
急重症醫學之智慧醫療新進展

Smart Healthcare Advancements in Emergency and Critical Care Medicine

時間：113 年 6 月 22 日(星期六) 08:30~12:30

地點：臺北榮民總醫院 長青樓一樓會議室

共同主辦單位：國立陽明交通大學急重症醫學研究所、

臺北榮民總醫院新生兒醫療中心、重症醫學部、
急診醫學部、胸腔外科、感染科、心胸麻醉科

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| 08:40-08:50 | Opening Remarks | 李建賢教授 林永揚副院長 Yung-Yang Lin |
| | 座長：鄭玫枝 教授 (Mei-Jy Jeng) 許瀚水 教授 (Han-Shui Hsu) | |
| 08:50-09:20 | 2030 機智加護中心 Double SMART ICU 2030 | 尹彙文醫師 Huey-Wen Yien |
| 09:20-09:50 | 從概念到商業化：加護病房急性腎損傷預測模型的全方位發展之旅 From Concept to Commercialization: The Comprehensive Journey of Developing an ICU Acute Kidney Injury Prediction Model | 黃俊德醫師 Chun-Te Huang |
| 09:50-10:20 | 從預測到行動：臺北榮總重症醫學步的分享 From prediction to action：Sharing from CCM of Taipei VGH | 江東鴻醫師 Dung-Hung Chiang |
| 10:20-10:30 | Discussion | |
| 10:30-10:40 | Coffee Break | |
| | 座長：侯重光 教授 (Chorng-Kuang How) 丁乾坤 教授 (Chien-Kun Ting) | |
| 10:40-11:10 | 分秒必爭－外傷重症影像智能化判讀應用 Time Matters: The Application of AI in the Critical Care and Trauma Imaging | 鄭啟桐醫師 Chi-Tung Cheng |
| 11:10-11:40 | 臺北榮總麻醉部資訊系統改良經驗談 Anesthesia Department Information System Improvement, experiences of VGH Taipei | 蘇府蔚醫師 Fu-Wei Su |

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| 11:40-11:45 | Discussion 座長：林邑璫 教授 (Yi-Tsung Lin) 劉嘉仁 副教授 (Chia-Jen Liu) | |
| 11:45-12:00 | 重症研究經驗分享及未來智慧加護病房研究方向 Experience sharing of critical care research and future directions in smart ICU | 陳威志醫師 Wei-Chih Chen |
| 12:00-12:10 | 預測血液透析期間血管通路流量閾值：發展與驗證一個機器學習模型 Development and Validation of a Machine Learning Model for Predicting the Vascular Access Flow Threshold in End-Stage Renal Disease Patients during Hemodialysis | 陳範宇醫師 Fan-Yu Chen |
| 12:10-12:20 | 嬰兒智慧監測系統 Smart Wireless Monitoring for Infants | 周佳穗醫師 Chia-Sui Chou |
| 12:20-12:30 | Discussion | |

【演講摘要如後附】

Double SMART ICU 2030

2030 機智加護中心

Huey-Wen Yien

尹彙文

Medical Artificial Intelligence Development Center / Surgical ICU, Taipei Veteran General Hospital, Taiwan, ROC.

臺北榮總 醫療人工智慧發展中心/外科加護中心

In the era of digital transformation, the concept of “ICU without wall” can fix the unmet demand during the critically-ill patient journey which includes both critical and concierge care for the patients and families.

We propose the new model of critical care by AIR(AI and Robotics) to transform the delivery of continuity and comprehensive care in the paradigm shift of digital generation. The term of “**Double SMART**” represents both physical and digital dimensions, that is “**S**ervice, **M**anagement, **A**rchitecture, **R**esearch, **T**echnology” and “**S**afe/save, **M**obile, **A**I, **R**obotics, **T**rust/touch”. We design a high performance process to de-load the low-value care, especially while facing the challenge of burnout and shortage of ICU staffs.

In Mercy Virtue hospital, the world’s first facility dedicated to telehealth, they propose the “**Hospital without beds**” project. Physician staffs can “see” patients where they are. Another example is the “Journey with *Guided Care*” in Cleveland Clinic Medical Center showing their great core value, “Every patient deserves world-class care.”

In conclusion, we are facing the great challenges in our traditional model of delivering low value care during patient journey including burnout of staffs, shortage of workforce, and finally collapse of the non-resilient medical care system. We are now on the AIR way to double SMART ICU 2030.

From Concept to Commercialization: The Comprehensive Journey of Developing an ICU Acute Kidney Injury Prediction Model

從概念到商業化：加護病房急性腎損傷預測模型的全方位發展之旅

Chun-Te Huang

黃俊德

*Nephrology and Critical Care Medicine, Department of Internal Medicine and Critical Care Medicine,
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臺中榮民總醫院內科部腎臟科/重症部重症內科

Acute Kidney Injury (AKI) is a critical concern in ICUs, with a 30% prevalence and severe long-term consequences. Addressing this, our collaborative effort with Tunghai University and Advantech Technology led to a pioneering predictive model for AKI, forecasting incidents 24 hours in advance with remarkable accuracy. Through external validations at four medical centers and enhancements via federated learning, our model has been patented in Taiwan and the USA, and certified as a software medical device by Taiwan's FDA in December 2023. We are now moving towards clinical trials, aiming for broader clinical implementation and inclusion in Taiwan's National Health Insurance. This journey from concept to potential commercialization embodies a significant leap in ICU patient care, showcasing the power of collaboration, innovation, and perseverance in tackling healthcare challenges

From prediction to action: Sharing from CCM of Taipei VGH

從預測到行動：臺北榮總重症醫學部的分享

Dung-Hung Chiang

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臺北榮民總醫院重症醫學部

"Prediction AI" refers to artificial intelligence systems that utilize machine learning, statistical analysis, and data mining techniques to predict future events, trends, or outcomes. Such AI systems predict future developments by analyzing past and present data, learning the patterns and correlations within.

"Actionable AI" refers to artificial intelligence systems capable of directly supporting decision-making and concrete actions. These AI systems go beyond mere data analysis or prediction; they provide specific recommendations, solutions, and can even autonomously execute particular tasks.

In recent years, the Department of Critical Care Medicine at Taipei Veterans General Hospital has also been committed to the development of intelligent critical care medicine. This presentation will introduce the department's achievements in developing prediction models and the progress towards implementing actionable AI.

Time Matters: The Application of AI in the Critical Care and Trauma Imaging

分秒必爭－外傷重症影像智能化判讀應用

Chi-Tung Cheng

鄭啟桐

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林口長庚醫院 外傷急症外科

Trauma constitutes a critical medical scenario that often poses an immediate threat to life, necessitating rapid intervention to secure patient survival and the swift identification of affected organs. Physicians operating within such a high-stakes environment are tasked with the rapid assimilation and interpretation of a voluminous array of information and imaging, all within stringent time constraints. The efficacy of deep learning technologies has been substantiated across a spectrum of medical imaging domains, encompassing the identification of hemorrhages in brain CT scans, the detection of fractures in chest and pelvic X-rays, and the recognition of fluid in ultrasonography.

At the Trauma Department of Linkou Chang Gung Memorial Hospital, our aim is to harness deep learning algorithms across a diverse range of critical trauma imaging modalities, thereby advancing the development of a sophisticated computer-aided diagnosis (CAD) system. Our team has achieved notable success in formulating models for the detection of pelvic fractures in X-rays, the identification of rib fractures in chest X-rays, and the delineation of spleen injuries in abdominal computed tomography scans.

Looking forward, our ambition is to seamlessly integrate this CAD system within the existing clinical information system and to incorporate these models into the trauma imaging alert system. This integration is envisioned to furnish an automated diagnostic support for critical injuries in trauma patients across multiple healthcare facilities. By enabling the early diagnosis of severe injuries, our initiative stands to significantly enhance the caliber of trauma care, thereby preserving patient lives and optimizing recovery outcomes.

Anesthesia Department Information System Improvement, experiences of VGH Taipei

臺北榮總麻醉部資訊系統改良經驗談

Fu-Wei SU

蘇府蔚

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臺北榮民總醫院 麻醉部

Taipei Veterans General Hospital ranks as the twelfth largest hospital in the world by bed capacity. The high complexity in operating room management necessitates a process to reduce errors, maximize efficiency, and alleviate healthcare worker burnout. This preoperative preparation process for surgical patients involves coordination among multiple personnel and patients themselves.

Anesthesia evaluation begins at the early stage of preoperative preparation. We tried to develop an evaluation platform and use artificial intelligence to reduce the workload of anesthesiologists, to facilitate OR schedule management, and to reduce perioperative complications.

Experience sharing of critical care research and future directions in smart ICU

重症研究經驗分享及未來智慧加護病房研究方向

Wei-Chih Chen

陳威志

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臺北榮民總醫院胸腔部

陽明交通大學醫學系

Critical care research is paramount in advancing our understanding of critical care medicine and facilitating enhanced patient care within the intensive care unit (ICU). The evolution of new technologies and electronic medical records has streamlined data collection processes for researchers, enabling them to acquire more data efficiently compared to previous methods. However, effectively harnessing the vast amounts of data generated by various ICU machines for precise analysis remains a significant challenge.

My research journey began during my residency, where I started at the process of topic exploration, securing institutional review board approval, designing case report forms, transitioning from hard copy to electronic database, utilizing statistical software for analysis, crafting figures and tables, manuscript composition, reference management, English editing, and the submission and revision process, including handling rejections.

The vision of a 'smart ICU' holds promise for revolutionizing clinical studies by offering unparalleled convenience. Additionally, establishing a nationwide network of ICUs holds immense potential for uncovering clinically significant insights that may not be apparent within single-center studies. In the current insurance system, hospital administrations are not willing to invest in ICU improvements due to less reimbursement from daily clinical care. However, the advancement of the 'smart ICU' is intrinsically tied to overall quality enhancement and improved patient outcomes. Hence, policymakers within governmental and hospital administration boards must allocate more resources and provide ample encouragement to ICU professionals to facilitate this progress.