweight and obesity are closely related to insulin resistance. In Indonesia, the prevalence of obesity is 5 times higher in urban than rural area, and those who were overweight or obese in childhood are more likely to remain overweight or obese in adolescence. Furthermore, we found a high prevalence of insulin resistance in obese adolescents aged 12-15 years old in Indonesia; obesity and glucose intolerance in childhood are strongly associated with premature death. There is rising prevalence of type 2 diabetes mellitus in Indonesian youth, thus proper registry and patient education is needed.

Therefore, screening by healthcare professionals should be done to provide early intervention to improve outcomes. Regular anthropometric measurement is highly recommended in daily clinical practice, along with patient education on appropriate food intake and physical activity. Support from parents, schools, pediatricians, and the government is essential.

TRACK 4 – MATERNAL HEALTH
ASIA PACIFIC MATERNAL HEALTH UPDATES – VITAMIN D IN PREGNANCY

Maternal Vitamin D Status and Outcomes in Singapore

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Globally, a high prevalence of vitamin D deficiency is now recognized in pregnant women, ranging from 25-90%. Despite Singapore being a tropical country, 41% women are deficient or insufficient in vitamin D during pregnancy, specifically at late second trimester. In women preparing for pregnancy, 45% are deficient in vitamin D. Low vitamin D status during pregnancy was associated with higher plasma glucose levels, poorer sleep quality, greater risk of emergency caesarean section and delivery of neonates with higher abdominal subcutaneous fat, particularly metabolically active deep subcutaneous fat which is metabolically similar to visceral fat in adults. Drawing from the above-mentioned local evidence, a randomised control trial on vitamin D supplementation was initiated in KK Women's and Children's Hospital since Jun 2021, targeting 300 overweight and obese pregnant women (body mass index ≥25 kg/m^2) who are especially vulnerable to vitamin D deficiency. This trial aims to examine whether oral supplement of vitamin D3 (cholecalciferol) in total dosage of 800 IU given since early pregnancy until delivery can help to improve maternal vitamin D levels, metabolic and obstetric outcomes, compared with those given routine prenatal multivitamin containing 400 IU vitamin D3. The trial will fill up the gap of knowledge regarding the role of vitamin D supplementation on pregnancy outcomes and metabolic status in overweight and obese pregnant women.

Vitamin D and Pregnancy

Wu Ting
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In my presentation, I would like to discuss the following points:
(1) Summary of Vitamin D
(2) Effects of vitamin D deficiency during pregnancy on mothers and fetuses/infants
(3) Current level of vitamin D in pregnant women
(4) Vitamin D supplementation during pregnancy

Maternal vitamin D status and its related factors in Thailand

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Vitamin D is critical for the health of both the mother and the infant. Over 1000 human genes are regulated by vitamin D, and vitamin D receptors can be identified in a variety of tissues and cells throughout the body. Hypovitaminosis D in mothers can harm both the mother and her children. Preeclampsia, gestational diabetes mellitus, postpartum depression, preterm birth, and small-for-gestational-age birth have all been linked to low levels of vitamin D in the mother.
When vitamin D deficiency is present in utero or early in life, it has been linked to various diseases, including an increased risk of childhood wheezing, respiratory infections, type 1 diabetes, multiple sclerosis, and schizophrenia. As a result, it is critical to obtain an optimal level of vitamin D during pregnancy.
Hypovitaminosis D is not expected in a tropical country such as Thailand, where the sun shines nearly all year. Increased urbanization, which limits outdoor exposure to the sun, and rising levels of air pollution can contribute to vitamin D deficiency. Ozone-containing air pollution absorbs ultraviolet-B photons, resulting in a decrease in 7-dehydrocholesterol cutaneous photosynthesis. This session will examine maternal vitamin D status and its related factors in Thailand.

Vitamin D Deficiency in Pregnant Women – Asia Pacific Perspective

Milind R Shah
Naval Maternity & Nursing Home, India & Deputy Secretary General Asia Oceania Federation of Perinatal Societies (FAOPS), India

Vitamin D is a pleiotropic secosteroid hormone important for health and disease prevention. Nowadays Vitamin D deficiency is seen very commonly in pregnant women worldwide and is seen in Asia pacific region due to reduced exposure to sunlight. In Asia Pacific countries, where sunshine is abundant throughout the year, the extent of VD deficiency has been reported ranging from 50% to 86.5% for neonatal and young infants, which is still huge. There are many social and religious reasons behind it. Specially in India, pregnant women are refrained from outside activities and advised to cover body with complete clothing. Research indicates that adequate vitamin D intake in pregnancy is optimal for maternal, fetal and child health. It is associated with an increased risk of pre-eclampsia, gestational diabetes mellitus, preterm birth, and many other tissue-specific conditions like small for gestational age infants, impaired fetal skeletal formation leading to infant rickets and reduced bone mass. There is a risk of neonatal hypocalcaemia, asthma and/or type1 diabetes. Immune dysfunction, placental implantation, angiogenesis (abnormal growth of new blood vessels from pre-existing vessels), excessive inflammation and hypertension in the mother have also been associated with vitamin D deficiency, although the underlying pathogenic mechanisms are not well understood. Therefore, to achieve Millennium Development Goals and the global targets set in the maternal, infant and child nutrition comprehensive implementation plan, we need to know effects and safety of Vitamin D supplementation in pregnancy.

The main risk factors of vitamin D deficiency are those that inhibit the body's production of vitamin D in the skin, including dark pigmentation, too little exposure to sunlight, clothing that limits exposure of skin to sunlight, living in latitudes above 40° (both north and south), the season of the year, environmental pollution, use of sunscreen and ageing creams which is commonly observed. India is a vast tropical country extending from 8.4° N latitude to 37.6° N latitude. Majority of its population lives in areas receiving ample sunlight throughout the year and hence there was disbelief that vitamin D (Vit D) deficiency is uncommon in India.

However, the as per various studies, role of vitamin D supplementation in pregnancy in preventing low birth weight babies or preventing pre-eclampsia is unclear. Similarly, there is limited evidence on side effects of this intervention and safety of Vit. D supplementation in Pregnancy. There are many ongoing trials but clear guidelines are yet to receive. WHO recommends

on this subject as pregnant women should be encouraged to eat healthy during pregnancy and to receive healthy balanced diet to achieve adequate nutrition.

Vitamin D status during late pregnancy on the development of malnutrition and allergic diseases in the first year of life

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Vitamin D inadequacy during pregnancy could lead to adverse maternal and foetal outcomes. Emerging evidence demonstrated the important role of maternal vitamin D status during pregnancy in foetal programming, leading to several non-skeletal outcomes such as malnutrition and allergic diseases in the offspring. One of the main objectives of the Mother and Infant Cohort Study (MICOS), which is a prospective birth cohort study among Malaysian mother-infant pairs, was to determine the associations of maternal vitamin D status during late pregnancy with childhood allergic diseases and malnutrition during the first year of life. Although Malaysia is a country with abundant sunshine all year round, vitamin D insufficiency and deficiency were observed in 48.8% and 42.8% of the pregnant women, respectively. Low dietary intake of vitamin D and being a Malay woman were risk factors of vitamin D deficiency among pregnant women. Further, maternal vitamin D deficiency was associated with higher risk of parent-reported food allergy (FA) in infants, but no significant associations were found with eczema and IgE-mediated FA. The structural equation modelling showed that the relationship between maternal vitamin D status and wasting in infants was fully mediated by parent-reported FA after adjustment for confounders. This study demonstrates the important role of FA in explaining the relationships between maternal vitamin D status and infant wasting. In short, nutrition education and counselling for pregnant women and lactating mothers should emphasise on the importance of vitamin D and their sources, common food allergens, and management of FA to ensure optimal growth in infants.

Collaborative Efforts in Promoting Asia Pacific Maternal Health

IPRAMHO Asia Pacific Maternal Health Network

Integrated Platform for Research in Advancing Metabolic Health Outcomes of Women and Children (IPRAMHO)

IPRAMHO Asia Pacific Maternal Health Network was first initiated in 2017 when plan was made towards having annual international IPRAMHO meetings on maternal metabolic health. The representative members & investigators are from various Asia Pacific countries including Singapore, Malaysia, Thailand, Indonesia, Philippines, Myanmar, Vietnam, Japan, China, India, Sri Lanka & Australia. This is a unique network where Asia Pacific experts and partners in maternal health have come together to work on collaborative maternal and metabolic health research for the region, supplementing global WHO efforts.

This IPRAMHO network has been leading in building consensus for Asia Pacific region to improve metabolic health of mothers and children. Three Asia Pacific consensus statements have been achieved: on GDM; Perinatal Nutrition; and Physical Activity & Exercise in Pregnancy, 2 of which have been published:

1. Asia & Oceania Federation of Obstetrics and Gynaecology, Maternal Fetal Medicine Committee's consensus statements on screening for hyperglycemia in pregnancy. IPRAMHO Hyperglycemia in Pregnancy Consensus Working Group. J Obstet Gynaecol Res. 2018 Nov;44(11):2023-2024.
2. Asia Pacific Consensus on Perinatal Nutrition and Breastfeeding. Ann Nutr Metab. 2019;75(1):86-87.

There were 3 specific published studies from the network. These include:

1. Clinical practice in diabetic pregnancy screening in Asia-Pacific Countries: a survey review. Acta Diabetol. 2019 Jul;56(7):815-817
2. Comparing Different Diagnostic Criteria for Gestational Diabetes Mellitus in Relation to Birthweight in Sri Lankan Women Frontiers in Endocrinology. 2018 Nov 15;9:682
3. Exploring Abnormal Glucose Metabolism in Pregnancy among Australia Chinese Migrants. BMJ Open Diab Res Care 2020;8:e000903.

It is hoped that our efforts can give greater awareness and knowledge to help improve population metabolic health of mothers and women, enhancing and optimise the potential of women and every child born in our region.

For this year 2022, the IPRAMHO maternal network will focus on a collaborative survey of the screening, supplementation and management of Vitamin D in pregnancy as well as discuss on possible consensus framework for screening, supplementation and management of Vitamin D in pregnancy for following year.

LIST OF POSTER ABSTRACTS

APMCH001 Occult Intrauterine Fetal Abdominal Emergencies Precipitating Emergency Caesarean Section

Pui Chin Liza TAY[1], Chun Yuet KHOO[1], Yan Lin Michelle SIM[1], NARASIMHAN Kannan Laksmi[1], Melissa BATILANDO[2], Phua Hwee TANG[3]

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APMCH002 Holding both mothers and children together: Stories from a home visitation programme for socially high-risk families.

Jun Lin SAI[1], Shiyun Charmain Samantha TAN[2], Hui Qi Angelika CHAN[1], Mei Ying Theresa LEE[3,4,] Helen Yu CHEN[3,4] [1] Anchor Programme, KK Women's and Children's Hospital, Singapore

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APMCH003 Caregiver Mental Health and Child Developmental and Behavioural Outcomes in a High-Risk Population

Wen Hann Chow[1], Li Ming Ong[1], Jean Yin Oh[1], Helen Yu Chen[2], Oh Moh Chay[1], Jun Lin Sai[1], Charmain Tan[3], Jasmine Lim[1,] Bavani Govindarasu[1], Angelika Chen[1], Siti Maisarah Afandi[1], Yeleswarapu Padmini[3] [1] Department of Paediatrics, KK Women's and Children's Hospital, Singapore [2] Department of Psychological Medicine, KK Women's and Children's Hospital, Singapore

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APMCH004 Exploring the determinants of preventive health behaviours among women with a history of gestational diabetes mellitus in Singapore- A descriptive correlational study.

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APMCH005 Improving medical students' knowledge and counselling skills on paediatric obesity using a newly developed e-learning programme

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APMCH006 T Congenital Adrenal Hyperplasia (CAH) Screening in Singapore

Sherry POH[1], Huey Min TAN[1], Xinyi CHIN[2], Fabian YAP[2], Denise Li Meng GOH[3], Victor Samuel RAJADURAI[4], Ee Shien TAN[5], Soon Chuan James LIM[1]

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APMCH007 Community Enabled Readiness for first 1000-Days Learning Ecosystem (CRADLE) study – Effective Strategies in Recruitment

Joyce TEO[1], See Ling LOY[2], Dianna SRI DEWI[3], Michelle REN[3], Kok Hian TAN[4] ,Thilagamangai[5], Oh Moh CHAY[6], Kee Chong NG[1]

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APMCH008 Retrospective study of abnormal chest X-Ray findings in paediatric patients presenting to Children's Emergency Department

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APMCH009 Improvement in Humidification for Sub-acute Ventilation in Pediatric High Dependency Unit: A Cohort Study

Juan ZHAO[1], Hwei Mwei PHANG[1], Emily Fulgencio TIMPUG[1], Mengting YAN[1]

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APMCH010 Prevalence and perinatal outcomes of gestational diabetes in Singapore- a cross-sectional study

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APMCH011 Perinatal Inter-Professional Service (PIPS)@SGH: a resource and time efficient service for high-risk pregnancies

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APMCH012 The Art and Science of Implementing ECHO Framework through a Collaborative Approach ONG Goon Tat[1], TEOH Wei Qin[2], LIM Chun Yi[2], YEO Yunwei Lucia[2], CHONG Hwee Min[2], Majella IRUDAYAM[2], Nataline NG Huai Kuan[2], LEONG Yi Lin[2], KOH Huijia[2], TAN Jin Aun Peter[3], A/Prof LIM Sok Bee[2], Ellen Tay Ghim Hoon[2]

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APMCH013 Integrated Hyperglycaemia Incentivised Postnatal Surveillance (I-HIPS) Study: Personalized Goal Setting using the 6P Nutrition & Physical Activity Assessment Tool Online Tool. Chai MHS[1], Razali NSZ[1], Razali NSK[1], Han WM[2], Lim JKE[2], Fadzully F[3], Bakar MAA[3], Lee WKR[4], Loy SL[4,5,6], Khoo CW [1,5], Yap KPF[5,7,8], Quah PL[1], Tan KH [5,9]

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APMCH014 Integrated Hyperglycaemia Incentivised Postnatal Surveillance (I-HIPS) Study: Participant Recruitment

Razali NSK[1], Razali NSZ[1], Chai MHS[1] Han WM[2], Lim JKE[2], Fadzully F [3], Bakar MAA [3], Lee WKR[4], Quah PL[1], Tan KH [4,5] [1] Department of Obstetrics & Gynecology, KK Women's and Children's Hospital, Singapore.
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APMCH015 Integrated Hyperglycaemia Incentivised Postnatal Surveillance (I-HIPS) Study Trial: Study Design of Wearable Devices in a Randomized Controlled Trial for Postpartum Women

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APMCH016 Physical Activity Tracking and Exercise in Postpartum Women (I-TRACK): The Challenge of Recruitment and Retention of Participants

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APMCH017 Investigating Caregivers' Management of Children's Digital Screen Device Use

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APMCH018 Physical activity, screen viewing time and sleep of infants, toddlers and preschoolers in Singapore.

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APMCH019 Development and Validation of a Lifestyle Behavior Tool in Overweight and Obese Women for Healthy Early Life Moments in Singapore (HELMS)

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APMCH020 Prevalence and perinatal outcomes of gestational diabetes in private hospital in Singapore - A cross-sectional study

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APMCH021 IPRAMHO Study of Structured Exercise on Pregnant Women with Gestational Diabetes Mellitus (I-EXERCISE), A Randomised Controlled Trial

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POSTER ABSTRACTS

APMCH001 Occult Intrauterine Fetal Abdominal Emergencies Precipitating Emergency Caesarean Section

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Introduction

The fetus can be afflicted with a multitude of occult but life threatening intra-abdominal conditions in-utero, such as primary segmental intestinal volvulus and meconium peritonitis which can affect maternal wellbeing. They present as non-specific fetal distress during pregnancy or fetal hydrops and thus necessitating emergency caesarean section delivery. Expedient surgical intervention after birth may be required to prevent fetal loss.

Methods

We herein report two cases of occult intrauterine fetal abdominal emergencies precipitating emergency Caesarean section and discuss the management issues to demonstrate that early neonatal surgery results in good outcome. The first case is that of intrauterine fetal primary segmental intestinal volvulus resulting in the mother presenting at 35 weeks with symptoms and non-reassuring fetal status with decreased fetal movements. The second case describes a rapidly distending fetal abdominal mass at 31 weeks manifesting as fetal hydrops. The post-delivery newborn management issues are also presented.

Results

The two cases presented had undiagnosed intrauterine fetal pathologies that provided a diagnostic conundrum on presentation and was only diagnosed intra-operatively after a high suspicion of a surgical cause prompted early newborn surgery. The expedite referral to pediatric surgery and subsequent early surgeries done resulted in the survival of both patients who are now thriving well on oral feeds.

Conclusion

Clinicians should be aware of potential occult gastrointestinal presentations in the fetus in order to facilitate the activation of emergent obstetric intervention and subsequent neonatal surgery, or transfer to an institution with immediate access to such services, so as to improve survival outcomes.

APMCH002 Holding both mothers and children together: Stories from a home visitation programme for socially high-risk families.

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Introduction

Anchor pilot programme was initiated to optimise the health and developmental outcomes of children aged 0 to 3 years 11 months who have been exposed to maltreatment. Through the programme, families receive regular home visits from Community Health Visitors (CHVs), supported by a team of Paediatricians, Psychologists and Medical Social Workers. Besides developmental and behavioural support for the child and psychoeducation, the team also monitors caregivers' mental health, supports caregiver-child relationships, and provides onward referrals as deemed necessary.
In this poster presentation, we describe two families where there were significant concerns of maternal mental health, and the work we undertook to support these mothers and their children.

Methods

Anchor's framework and principles (i.e., safety/stability, relationship building, skills teaching), will be outlined through these case reports. The intervention and support provided to the mothers, who were experiencing significant mental health issues that impacted on their capacity to care for their children and provide a nurturing and stable home environment for them, will be described.

Results

Case Study 1: 2-year-old Sarah* was admitted to KKH in late 2019 over suspicions of non-accidental injury, allegedly inflicted by her 35-year-old mother, Jane*. Sarah presented with delays in language and social-emotional development. A single parent with a history of early childhood adversity that led to estrangement from her own biological mother, Jane reported experiencing trauma symptoms such as flashbacks and presented with her own emotion regulation difficulties while managing Sarah's tantrums and behaviours. Our intervention centred on providing Jane with the necessary strategies and skills in recognising and attending to her child's needs. Jane herself received support and care under the Women's Mental Wellness Service to address her own history and symptoms of childhood trauma. We also worked with other community agencies so that Jane and Sarah received support for ongoing stressors.

Case Study 2: Kate* is a 37-year-old homemaker, with 6 children under the age of 7. The family was recruited into Anchor in early 2020 when the fourth child (2.5 years old at the time) was injured by his father. At that time, Kate and her children were staying in a shelter, she was pregnant, and her husband was in prison due to drug related charges. There was a history of domestic violence, and 3 children assessed presented with developmental delays. Kate had significant levels of anxiety and depressive symptoms, with limited social support. Kate's mental health improved upon referral to Women's Mental Wellness Service where she received counselling and treatment with anti-depressants. Subsequent intervention focused on supporting her relationship with her children through reflective parenting work, referrals for the children, and working closely with the community agencies.

Conclusion

The two case studies highlight how maternal mental health intervention ameliorates the adverse impact that poor maternal mental health has on child health and developmental outcomes. It is vital that we hold both the mother and child's perspectives concurrently as we work on increasing safety/stability, supporting the dyad's relationship, and teaching childrearing skills.

*Names have been changed to protect clients' confidentiality.

APMCH003 Caregiver Mental Health and Child Developmental and Behavioural Outcomes in a High-Risk Population

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Introduction

Exposure of young children to Adverse Childhood Experiences (ACEs) can result in poor developmental and behaviour outcomes, with effects lasting into adulthood. Poor caregiver mental health is one of the ACEs that has a significant impact on all aspects of the child, such as negative parent-child relationship, recurrence of maltreatment, developmental delays including social-emotional development, and behaviour problems including trauma related symptoms.

Anchor programme is an inter-agency collaborative home visitation programme, funded by Temasek Foundation, that was initiated to support children who have been maltreated, and their families in order to achieve optimal developmental and behaviour outcomes. We explored the prevalence of caregiver mental health and its impact on child development and behaviour.

Methods

The families of children 0-4 years old, who are exposed to maltreatment and present to KK Women's and Children's Hospital, are offered the Anchor programme. Children enrolled into the Anchor programme are evaluated for developmental delays and behavioural problems via the Ages and Stages Questionnaire, 3rd edition (ASQ-3), Ages and Stages Questionnaires: Social Emotional, 2nd edition (ASQ-SE2) and Child Behaviour Checklist Questionnaire (CBCL). Their caregivers are evaluated for mental health problems via interviews as well as the Patient Health Questionnaire-9 (PHQ-9) and Generalised Anxiety Disorder 7-item Questionnaire (GAD-7).

Results

Between November 2019 and August 2021, a total of 93 children were enrolled into the programme. 41(49%) children had significant developmental delays, with an additional 17 (21%) with borderline developmental delays. 14 (27%) children had significant behavioural difficulties. 17(34%) caregivers had significant mental health concerns, and 11(20%) had clinical red flags but scored within the normal range on the screening questionnaires. Where caregivers had significant mental

health concerns, 24 (62%) of them have children presenting with significant developmental delays and 13 (50% of those with CBCL assessment) had behavioural problems. Of caregivers that did not have significant mental health concerns, only 20 (50%) of their children were found to have significant developmental delays and 3 (11% of those with CBCL assessment) had behavioural problems. The odds of caregiver mental health issues were 2.1 times higher in those children with developmental delay (OR 2.1, 95% CI 0.90, 5.1) compared to those without developmental problems. The odds of caregiver mental health issues were 8.3 times higher in those children with behavioural problems (OR 8.3, 95% CI 2.0, 34.5) compared to those without behavioural problems.

Conclusion

We found that in children exposed to maltreatment, there was a high prevalence of caregiver mental health issues. Some of these were picked up through mental health screeners, while others through clinical evaluation after a period of working with the caregivers. Where the caregiver had mental health concerns, their children were at a high risk for developmental and behaviour problems, highlighting the need to evaluate caregiver mental health routinely and intervene early, to mitigate the long-term risks posed by the adversities experienced, in this group of vulnerable children.

APMCH004 Exploring the determinants of preventive health behaviours among women with a history of gestational diabetes mellitus in Singapore- A descriptive correlational study.

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Introduction

Gestational Diabetes Mellitus (GDM) is a medical condition of glucose intolerance with onset first detected during pregnancy. It is the most common metabolic disorder of pregnancy. Women who have a history of GDM are seven times more likely to develop Type 2 Diabetes Mellitus (T2DM) later in life than women without GDM. However, the risk of progression to T2DM can be greatly reduced by practising preventive health behaviours such as controlling diet and having adequate physical activity levels. Understanding the factors that affect these preventive health behaviours is important so that effective interventions can be provided to women with a history of GDM to support them in living healthily after childbirth. This study aimed to determine the levels of preventive health behaviours and the factors affecting these behaviours among women with a history of GDM in Singapore.

Methods

A quantitative descriptive correlational design was used for this study. Convenience sampling method was used to recruit women aged 21 to 50 years, literate in English, diagnosed with GDM before 37 weeks of gestation and delivered between 37 to 41 weeks of gestation from a public maternity hospital in Singapore. Data were collected using Rapid Eating Assessment for Patients (REAP), Global Physical Activity Questionnaire (GPAQ) and Determinants of Preventive Health Behaviours Questionnaire. Descriptive statistics, Pearson Product-Moment correlation coefficient, and multiple linear regression and logistic regression were used to analyse the data.

Results

A total of 102 women participated in the study. With a mean score of 55.89 (SD= 6.19) for REAP, women in this study had moderately high levels of the recommended dietary habits. More than two-thirds (69.6%) of the women had moderate or high levels of physical activity. Correlations were found between dietary intake and perceptions, self-efficacy, barriers and social support for preventive health behaviours, and between physical activity and perceptions of preventive health behaviours. Age and barriers to practising preventive health behaviours were identified as significant factors affecting the adherence to recommended dietary intake.

Conclusion

Since women with a history of GDM in Singapore had moderately high levels of the recommended preventive health behaviours, it is recommended that health promotion strategies promote positive perceptions of healthy habits in women during reproductive age. The communication between women and healthcare providers should be improved to address the needs of the women adequately. Future observational studies are needed to provide a more genuine depiction of the lifestyle habits of these women.

APMCH005 Improving medical students' knowledge and counselling skills on paediatric obesity using a newly developed e-learning programme

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Introduction

Childhood obesity is on the rise in Singapore with the majority tracking into adulthood resulting in serious long-term medical and psychosocial complications. While the current Singapore clinical practice guideline for obesity management addresses paediatric obesity care in Singapore, no structured programme exists to teach medical students and physicians about the diagnosis and treatment of paediatric obesity. To address this training gap, this study has developed a new e-learning programme on the management of paediatric obesity for healthcare professionals to improve their knowledge and skills in paediatric obesity management that can be utilized in the current pandemic. This e-learning programme has been incorporated as part of the curriculum for Duke-NUS medical students. Our aim is that upon completion of the e-learning programme, students will have increased self-efficacy for patient-centred obesity counseling and apply principles of motivational interviewing (MI) in their communication with parents and patients on paediatric obesity.

Methods

A new e-learning programme was designed by a multidisciplinary team (paediatricians, dietitians and exercise specialists trained in paediatric obesity management). One hundred and forty-three medical students from Duke-NUS underwent a 3-hour e-learning programme, consisting of lectures and videos role-modeling MI strategies in the context of patient and parent communication. Students were given a simulated case scenario pre and post MI training where students completed communication tasks regarding the diagnosis and management of obesity. MI counselling skills were independently rated using the Behaviour Change Counselling Index (BECCI) score and feedback was provided by an MI-trained facilitator after each role-play. BECCI is scored on a 4-point Likert scale, with higher scores indicating more application of MI skills. Students completed an evaluation questionnaire, scored on a 5-point Likert scale to assess their satisfaction, knowledge gained from the programme and relevance to their clinical work. To assess students' perceived self-efficacy for patient-centred obesity counselling, the Perceived Competence for Obesity Counselling (PCOC), scored on a 5-point Likert scale, with higher scores indicating more confidence, was administered pre and post e-learning programme.

Results

A total of 109 students completed pre-test questionnaires and 84 students completed post-test questionnaires. There was an increase in students' self-efficacy for patient-centred obesity counselling, from a mean score of 2.73±0.81 to 3.73±0.55 ($p<0.001$). Students also scored higher on the total BECCI score post-programme from a mean score of 2.79±0.89 to 3.22±0.65 ($p<0.001$), indicating increased application of MI skills after the intervention. Evaluation of the e-learning programme was good. 92.9% of the students enjoyed the e-learning programme, 96.4% agreed that the content was relevant to their work and 92.9% agreed that they could apply knowledge and skills directly to their work.

Conclusion

The e-learning programme is feasible and acceptable to be implemented as part of training for medical students. It improved medical students' self-efficacy on obesity counselling and increased their application of MI skills in their communication tasks on paediatric obesity. This e-learning programme holds promise to be more widely utilized with other healthcare professionals such as residents and nurses to improve their knowledge and counselling skills on paediatric obesity.

APMCH006 T Congenital Adrenal Hyperplasia (CAH) Screening in Singapore

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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 increased 17α-hydroxyprogesterone (17-OHP) and decreased levels of glucocorticoids and mineralocorticoids. These hormonal imbalances can lead to life-threatening salt-wasting crisis and incorrect gender assignments of virilized individuals. Singapore's newborn screening programme introduced CAH screening in October 2019. As high false-positive rates often occur in the measurement of 17-OHP by conventional immunoassay in newborn screening, we adapted and developed a quantitative LC/MS/MS method to measure 17-OHP in newborn dried blood spots to increase the specificity of CAH screening.

Methods

Heel prick dried blood spot (DBS) samples were collected on Guthrie filter card between 1 and 7 days of age. Measurement of 17-OHP in DBS was performed by time resolved fluoroimmunoassay using PerkinElmer GSP® Neonatal 17αOHP reagent Kit. In our cohort, a single cutoff value of 20 ng/mL (60 nmol/L) was used for all neonates regardless of birth weight (BW) and gestational age. According to our screening algorithm, samples with an initial 17-OHP result >20 ng/mL is reflexed to a 2nd tier steroid assay by LC/MS/MS. The 2nd tier test is considered out of range if the 17-OHP is >10 ng/ml (30 nmol/L) and the (17-OHP+ Androstenedione/Cortisol) ratio is >1.1.

Results

Between Oct 2019 and Oct 2021, 71,318 newborns were screened for CAH. Of these, 357 samples (0.50%) were reflexed to the 2nd tier LC/MS/MS test. About 65% were preterm samples. Seven of these samples were found to have out of range results leading to the diagnoses of 3 CAH due to 21-hydroxylase deficiency and 4 false positive cases. All positive CAH cases are full term newborns. The performance metrics showed a CAH Incidence rate of 1: 18,000 with a false positive rate of 0.01%, PPV of 43%, sensitivity of 75% and specificity of 99.99%.

Conclusion

We have successfully implemented newborn screening for CAH using a two-tier assay protocol (real time fluoroimmunoassay and LC/MS/MS). The 2nd tier steroid profile by LC/MS/MS significantly improved the specificity of the primary screening.

APMCH007 Community Enabled Readiness for first 1000-Days Learning Ecosystem (CRADLE) study – Effective Strategies in Recruitment

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Introduction

First-time parents are usually apprehensive about coping with the demands of pregnancy and motherhood in the early years of child growth and development. The Community enabled Readiness for first 1000-Days Learning Ecosystem (CRADLE) programme seeks to develop a self-learning eco-community from pregnancy to early childhood, to encourage parenting self-efficacy (PSE) and improve health outcomes for first-time parents. (57)

Methods

The three-arm randomised controlled trial will recruit up to 750 pregnant women from KK Women's and Children's Hospital. Participants are randomly assigned to receive (1) routine care; (2) regular behavioral nudges through short text messages and engagement via a social media platform; or (3) continuity care involving one-to-one engagement with midwives from pregnancy until six-months post-delivery. The primary outcome is PSE, while secondary outcomes include health and birth experience. Participants are followed-up from recruitment until child turns two years of age, through the measurement of health and nutrition domains and patient-reported outcome measures. At the end of the study, effects of the interventions across all arms will be evaluated. (109)

Results

The trial was delayed due to COVID-19, and recruitment started in July 2020, with only over 70 participants recruited by February 2021. To improve the recruitment rate, publicity was extended to the primary healthcare level i.e. Polyclinic and SingHealth-approved online platforms. Doctors were individually engaged to promote the study. In addition, a study team

member was physically present at the clinics on a daily basis to create awareness of the study and handle on-site queries by interested patients. By 22 November 2021, 509 participants were recruited, with 38% recruited through doctors' referrals, and 29% recruited through active onsite engagement. (99)

Conclusion

Doctors' referrals and having an onsite staff for patient engagement are effective strategies in study recruitment. Besides the ongoing interventions, a total of two maternal and child wellness webinars have been held for participants, as part of the engagement efforts to minimise the dropout rates. This study has the potential to identify better ways to increase first-time parents' PSE, leading to improved PSE and health outcomes. (66)

APMCH008 Retrospective study of abnormal chest X-Ray findings in paediatric patients presenting to Children's Emergency Department

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Introduction

Chest X-Ray (CXR) is frequently ordered from Children's Emergency Department in children with respiratory symptoms. This retrospective study is done to determine the percentage of abnormal CXRs and the major types of abnormalities visible.

Methods

CXR reports from Jan 2016 to Dec 2016 from Children's Emergency in KK Women's and Children's Hospital were reviewed in this IRB approved retrospective study.

The CXRs that had been classified by the reporting radiologist into critical abnormal and requiring further action or early intervention were further classified into the types of abnormalities.

Electronic medical records were reviewed to ensure diagnosis on the CXR is confirmed against the diagnosis reflected in the clinical notes.

Demographics of the children were also captured.

Results

In year 2016, 26,172 CXRs were performed. Of these, 10,009 (38.2%) were normal, 5,767 (22%) had known or minor findings, 8,200 (31.2%) might require further action, 2,192 (8.4%) required further action or early intervention and 4 (0.02%) were critically abnormal.

In the 2,196 requiring early intervention or critically abnormal CXRs, 2,120 CXRs showed consolidation/ air space changes/ shadowing/ opacification/ infiltrates/ haziness, 900 peribronchial cuffing, 31 showed abnormal lucencies, 19 foreign bodies, 9 fractures, some of whom had overlapping findings.

In the 2,120 where CXRs showed lung infection, clinical notes confirmed 1,655 pneumonia, 259 acute bronchiolitis/ bronchitis/ asthma/ bronchial hypersensitivities, 114 upper respiratory tract infection, 9 acute laryngotracheobronchitis and 83 mixed etiologies.

31 CXRs showing abnormal lucencies had clinical notes confirming 13 pneumothoraxes and 5 pneumomediastinum.

All 19 foreign bodies and 9 fractures were also confirmed by clinical notes.

For pneumonia, there were 1,411 solely due to pneumonia while the other 244 pneumonias were reported to be associated with pleural effusion (239), bronchiectasis (1), obliterative bronchiolitis (1), bronchiolitis (1), mediastinal mass (1) and pericarditis (1). All 1655 cases were confirmed as pneumonia in the clinical notes. As for the 239 pleural effusion associated pneumonia, only 100 cases were confirmed in clinical notes, with 5 patients requiring chest tube insertion.

There were 1,361 unilateral pneumonias (791 right; 570 left) and 294 bilateral pneumonias. Pleural effusion was presented in 14.4% of all pneumonia, ranging from 11.2% in those with bilateral pneumonia to 18.4% in those with left pneumonia.

Average age of pneumonia patients was 5.4 years (range from 32 days old to 16 years old) with 852 (51%) males and 803 (49%) females. In patients with pneumonia and pleural effusion, the average age was 6.8 years (range from 5 months old to 16 years old) with 103 (43%) males and 136 (57%) females.

There were 12 spontaneous pneumothorax (3 right; 9 left) and 1 traumatic bilateral pneumothoraxes.

Average age of patients with spontaneous pneumothorax was 15.8 years (range from 14 to 17 years) seen in 9 males whereas the traumatic pneumothorax was seen in an 11-year-old male.

Conclusion

Pneumonia is the most common abnormality seen on paediatric CXRs done in the emergency department. These tend to occur in preschoolers as compared to pneumothorax which occur in teenage males.

APMCH009 Improvement in Humidification for Sub-acute Ventilation in Pediatric High Dependency Unit: A Cohort Study

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Introduction

Humidifier chamber, a vital part of the ventilation system, consistently delivers heated and humidified air to patients. In Jan 2020, disposable auto-feed humidifier chamber was introduced to High Dependency Unit (HDU) in KK Women's and Children's Hospital with the intention to address the problems of complex set-up and maintenance process with reusable humidifier chamber. To date, few studies reported comparison of these two humidification chambers. The aim of this study was to compare these two humidifier chambers in terms of set-up and water refilling time, treatment down-time (disconnection of ventilator tubing), and nurses' perceptions and experience, as a process improvement to enhance patient's safety and reduce nursing workload.

Methods

This cohort study included all nurses working in HDU in May 2021. Data were collected from May to June 2021 using the validated survey "the Functionality and Feasibility of Reusable Humidifier Chamber and Auto-Feed Humidifier Chamber" to understand their perceptions and experiences of the two humidifier chambers. A time-motion study was also conducted on 37 nurses in HDU who were randomly selected while using these two humidifier chambers in July 2021. Independent recorders recorded the timing concurrently to ensure accuracy. The differences in the duration of refilling water, set-up, and downtime between the two humidifier chambers were compared using paired t-test.

Results

Approximately 79% (46/58) of nurses in HDU responded the survey. Findings revealed that 45 (98%) nurses consentaneously indicated auto-feed humidifier chamber as their preferred choice. Forty-three (94%) nurses believed they could refill auto-feed humidifier chamber within a minute while 26 (57%) nurses could do so on the reusable humidifier chamber. Twenty-four (52%) nurses found that setting up auto-feed humidifier took less than one minute, whereas 8 (17%) nurses found it was achievable on reusable humidifier. Thirty-three (72%) nurses felt that at least additional two minutes would be required to send the reusable humidifier for cleaning. However, cleaning process was not required for the single-used auto-feed humidifier chamber. The three challenges commonly faced when using reusable humidifier chamber were water spillage, frequent refilling, and wastage of sterile water.

The time motion study showed that there was a significant difference (29 seconds, $p<0.001$) in time used to refill water between auto-feed humidifier (M=10, SD=3.3) and reusable humidifier (M=39, SD=11.3); A significant difference (14 seconds, $p<0.001$) was also found in time used to assemble the equipment between auto-feed humidifier (M=42, SD=16.4) and reusable humidifier (M=56, SD=15.5). Lastly, findings revealed that there was an average of 13 seconds of interruption to the ventilation therapy time when refilling water for reusable humidifier chamber, while there was no down-time for auto-feed humidifier chamber.

Conclusion

Interruptions to the ventilation therapy may put patients at risk of developing hypoxia. Auto-feed humidifier chamber avoided downtime, hence significantly guarded patients' safety. Findings from this study showed that auto-feed humidifier chamber reduced the time nurses spent on the ventilation therapy process and is the preferred choice among nurses. Using auto-feed humidifier chamber for ventilation therapy is an improved practice in current setting.

APMCH010 Prevalence and perinatal outcomes of gestational diabetes in Singapore- a cross-sectional study

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Introduction

The prevalence of gestational diabetes mellitus (GDM) has been increasing in Singapore during the last two decades. There are variations among the prevalences of GDM in different ethnicities. The International Association of Diabetes and Pregnancy Study Groups (IADPSG) criterion is widely adopted with new diagnostic thresholds. Large scale studies are still uncommon in Singapore to compare the different races/ethnicities based on IADPSG criteria.

Methods

We conducted a hospital-based cross-sectional study. All deliveries in KK Women's and Children's Hospital (KKH), Singapore from January to December 2019 were included in this study. We extracted information on maternal age, body mass index

(BMI) and gestational age (GA), mode of delivery, and birth weight from medical records. We calculated the prevalence of GDM (IADPSG criterion) by ethnicity. Multivariable logistic regression was performed to investigate the risk factors of GDM. We compared the caesarean section rates and incidence of macrosomia (birth weight ≥ 4kg) between GDM and non-GDM patients.

Results

A total of 8481 deliveries with complete information on the results of OGTT were included. The overall prevalence of GDM was 17.6%, the prevalence by ethnicity were highest among Indian (22.0%), followed by other ethnicity (18.3%), Chinese (17.4%), lowest among Malay (15.6%). Age (> 35 years) and body mass index (BMI>25 kg/m2) at the 1st trimester is risk factors for GDM.

The overall caesarean section (CS) rate was 34.6%. The CS rates in the ethnicities were: Chinese (38.2%), Malay (27.3%), Indian (40.5%), others (33.5%). The CS rates among the GDM patients were higher: Chinese (45.1%), Malay (31.4 %), Indian (45.4%), others (38.7%). The CS rate among the non-GDM patients were Chinese (36.7%), Malay (26.6%), Indian (39.1%), others (32.3%).

The incidences of macrosomia among the populations were Chinese (1.0%), Malay (0.9%), Indian (0.8%), others (1.3%). Among the GDM patients, the incidences of macrosomia were Chinese (1.2%), Malay (2.1%), Indian (2.0%), others (3.4%). Among the non-GDM patients, the incidences of macrosomia were Chinese (1.0%), Malay (0.7%), Indian (0.4%), others (1.4%).

Conclusion

Different ethnicities were at variable risks from GDM. Age (> 35 years) and BMI (> 25 kg/m2) are risk factors for GDM. GDM patients had a higher risk of caesarean section & macrosomia.

APMCH011 Perinatal Inter-Professional Service (PIPS)@SGH: a resource and time efficient service for high-risk pregnancies

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Introduction

Early subspecialist input and multidisciplinary team (MDT) care is the gold standard of care for complicated obstetric patients. Traditionally the core groups in obstetric MDT are OG, Neonatal (N) and Anesthesiology (A). Singapore General Hospital (SGH) has many sub-specialties that provide advanced obstetric care for women with high-risk pregnancies including Cardiac, Renal, Endocrine, Hematology and Rheumatology. This abstract compares the traditional sub-specialist referral system with PIPS@SGH where the core groups and medical sub-specialist hold joint clinics to enhance communication, collaboration and improve efficiency.

Methods

All complicated obstetric patients need antennal consultations from OG, anesthesia and neonatology. Different pathologies will need different medical specialties' input. E.g. patients with serious placental pathologies need interventional radiology consultation, thyroid disease and diabetes need endocrinologists; cardiac diseases need cardiologists; rheumatological diseases need rheumatologists; renal disease / renal transplant need nephrologists etc. These examples are not exhaustive.

Example of a complicated obstetric patient's journey:

Traditional referral model for high-risk pregnancies: A woman with complicated medical issues e.g., congenital heart disease is referred to OG from the cardiologist (CVM) for preconception care. When conception is achieved, CVM and OG offer joint surveillance as per gold standard. In the late 2nd trimester, the woman is referred to the Departments of Anesthesia and Neonatology for anesthesia-analgesia advice, and neonatal counseling respectively. A MDT meeting is organized for delivery and contingency planning.

PIPS@SGH model: The same patient above sees CVM and OG in the joint clinic from preconception to post delivery. In the late 2nd trimester, joint consultation is provided by the Anesthesia and Neonatology specialists in PIPS@SGH clinic together with CVM and OG. A management plan is formulated at this MDT.

In PIPS@SGH CVM can be substituted by other medical specialty for other conditions.

Advanced planning of various specialties' time is mandatory in PIPS@SGH

Results

Using the above patient as an example, the number of clinic visit for patient going through the referral model is 8-12 (OG) + 8 (CVM) + 2 (A) + 2 (N) = 20-24, the MDT team needs at least one meeting. The total number of clinic visit for PIPS@SGH model is 8-12 and MDT meeting will happen at the clinic. Assuming the patient uses 0.5 day to attend each clinic appointment, the PIPS@SGH model saves the patient around 6 working days. In addition, less clinic visits means less documentation and less chance of important information being lost.

Conclusion

The advantages of PIPS@SGH include:

1. Reduced number of antenatal visits as patients can be reviewed by medical sub-specialists, obstetricians, anesthesiologists, and neonatologists in one visit. This model causes less disruption to patient's schedule and provides economic benefits for patients and healthcare resources.
2. The opportunity for multiple specialists to collaborate and reach a consensus regarding stabilization of the complex medical condition, timing and mode of delivery. Joint documentation also minimizes error and improves patient safety.
3. Advanced planning to coordinate various clinician's time is mandatory for success in PIPS@SGH

APMCH012 The Art and Science of Implementing ECHO Framework through a Collaborative Approach

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Introduction

The Early Childhood Holistic Outcome (ECHO) Framework is a functional outcome measurement system that aims to improve functional outcomes of children with developmental needs under the 3 Global Child Outcomes. Led by an ECHO Technical Assistance Team (TA) comprising of an Implementation Team (IT) and a Data Team (DT), the ECHO Framework is currently implemented across 17 Early Intervention (EI) centres in Singapore using Implementation Science principles. The ECHO IT, made up of a team of transdisciplinary professionals from KKH, NUH and CPH, work collaboratively with EI professionals to build up their competency through training and coaching. The ECHO DT includes research officers from CPH, who conduct fidelity checks to ensure adherence to the ECHO Framework. Collaboration within the ECHO IT, DT and EI centres are crucial for implementing the ECHO Framework. Perrault et al., (2011) suggested that various support factors such as attention to trust, relationship building and adequate resources supported successful collaboration. Conceptual, leadership, and operational-related challenges hindered collaboration (Diane et al., 2020).

Method

An open-ended survey, Enhancing ECHO Implementation, was developed by the ECHO Good Practices Workgroup – a subgroup within the ECHO IT. The survey asked questions about the Competency, Organization and Leadership Drivers in the EI centres based on the Implementation Science framework. The Competency Drivers questions focused on the factors to improve and sustain EI professionals' ability to implement the ECHO Framework. The Organization Drivers questions focused on the mechanisms to create and sustain hospitable environments for effective implementation. The Leadership Drivers questions focused on the right leadership strategies for different types of leadership challenges. The survey was administered to the ECHO IT (17 professionals) at the end of the pre-pilot, pilot and full implementation phase to elicit their observations at their respective assigned EI centres. The results were analysed to identify key factors that supported or hindered collaboration.

Results

Findings from this internal survey generally showed close collaboration between the ECHO IT and EI centres. Attention to trust and relationship building factors found to be supportive of collaboration included working closely with EI centres to provide training and coaching. This relates to the Implementation Science Competency Drivers. Organisation Drivers such as having a good understanding of individual EI centre practices also helped the ECHO IT to collaborate with the EI centre. Leadership Drivers that supported collaboration included providing staff with resources such as protected time for ECHO implementation and adequate leadership support. Regular communication had also facilitated collaboration. Factors that hindered collaboration included a lack of buy-in into the ECHO Framework, difficulty faced by the ECHO IT in establishing a physical presence in EI centres due to COVID-19, a lack of time, manpower resources and leadership involvement (e.g. direction to implement the ECHO Framework), as well as operational-related challenges where EI centres had to change their processes in order to assimilate the ECHO Framework.

Conclusion

Positive collaboration supported the implementation of the ECHO Framework across the EI centres. The factors identified above can serve as a consideration to guide collaboration between various stakeholders and the early intervention sector in future implementation works to better child outcomes. To further enhance our current knowledge, EI centres' viewpoints on the collaboration will be added on in the near future.

Reference:

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APMCH013 Integrated Hyperglycaemia Incentivised Postnatal Surveillance (I-HIPS) Study: Personalized Goal setting using the 6P Nutrition & Physical Activity Assessment Tool Online Tool.

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Introduction

Wearable Care group (Intervention group) participants in the Integrated Hyperglycaemia Incentivised Postnatal Surveillance (I-HIPS) study trial will be receiving individualized goal setting workshops as part of the study intervention using an online assessment tool called the 6P. The 6P was designed based on the concept of developing a healthy mindset for women to improve their healthy nutrition behaviour that comprised of 6 components: Portion, Proportion, Pleasure, Phase, Physicality, Psychology. The I-HIPS study is the first to utilize the online assessment 6P platform in a randomized controlled trial for post-partum women with a history of gestational diabetes mellitus (GDM) to encourage health weight loss, and to subsequently reduce the rates of Type II Diabetes conversion.

Methods

The 6P assessment tool is designed to be self-administered, and comprises three parts (quantitative component, qualitative component and a self-reported weight log) which needs to be completed to generate a summary report. In the I-HIPS study, the 6P online assessment tool will be administered at three timepoints in the study between baseline up to 6 months. Participants would have to complete the 6P online tool at the baseline of the study, at 11-13 weeks and lastly at 23-25 weeks from the baseline of the study trial. After the completion of the 6P assessment tool at each timepoint, a feedback report with recommendations will be generated based on the 6 components of the 6P, and individualized goals will be set for the participants by KK Women's and Children's Hospital (KKH) exercise specialist and dieticians.

Results

The 6P assessment was self-administered by six recruited participants randomized to the Wearable Care group as of 15 Nov 2021. All participants had at least a college education, a mean body mass index (BMI) of 25.8 ± 4.23 and mean age of 35.3 ± 2.5 years, three of the participants were of Chinese ethnicity, two of Indian ethnicity and one of Malay ethnicity. The Psychology component measuring a participant's desire for changing eating behaviors had a mean score of 4.83 out of 10. The assessment on the Physicality component reported that 5 of the participants had inadequate amounts of physical activity. 5 participants were given feedback on the Portion and Proportion component regarding their food intakes from both the quantitative and qualitative assessments.

The quantitative assessment of portion intake recommended reducing the amount of carbohydrates consumed daily. The qualitative assessment of portion intake provided further advice on chewing, and consuming food slower to prevent overeating and promote fullness, or to replace refined carbohydrates with whole grains. The quantitative assessment of food intake proportions highlighted the participants' inadequate vegetable and fruit intake, and recommended an increase in intake. The Pleasure component of the 6P identified irregular meal intakes for 5 participants, and frequent intake of

unhealthy snacks and drinks in 3 participants. In the Phase component, 3 participants were identified as late-night eaters, both the Pleasure and Phase components provide recommendations to encourage regular eating patterns and timings to maintain healthy glucose levels.

Conclusion

The 6P assessment tool is useful as a guide for the dieticians and exercise specialists of the I-HIPS study to provide tailored goals to each participant for targeted weight loss, depending on their current BMI status. To maintain healthy eating behaviors, and a healthy BMI range, participants were given positive reinforcement through the 6P tool.

APMCH014 Integrated Hyperglycaemia Incentivised Postnatal Surveillance (I-HIPS) Study: Participant recruitment

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Introduction

The increased incidence of gestational diabetes (GDM) resulting from increased insulin resistance has become a major health concern. Women with gestational diabetes (GDM) have an up to 10 to 15-fold risk of developing type 2 diabetes (T2D) 5 years after delivery compared to their non-GDM counterparts. The Integrated Hyperglycaemia Incentivised Postnatal Surveillance (I-HIPS) Study is conducting a lifestyle intervention study, and is currently recruiting a specific group of postpartum women with history of gestational diabetes mellitus (GDM) who are at high-risk for developing T2D in the next 3-4 years.

Methods

Our recruitment criteria include pregnant women who attended KK's Women and Children's Hospital (KKH) for antenatal consultation, and were diagnosed with GDM using the International Association of Diabetes and Pregnancy Study Groups (IADPSG) guidelines. Potential participants were also required to meet a pre-screening criterion of postpartum BMI range from 20-40, and to be physically fit enough to participate in moderate intensity walking. Our recruitment strategy uses four different approaches (Methods' A, B, C and D) to recruit participants for this study. Method A sees to screen potential participants immediately postnatal at the obstetric wards after a clinical research coordinator has delivered postnatal GDM education to mother's diagnosed with GDM during pregnancy. Method B is to screen potential participants at the Specialist Outpatient Clinics during the 6-week postnatal oral glucose tolerance test (OGTT) clinic visit. For both Method A and B, the participants will be approached for prospective recruitment, and will be followed-up to ensure their post-natal OGTT results are normal. Participants with normal OGTT results will be scheduled for a baseline study visit. Method C is a phone recruitment method where a research personnel will deliver the participants' postnatal OGTT results via telephone, and recruit only those with normal OGTT results. Lastly, in Method D, the I-HIPS study will be advertised using notices and posters placed in the obstetrics and gynaecology clinics.

Results

Using only Method, A from the 6th July 2021 to the 24th of November, 135 patients were approached at the obstetric wards, and were screened for a prospective recruitment based on the study's inclusion criteria. Out of 135 patients approached, 50 (37.0%) failed the pre-screening (i.e., showed no interest in participation or did not meet pre-screening criteria). In total, 85 (63.0%) met the pre-screening criteria and consented to be contacted via phone by the clinical research coordinators once the OGTT has been completed 6-8 weeks postnatal. Out of the 85 patients who were potentially eligible for the study, 30 (35.3%) were loss to follow-up, 7 (8.2%) had abnormal OGTT results, 19 (22.5%) have pending OGTT results. Out of 29 (34.1%) subjects who met the inclusion criteria, including normal OGTT results, 15 (51.7%) declined study participation. Finally, 14 (16.5%) met the study's inclusion criteria, including having normal OGTT results and consented to the study participation at the scheduled baseline visit.

Conclusion

Using only Method A alone, which is to approach patients immediately postnatal at the obstetric wards, our study recruitment rate is approximately 3-4 participants per month.

APMCH015 Integrated Hyperglycaemia Incentivised Postnatal Surveillance (I-HIPS) Study Trial: Study Design of Wearable Devices in a Randomized Controlled Trial for Postpartum Women

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Introduction

A recent systematic review of Western diabetes prevention programs showed that lifestyle interventions implemented in women with a history of gestational diabetes mellitus (GDM) produced a reduction in subsequent Type II Diabetes (T2D) risk, and effects are best when initiated within 6 months after delivery. There is a lack of data on such intervention studies for Asian populations given the differences in dietary, lifestyle habits, health beliefs and healthcare systems. Furthermore, the use of wearable devices such as the continuous glucose monitoring (CGM) sensor, and exercise trackers have not been thoroughly explored in any Asian postpartum diabetes prevention research study.

Methods

We aimed to design a lifestyle intervention study recruiting up to 300 participants, to prevent postpartum T2D in Asian women with a history of GDM in a 2-arm randomized controlled trial. Pregnant women attending KK Hospital (KKH) for antenatal consultation and diagnosed with GDM using IADPSG guidelines, with a body mass index (BMI) range from 20-40, and physically fit to participate in moderate intensity walking will be followed-up to determine if they will have normal oral glucose tolerance test results at 6 weeks postpartum. Only subjects who meet the inclusion criteria will be recruited into the trial. Participants in the Wearable Care group (intervention) will receive a CGM sensor to monitor their glucose profile after pregnancy, and an exercise tracker as an objective assessment of the amount of exercise done to help women achieve targeted weight loss and adopt an active healthy lifestyle. Participants in the intervention group will also have access to nutritional and exercise workshops, goal-setting workshops and monthly SMS health tips. Those placed in the Scheduled Care group (control), will receive standard medical care with dietary and nutritional advice alone. Data will be collected through questionnaires and clinical measurements. The questionnaires include socio-economic factors, a quality-of-life questionnaire, maternal diet, physical activity, medical histories, lifestyle factors, health status, and home environment. Bio-physical measurements will be obtained from anthropometric measurements of participants. Human biological materials such as blood, are collected from the participants at their follow-up time points.

Results

Upon receiving ethical approval from SingHealth Centralised Institutional Review Board (CIRB) (Reference 2020/3070), the study recruitment began in July 2021, and by end of November, n=14 subjects were recruited. These 14 participants were randomized into the Wearable Care (n=6) and Scheduled Care (n=8). All participants had at least a college education, a mean age of 34.1+ 4.1years. Seven participants were of Chinese ethnicity, 5 of Indian ethnicity,1 of Malay ethnicity and 1 under the category of Others. The average BMI for all 14 subjects were 25.4 + 2.5 kg/m2. According to their BMI, 7 subjects were categorized as normal weight, 4 as overweight and 3 as obese.

Conclusion

In this intervention study, participants in both groups will be followed up in the specialist outpatient clinics with a total of 7 visits for up to 4 years to determine the primary endpoint of Type II Diabetes conversion.

APMCH016 Physical Activity Tracking and Exercise in Postpartum Women (I-TRACK): The Challenge of Recruitment and Retention of Participants

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Introduction

Postpartum period is an important phase in the reproductive years of women where excess weight retention after childbirth can lead to chronic diseases. Studies have suggested the use of pedometers to increase physical activity engagement. Hence, we proposed to examine the effects of a wearable pedometer for weight loss in postpartum women in a randomized controlled trial.

Methods

Postpartum women who met the study inclusion criteria were recruited from the KKH obstetric wards. Participants randomized at the 1st study visit (4-8 weeks postpartum) into the intervention group were provided with an Actigraph pedometer, and were sent weekly motivational text messages to encourage them to increase the number of steps taken by 500 steps a week, with the goal of meeting a minimum of 10,000 steps by the end of the study (6-10 weeks from baseline visit). Participants randomized into the control group will receive only the weekly motivational text messages. Sociodemographic data, breastfeeding practices will be collected using a questionnaire. Clinical measurements collected include height, weight, waist circumference, hip circumference, waist-to-hip ratio and blood pressure, and self-reported physical activity assessed using the international physical activity questionnaire (IPAQ) at all visits. Blood was collected at the 1st and 3rd clinic visit. The independent t-test and chi-squared test was used to determine significant differences in the demographic characteristics between subjects who completed and those who dropped out of the study.

Results

Upon receiving ethical approval from SingHealth Centralised Institutional Review Board (CIRB) (Reference 2017/3015), the study recruitment began in October 2020. Up till 14 September 2021, a total of 189 women approached at the obstetric wards were screened for recruitment, where 80 (42.3%) consented to participating in the study, while 13 (6.9%) did not meet the inclusion criteria, and 96 (50.8 %) declined participation. However, out of the 80 who consented to participation, 30 (37.5%) subjects dropped out after the recruitment, and did not attend the baseline clinic visit due to commitment issues or were lost to follow-up. Of the 49 remaining study subjects, 16 (32.7%) were of Chinese ethnicity, 29 (59.2%) of Malay, 2 (4.1%) of Indian and 2 (4.1%) of other ethnicities. The mean age was 30.2 (2.9) years, and majority [30 (61.2%)] had at least a post-secondary education. Of the 30 subjects who dropped out after recruitment, 13 (43.3%) were of Chinese ethnicity, 12 (40%) of Malay, 3 (10%) of Indian and 2 (6.7%) of other ethnicities. Majority of them had a post-secondary education [n=21(70%)] and a mean age of 28.9 (7.4). There were no significant differences in the characteristics of the subjects who remained on the study, and those who chose to drop out of the study ($p>0.05$).

Conclusion

Less than half of the patients approached for recruitment consented to participation in this study, and close to 40% chose to drop out later on. The challenges related to recruitment, timing of consent, patient commitment and retention of subjects in this clinical trial may help in devising strategies to overcome these issues in other future clinical studies.

APMCH017 Investigating Caregivers' Management of Children's Digital Screen Device Use

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Introduction

Children now live in a world of interactive media, with device use becoming more prevalent among preschoolers. To date, qualitative studies have been conducted to explore perspectives on adolescents' use of Digital Screen Devices (DSDs). However, research on preschoolers' device use in the local context is limited, especially for qualitative studies. This study aims to explore:
(i) caregivers' perceptions of DSDs
(ii) management strategies and challenges encountered
(iii) possible physical influences (i.e. postures, discomfort and physical activity level) of DSDs

Methods

This is a qualitative study. Participants were recruited via convenience snowball sampling with the following inclusion criteria:
(i) English speaking caregivers of children three to six years old
(ii) child uses at least one DSD
Semi-structured interviews were conducted via zoom online video call following an interview guide.

Ethics approval was acquired from the Singapore Institute of Technology Institutional Review Board and informed consent was obtained from all participants. Voice recordings were transcribed and coded. Thematic analysis was conducted, and potential themes and subthemes were generated by an inductive approach. Inter-rater reliability was performed by having a second author code and compare of the codes were conducted. All themes were reviewed and discussed by all the authors.

Results

In total, 17 caregivers (parents (n=15); and grandparents (n=2)) of 15 different children were recruited and interviewed. Children across the ages of three to six years old were recruited in equal numbers. Three main themes were obtained, namely caregivers' perception, management strategies and physical influences. For the first theme, most caregivers perceived that the use of DSDs helps to increase their social interactions, aid in education and provide entertainment. Despite this, caregivers still had several physical, mental, and emotional concerns. Active mediation, supervision and setting boundaries were the three most common types of management strategies adopted by caregivers. Behavioral issues, intrinsic and extrinsic influences were challenges caregivers often faced whilst managing their child's DSD usage.

For the last theme on the physical influences of DSDs, most caregivers reported poor postures adopted by their children during DSD usage. However, none of them reported any physical discomfort whilst or after using DSDs. During the COVID-19 pandemic when outdoor activities were restricted, parents turned to children-friendly programs on DSD to integrate physical activities into daily routines. Despite the increase in dependence on DSD, findings showed that most caregivers are able to set boundaries and manage their child's daily activities such that their time on DSD does not have any effect on physical activity time.

Conclusion

This study has provided descriptive findings and insights on caregivers' perceptions, management strategies along with the possible physical influences of the use of DSDs by preschoolers in Singapore. It is important to manage preschoolers' DSD usage wisely to reap their benefits while preventing adverse impact of DSDs on their development, health, and well-being. Future studies are should be done to explore other caregivers' such as grandparents, relatives and domestic helpers' perceptions, and the impact of the COVID-19 pandemic on preschoolers' use of DSDs.

APMCH018 Physical activity, screen viewing time and sleep of infants, toddlers and preschoolers in Singapore.

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Introduction

Children are encouraged to adopt a holistic approach toward integrating all types of activity within a daily 24-hour period for better health outcomes. However, there is limited descriptive lifestyle behaviour data amongst infants, toddlers and preschoolers in Singapore age 0-6 years old.

Methods

Three hundred and forty caregivers of children ages 0 months to 6 years old participated in a parent proxy-reported survey, and were assessed for parental perception of guideline recommendation awareness, total physical activity (PA) which included light and energetic PA, total sleep which included day time naps and night time sleep and screen viewing time (SVT). Failing to adhere to integrated Singapore guidelines recommendations for early childhood was defined as: <30 min of tummy time or floor-based play for infants, <180 minutes of PA at any intensity for toddlers and preschoolers; 0 hours SVT for infants and toddlers, and >1 h of SVT/day for preschoolers; <14 and <12 hours of sleep/night for infants age 0-3 months and 4-11 months, respectively, <11 and <10 of sleep night for toddlers and preschoolers, respectively. Descriptive data was presented as mean and standard deviation (SD), median and interquartile range (IQR) or frequency and percentages.

Results

Sixty percent of parents were unaware of existing PA guidelines, and 25% were unaware of existing SVT or sleep guidelines for their child's respective age groups. Falling below PA recommendations, 40% of infants spent a median of 20 (IQR 12-24) mins/day in PA. On weekdays, 40% of toddlers and preschoolers had a median of 1.5 (IQR 1-2) and 1.75 (IQR 1-2) hours/day of PA, respectively. On weekends, 20% of toddlers spent a median of 2 (IQR1.5-2) hours/day, while 30% of preschoolers spent a median of 1.75 (IQR 1-2) hours/day engaged in PA. Percentages failing to meet SVT recommendations increased with age, 30% of infants had a median of 1 (IQR 0.5-1) hours/day on weekdays, and 1 (IQR 0.5-2) hours/day on weekends, while 70% of toddlers had a median of 1 (IQR 0.9-2) hours/day on weekdays, and 90% had a median of 1.5 (0.5-3) hours/day on weekends. For preschoolers, 75% and 95% had a median of 2 (IQR 1.0-2.2) hours/day on weekdays, and 95% a median of 2 (IQR 2-4) hours/day on weekends. Percentages failing to meet sleep recommendations were the highest in infants with

35% at age 0-3 months having a mean total sleep of 11.5 (SD 1.7) hours/day on both weekdays and weekends, while 20% of infants age 4-11 months had an average of 10.5 (SD 0.8) on weekdays, and 10.0 (SD 0.9) hours/day of sleep on weekends. There were 11% and 13% of toddlers on weekdays and weekends respectively, receiving an average of 10 (SD 0.4) hours/day of sleep, and 11% of preschoolers received an average of 9.3 (SD 0.3) hours/day on weekdays, and 12% received 8.9 (SD 0.7) hours/day of sleep on weekends.

Conclusion

There is generally a lack of awareness in existing activity guidelines for children age 0-6 years old amongst parents. Physical activity, sleep and screen viewing time were suboptimal in the children of our population, indicating a need for an integrated guideline with greater dissemination, visibility and activities to promote better health behaviors.

APMCH019 Development and Validation of a Lifestyle Behavior Tool in Overweight and Obese Women for Healthy Early Life Moments in Singapore (HELMS)

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Introduction

An unhealthy lifestyle increases the risk of obesity and related co-morbidities. There is a paucity of effective lifestyle intervention tools available to assess, guide, and monitor one's own dietary and physical activity behaviours, especially among overweight or obese people. The current maternal-child health (MCH) system emphasizes antenatal care, where interventions are too far downstream to achieve a positive impact. Interventions to effectively promote a good start to life in at-risk populations require a transformation of the current MCH system to address the emerging challenges of metabolic and mental health. This study aimed to develop a lifestyle intervention tool called 6P, assess its acceptability and usefulness, and verify its construct validity in overweight or obese women. Subsequently, an integrated lifestyle intervention comprising the 6P tool will be initiated preconceptionally and continuing throughout the pregnancy and postpartum phases in a pilot implementation model "Healthy Early Life Moments in Singapore" (HELMS), which aims to improve the metabolic and mental health of overweight and obese women, as well as improve early child growth.

Methods

The 6P tool (Portion, Proportion, Pleasure, Phase, Physicality, Psychology) was developed and 15 women with a body mass index (BMI) ≥ 25 kg/m2 were interviewed to assess its perceived acceptability and usefulness. Subsequently, the revised 6P tool was tested in 46 women with a BMI ≥ 25 kg/m2. The Three-Factor Eating Questionnaire (TFEQ), International Physical Activity Questionnaire-Short (IPAQ), and weight were measured at baseline and one-month.

Results

The face and content validity were satisfactory. Cronbach's alpha for the 6P tool was 0.75. Most participants were satisfied with the presentation of the 6P tool (86.8%), and agreed it was useful in guiding healthy eating (81.6%) and raising awareness of eating behaviour (97.4%). There were significant improvements in cognitive restraint ($p = 0.010$) and disinhibition ($p = 0.030$) (TFEQ), portion size (P1), pleasure behaviours (P3), and total composite 6P score ($p < 0.001$). However, there was no significant reduction in weight or increase in physical activity.

Conclusion

We present a novel interactive lifestyle intervention tool called 6P, which is based on the mental model and TPB framework to raise awareness of eating habits and activity, and to promote self-directed behavioural change. This involves real-time feedback, goal setting, and personalized mobile health messages. The 6P tool is an easily accessible, feasible, and acceptable intervention with the potential to be both scalable and cost-effective. One-month follow-up with personalized mobile health messages aligned with respective 6P goal setting has shown an overall positive change in dietary habits. A holistic lifestyle intervention comprising the 6P tool, adopting a life-course approach to improve women's baseline knowledge of nutrition, using a mobile health platform to reduce barriers to adopting lifestyle changes, and providing personalized feedback and goal setting with regular health nudges to cultivate sustained lifestyle habits, are key strategies to break the vicious cycle of the obesity pandemic and promote optimal maternal and child health.

APMCH020 Prevalence and perinatal outcomes of gestational diabetes in private hospital in Singapore - A cross-sectional study

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Introduction

The prevalence of gestational diabetes mellitus (GDM) has been increasing in Singapore during the last two decades, but most results come from public hospitals. The characteristics of patients and the incidence of gestational diabetes in private hospital in Singapore is unclear.

Methods

We conducted a hospital-based cross-sectional study in a private hospital, the Raffles Hospital in Singapore. Consecutive deliveries in Raffles Hospital from October 2016 to November 2017 with complete information were included in this study. We extracted information on maternal age, body mass index (BMI) and gestational age (GA), mode of delivery, and birth weight from medical records. We calculated the prevalence of GDM (IADPSG criteria) by ethnicity. Multivariate logistic regression was performed to investigate the risk factors of GDM. We compared the caesarean section rates between GDM and non-GDM patients.

Results

A total of 158 deliveries with complete information on the results of OGTT were included. The overall prevalence of GDM was 23.4%, the prevalence by ethnicity were highest among other races (including Black, Hispanic, and unknown, 32.0%), followed by South Asian (including Indian, Pakistani and Bangladeshi, 31.6%), Eastern Asian (Chinese, Korean and Japanese, 21.6%), lowest among White (20.9%). Age (> 35 years), parity (>1), and body mass index (BMI>25 kg/m2) at the 1st trimester may be risk factors for GDM, but the association were not statistically significant based on the current sample size. The overall caesarean section (CS) rate was 38.0%. The CS rates among the GDM patients and non-GDM patients were 32.4% and 39.7%, respectively.

Conclusion

Patients in Singapore private hospital had similarly high incidence of GDM. Different population were at variable risks of GDM. South Asian (including Indian, Pakistani and Bangladeshi, 31.6%) had higher prevalence than Eastern Asian (Chinese, Korean and Japanese, 21.6%), GDM or the potential risk of macrosomia appeared not to be factor influencing the CS rate in this study population.

APMCH021 IPRAMHO Study of Structured Exercise on Pregnant Women with Gestational Diabetes Mellitus (I-EXERCISE) - A Randomised Controlled Trial

Maureen Navarra Aleste[1], Dhilshad Bte Muhd Abdul Qadir[2], Elizabeth Chan[1], Caroline Chua[1] **[1]Physiotherapy Department, KKH, Singapore,** [2]Division of O&G, KKH, Singapore

Introduction

The prevalence of gestational diabetes mellitus (GDM) is increasing globally. GDM is associated with increased short- and long-term health risk for both mother and child. Participating in structured exercise has been shown to improve glycaemic control and minimize complications in type 2 diabetes. However, its role in preventing adverse pregnancy outcomes in women with GDM remains unclear. This study aims to investigate the effects of an eight-week structured exercise programme on Hba1c levels, weight gain in pregnancy and its efficacy in reducing adverse pregnancy outcomes.

Methods

Forty-eight women who were newly diagnosed with GDM at KKH and eligible to participate in the study were randomly assigned to either an exercise intervention group (n=28) or standard care control group (n=20). Participants in the exercise group received information on the role of exercise in glycaemic control, attended structured exercise group class once weekly for eight weeks in addition to the diet advice and education on glucose monitoring which was the standard care. Those in the control group only received standard care. Maternal outcomes such as HbA1c levels, weight and BMI were measured at baseline and after eight weeks of structured exercises. Pregnancy outcomes such as assisted delivery, prematurity, stillbirth, neonatal hypoglycaemia and large for gestational age records were recorded. Independent t tests and chi-squared tests were used to examine the differences between the intervention and the control groups.

Results

After eight weeks of structured exercise, women in the exercise group had lower gestational weight gain, body mass index and Hba1c levels. However, these results were not significantly lower as compared with those women in the control group (2.4 ± 2.3 kg vs 3.1 ± 2.8 kg; p = 0.38), (0.93 ± 0.89 vs 1.26 ±1.2; P = 0.32), (0.22 ± 0.20 vs 0.14 ± 0.39; P = 0.40). There was a lower incidence of assisted delivery in the intervention group (14 (50 %) vs 8 (40%); p = 0.49). Three women who had elective lower caesarean section were excluded from the analysis. Women in the intervention group had significantly lower neonatal adverse events such as prematurity, hypoglycaemia, stillbirth, small and large for gestational ages (n=6 (24.1%) vs n= 4 (20%); p = 0.01). However, more large for gestational age (LGA) newborns were reported in the exercise group (n=3 (16.7%) vs n=0 (0%); p = 0.04).

Conclusion

In this study, women who participated in the eight-week exercise programme had lower neonatal adverse outcomes and were less likely to have assisted deliveries. While it seemed like exercise participation did not reduce the occurrence of having a baby with macrosomia, this could be attributed to the women in the exercise group having a higher weight, though not statistically significant.

Addendum: SYMPOSIUM III - SINGHEALTH DUKE-NUS MATERNAL & CHILD HEALTH RESEARCH INSTITUTE FORUM

Key Domains and Platforms for Maternal & Child Health Translation

Derrick Chan Wei Shih
Neurology Service, KKH, Singapore

The focus of maternal and child health is threefold:

1. Reaching optimal potential of healthy children and women
2. Returning children and women from illness to health in the best possible way, and
3. Reducing and prevent disability and death in illness to minimize the impact of disease and burden onto family and optimize contribution to society

Key domains comprise Immune-mediated diseases, Women's Mental Health and Pain, Brain and Child Developmental Health, Reproductive Health, Children's and Women's Cancer and Metabolism and Optimal and Therapeutic Nutrition.

Together these are supported in our ecosystem by platforms in Translational Immunology, Genomics, Medical Technology, Life Course Analysis and Implementation and Data Science.

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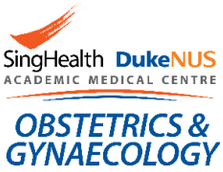

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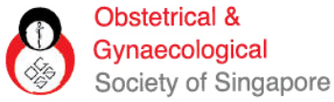

INTEGRATED PLATFORM FOR RESEARCH IN ADVANCING METABOLIC HEALTH OUTCOMES IN WOMEN AND CHILDREN (IPRAMHO) STUDY GROUP

Research Theme 1: Collaborative Research Platform for Early Intervention for Woman at High Risk of Metabolic Diseases

Theme Leaders:	Prof Tan Kok Hian
	A/Prof Tan Ngiap Chuan
	Dr Lee Eng Sing
Key Opinion Leaders:	Prof Eric A. Finkelstein
	Prof Truls Ostbye
Key Members:	Dr Lim Wai Yee
	A/Prof Tan Lay Kok
	A/Prof Tan Thiam Chye
	Dr Shyamala Thilagaratnam
	Dr Tippi Mak

Research Theme 2: Collaborative Research Platform for Early Intervention for Infant and Children with High Risk of Metabolic Diseases

Theme Leaders:	A/Prof Fabian Yap
	Dr Jasmine Lew
	Dr Karen Ng
Key Opinion Leaders:	Dr Oh Jean Yin
	Dr Lek Ngee
Key Members:	Prof Victor Samuel Rajadurai
	Dr Jasper Tong
	Dr Han Wee Meng

Research Theme 3: Innovative & System Research Platform for Enhancing Health Outcome in Women and Children with High Metabolic Risks

Theme Leaders:	Dr Dirk Frans de Korne
	A/Prof Bernard Chern
Key Opinion Leaders:	Prof David B. Matchar
	Dr John Pastor Ansah
Key Members:	Prof Tan Kok Hian
	Dr Oh Jean Yin
	Dr Han Wee Meng

Research Theme 4: Qualitative Research Platform for Maternal-Child Adjustment and Patient Activation in Women and Children with High Metabolic Risks Diseases

Theme Leaders:	Dr Chia Yen Yen
	Dr Yin Shanqing
Key Opinion Leaders:	Dr Darren Seah
	Prof George Yeo
	Ms Stephanie Teo
Key Members:	Dr Vincent Ng
	Dr Serene Thain
	Dr Helen Chen

Research Theme 5: Collaborative Research Platform of Bio-Psycho-Social Integration for better Maternal and Child Health Outcomes

Theme Leaders:	A/Prof Ang Seng Bin
	Dr Adrian Ee
Key Opinion Leaders:	Dr Helen Chen
	Dr Vincent Ng
Key Members:	Dr Lois Teo
	Dr Darren Seah
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Research Theme 6: Collaborative Implementation Science Platform for the Optimal Implementation of Programs for better Maternal and Child Health Outcomes

Theme Leaders:	Dr Tang Wern Ee
	A/Prof Ang Seng Bin
Key Opinion Leaders:	Prof Kenneth Kwek
	Dr Han Wee Meng
	Dr Tippi Mak
	Ms Ong Pei Ni
Key Members:	A/Prof Tan Ngiap Chuan
	Dr Karen Ng
	APN De Roza

Research Theme 7: Combined Registry for Metabolic Diseases (Obesity and Diabetes)

Theme Leaders:	A/Prof Tan Ngiap Chuan
	Prof Tan Kok Hian
Key Opinion Leaders:	Prof Eric A. Finkelstein
	Prof Jim Zhang
	Prof David B. Matchar
	Prof Satvinder Singh
Key Members:	Dr Bee Yong Mong
	Dr John Pastor Ansah
	Prof Fabian Yap
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INTEGRATED PLATFORM FOR RESEARCH IN ADVANCING METABOLIC HEALTH OUTCOMES IN WOMEN AND CHILDREN INTERNATIONAL NETWORK 2018-2022 IPRAMHO INTERNATIONAL INVESTIGATOR NETWORK

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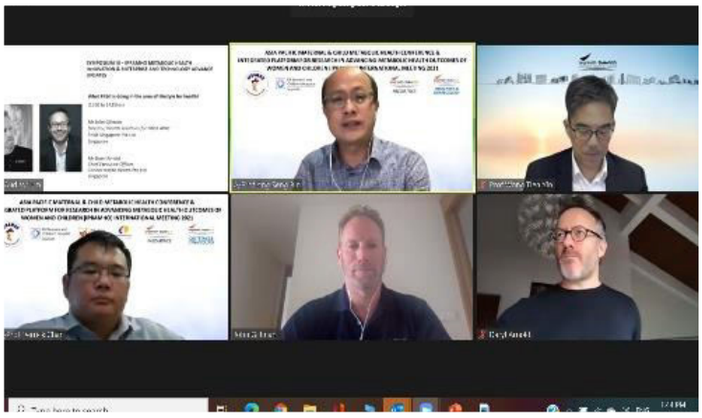

Asia Pacific Maternal and Child Metabolic Health Conference & IPRAMHO International Meeting 2021 at KKH Singapore. Dr Janil Puthucheary with local experts