(03)

大數據的力量：
醫療大數據在兒童與新生兒健康中的創新應用

Power of Big Data: Innovative Applications of Healthcare Big Data in Children's and Neonatal Health

時　　間：114 年 6 月 28 日(星期六) 08:30~12:30
地　　點：臺北榮民總醫院 致德樓第三會議室
共同主辦：臺北榮民總醫院新生兒醫療中心、大數據中心、兒童醫學部、急診部、國立陽明交通大學急重症醫學研究所、台灣新生兒科醫學會

08:30-08:40	***Opening Remarks***	李偉強副院長 Wui-Chiang Lee 李建璋處長 Chieh-Chang Lee
	座長：李偉強 副院長 (Wui-Chiang Lee) 陳曾基 院長 (Tzeng-Ji Chen)	
08:40-09:20	智慧醫療下的全國電子健康紀錄整合 National Electronic Health Record Integration for Smart Healthcare	李建璋處長 Chieh-Chang Lee (衛生福利部資訊處)
09:20-09:25	Discussion	
	座長：陳育群 教授 (Yu-Chun Chen) 李昱聲 主任 (Yu-Sheng Lee)	
09:25-09:45	優化醫院數據運用以支持臨床決策與醫學研究 Optimizing Hospital Data Utilization to Support Clinical Decision-Making and Medical Research	羅宇成主任 Yu-Chen Lo
09:45-9:50	Discussion	
	座長：朱世明 主任 (Shih-Ming Chu) 穆淑琪 教授 (Shu-Chi Mu)	
09:50-10:15	大數據分析產前暴露對子代健康的長期影響 From Big Data to Analyze Antenatal Exposure to Long-Term Offspring Health Outcomes	林明志主任 Ming-Chih Lin
10:15-10:20	Discussion	
10:20-10:30	***Coffee Break***	

座長：彭純芝 主任 (Chun-Chihn Peng)
周弘傑 主任 (Hung-Chieh Chou)

10:30-11:10	如何讓大數據有力量？以新生兒死亡率數據為例 How to Make Big Data Powerful? Neonatal Mortality Data as An Example	呂宗學教授 Tsung-Hsueh Lu
11:10-11:15	Discussion	

座長：謝武勳 教授 (Wu-Shiun Hsieh)
張瑞幸 董事長 (Jui-Hsing Chang)

11:15-11:55	大數據分析早產兒生長軌跡：使用美國醫療數據開發生長預測工具 Big Data Analytics of Preterm Infant Growth Trajectories: Insights from Growth Predictive Tool Development with US Healthcare Data	周甫聲醫師 Fu-Sheng Chou (美國)
11:55-12:00	Discussion	

座長：黃獻皞 主任 (Hsien-Hao Huang)
曹珮真 主任 (Pei-Chen Tsou)

12:00-12:20	台灣兒童急診急性呼吸道感染之分析與未來展望 Acute Respiratory Infections in Children Visiting the Emergency Department in Taiwan: Analysis and Future Perspectives	陳威宇醫師 Wei-Yu Chen
12:20-12:25	Discussion	
12:25-12:30	***Closing Remarks***	鄭玫枝教授 Mei-Jy Jeng

National electronic health record integration for smart healthcare

智慧醫療下的全國電子健康紀錄整合

Chien-Chang Lee

李建璋

Department of Information Management, Ministry of Health and Welfare, Taipei, Taiwan, ROC

衛生福利部 資訊處

Medical big data is essential for advancing smart healthcare, but its impact is limited when confined to a single institution. To support nationwide applications, Taiwan must develop a nationally representative electronic health record (EHR) dataset. However, decades of independent EHR development across hospitals have resulted in incompatible formats, creating major challenges for data integration. A single medical center operates around 50 systems, and hospitals vary in services and functionality, making a unified commercial EHR impractical.

A more feasible approach is leveraging a data platform to integrate heterogeneous EHR systems using international standards for data transformation. This strategy aligns with global efforts to enhance interoperability and enables seamless nationwide and international data exchange.

Successful integration requires three key components: a standardized national framework for EHR data exchange, unified clinical terminology and laboratory data, and a regulatory framework supported by high-speed data exchange infrastructure. These elements ensure seamless data transformation and interoperability.

This presentation will outline Taiwan's strategy for nationwide EHR integration, including new technologies, data exchange frameworks, and future policy directions. By establishing an efficient and interoperable EHR ecosystem, Taiwan aims to advance smart healthcare and align with international standards.

Optimizing hospital data utilization to support clinical decision-making and medical research

優化醫院數據運用以支持臨床決策與醫學研究

Yu-Chen Lo
羅宇成
Big Data Center, Taipei Veterans General Hospital, Taipei, Taiwan, ROC
臺北榮民總醫院 醫研部 大數據中心

In the healthcare environment, the value of data lies not only in daily operations but also serves as a critical foundation for clinical decision-making and medical research. This presentation will share practical experiences from Taipei Veterans General Hospital in optimizing the use of hospital data, including enhancing data quality through data governance, strengthening cross-departmental data collaboration, and leveraging digital tools to improve the accuracy of clinical and research decisions.

The speaker will explore the establishment of standardized data workflows to ensure data usability and security, and will demonstrate how digital dashboards and other tools can maximize efficiency in clinical practice and medical research. Through case studies, the presentation will illustrate how data can be transformed into actionable insights to support clinicians in making timely and accurate decisions, while also advancing medical research. Ultimately, data will be highlighted as a key driving force in fostering innovation in healthcare.

From big data to analyze antenatal exposure to long-term offspring health outcomes

大數據分析產前暴露對子代健康的長期影響

Ming-Chih Lin

林明志

Department of Post-Baccalaureate Medicine, College of Medicine, National Chung Hsing University, Taichung, Taiwan, ROC

Children's Medical Center, Taichung Veterans General Hospital, Taichung, Taiwan, ROC

School of Medicine, College of Medicine, National Yang Ming Chiao Tung University, Taipei, Taiwan, ROC

國立中興大學 學士後醫學系

臺中榮民總醫院 兒童醫學中心

國立陽明交通大學 醫學院 醫學系

Regarding the impact of prenatal risk factor exposure on child health using health insurance databases, past studies have often been limited by the inability to link mothers' and children's identification numbers, making it difficult to determine maternal diseases, medication use, and risk factor exposures during pregnancy. After the introduction of Taiwan's Maternal and Child Health Database (MCHD), Breakthroughs have been reached in research methodology.

We analyzed the relationship between maternal prenatal health and postnatal child health. First, we discovered that maternal immune diseases might increase the incidence of Kawasaki disease in children. Next, Pregnant women often have concerns about vaccination during pregnancy. Our research confirmed that influenza infection during pregnancy may increase the risk of febrile seizures in children, providing strong evidence to support the prevention of prenatal viral infections and encourage pregnant women to receive the influenza vaccine. Furthermore, we found that although prenatal corticosteroids have been widely used in obstetrics to prevent respiratory distress in preterm infants, our study showed that prenatal corticosteroid use may have long-term adverse effects on late preterm and full-term infants. Additionally, we also found that maternal autoimmune diseases may increase the risk of autism in children through epigenetic mechanisms.

In summary, Barker hypothesis could be further approved through big data analysis. Prenatal exposure has long-term impact on children's health.

How to make big data powerful? Neonatal mortality data as an example

如何讓大數據有力量？以新生兒死亡率數據為例

Tsung-Hsueh Lu

呂宗學

Institute of Public Health, College of Medicine, National Cheng Kung University, Tainan , Taiwan, ROC

國立成功大學 醫學院 公共衛生研究所

One of the ways to make big data powerful in providing better information for better actions is to collect relevant data and open the data to public analysis and uses. In this talk, I will use neonatal mortality as an example to illustrate how the government can collect more relevant data and open the data to incur better analysis and providing better information for better decision making.

1) the causes of death (COD) summary tables released by the Office of Statistics, Ministry of Health and Welfare (OS_MOHW) in Taiwan used broad categories for leading infant CODs and could not further analysis the neonatal mortality by age of death. by city/county and year.
2) the OS_MOHW also releases aggregated open data for three-digit International Classification of Disease Tenth Revision (ICD-10) and detail age of death from 2008 to present.
3) the gestational age and birthweight are two important relevant data related to neonatal mortality. However, the Birth Reporting System (BRS) maintained by the Surveillance Division in Health Promotion Administration (SD_HPA) did not release the open aggregated data and the annual report provides very limited information, little is known on the prevalence of very preterm (<32 weeks) and extremely preterm (<28 weeks) and periviable (<22 weeks).
4) the restricted Center for Data Science provides the linkage of different datasets for better analysis. However, it was not very friendly for identify neonatal death because of no neonatal ID in BRS.
5) the US National Center for Health Statistics (NCHS), in contrast, linked the birth certificate and multiple CODs infant death data and open to public. Furthermore, the NCHS collected more detail data in the birth certificates for providing more relevant information for clinicians and public health people.
6) many neonatal intensive care units (NICUs) networks collected more detailed data on medical treatments and related outcomes, which provide valuable and powerful information for research.
7) in the global health field, several modelled-based neonatal mortality data for countries or territories without complete vital statistics system have been developed, such as GBD and IGME.

Inviting you to make full use of these open neonatal mortality data for better analysis and producing powerful information for better decision making.

Big data analytics of preterm infant growth trajectories: Insights from growth predictive tool development with US healthcare data

大數據分析早產兒生長軌跡：使用美國醫療數據開發生長預測工具之經驗分享

Fu-Sheng Chou

周甫聲

Department of Neonatal-Perinatal Medicine, Southern California Permanente Medical Group, Pasadena, USA

美國南加州凱瑟醫療集團 新生兒科

Thanks to the advent of computer technology and the widespread adoption of electronic health records, healthcare-related data have been largely digitized for over a decade, amassing a vast repository of information that includes physiological parameters, clinical outcomes, pathological etiologies, and even molecular data. This wealth of historical data offers transformative potential for patient care, especially in data-driven domains like neonatal medicine, which focuses on supporting the growth and development of preterm infants while minimizing complications and morbidities.

Traditional methods for assessing growth in neonatal intensive care units (NICUs), such as intrauterine growth charts and weekly growth velocity (GV) calculations, fall short due to their impracticality for real-time monitoring. Intrauterine growth charts are designed to estimate fetal growth rather than postnatal development, and GV calculations require a full week of data collection before they can be applied. More importantly, postnatal growth follows a distinct trajectory from fetal growth, making the use of intrauterine charts not only impractical but also inappropriate for tracking preterm infants after birth.

To address these limitations, we embarked on a data-driven initiative, hypothesizing that, in the absence of morbidities, a preterm infant's growth follows a genetically predetermined trajectory. Partnering with the Pediatrix Medical Group, we worked with a comprehensive dataset of growth parameters, physiological measurements that are less prone to bias than many healthcare data sources but still require careful handling due to issues like measurement errors and missing data. Leveraging big data analytics, we set out to characterize postnatal growth patterns and develop a practical prediction tool for clinical use. We meticulously chose an algorithm to model these growth trajectories, carefully evaluating its strengths and weaknesses.

Currently, we are validating the postnatal growth charts using data from Kaiser Permanente Southern California. Additionally, we are categorizing growth patterns based on these charts and linking them to morbidity outcomes to enhance their clinical utility. Moreover, we are collaborating with Dr. Mei-Jy Jeng to implement this growth assessment tool at Taipei Veterans General Hospital as a web application, aiming to further strengthen care for Taiwanese preterm infants.

Through this effort, we've crafted an innovative framework that not only deepens our understanding of preterm growth dynamics but also lays the groundwork for future academic and clinical advancements, converting raw data into actionable insights to improve the long-term health of preterm infants and give them the strongest possible foundation for life. Ultimately, this work aims to revolutionize how we monitor and support preterm infants, ensuring they receive the best possible care from birth through childhood.

Acute respiratory infections in children visiting the emergency department in Taiwan: Analysis and future perspectives

台灣兒童急診急性呼吸道感染之分析與未來展望

Wei-Yu Chen

陳威宇

Department of Pediatrics, Neonatal Medical Care Center, Taipei Veterans General Hospital, Taipei, Taiwan, ROC

臺北榮民總醫院 兒童醫學部 新生兒醫療中心

Acute respiratory infections (ARIs) are a leading cause of pediatric emergency department (ED) visits, significantly burdening healthcare systems and posing challenges for clinical management and public health surveillance. Early and accurate pathogen identification is essential for appropriate treatment, efficient resource use, and outbreak detection. However, traditional diagnostics relying on symptoms and selective lab tests often cause delays, unnecessary antibiotic use, and missed intervention windows. This study examines the integration of multiplex PCR diagnostics with geographic surveillance in Taiwan's pediatric EDs and explores how AI and big data can further enhance ARI management.

Taiwan's current surveillance depends on the CDC's reporting systems and the Epidemic Prevention Cloud, which support physician reports and lab-based disease detection, mainly focusing on influenza and lacking real-time geospatial integration. Implementing multiplex PCR enabled pathogen identification within one hour, improving antibiotic stewardship and reducing unnecessary hospitalizations. Merging lab data with geographic information systems (GIS) allowed real-time cluster detection and strengthened public health responses.

Building on these results, AI and big data can further improve surveillance. Predictive modeling can forecast ARI surges, enabling proactive resource planning. Real-time outbreak detection using hospital and community data can enhance early warnings. Integrating AI decision support in EDs can streamline triage and treatment decisions. Embedding these technologies can shift Taiwan toward a proactive, data-driven approach to pediatric ARI management, improving patient outcomes and public health preparedness.