



**KMU**  
Kaohsiung Medical University

# RESEARCH CENTER QUARTERLY REPORT

2026.05



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# UNIVERSITY-LEVEL RESEARCH CENTERS

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# UNIVERSITY-LEVEL RESEARCH CENTERS

## University -Level Academic Research Institute



**Biomedical Artificial Intelligence Academy (BAIA)**  
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## UNIVERSITY-LEVEL RESEARCH CENTERS

## University-Level Mission-Oriented Research Center


**Neuroscience Research Center (NRC)**

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# UNIVERSITY RESEARCH CENTER COLUMN

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## Delivering Outstanding Outcomes in Clinical Transformation: AI Nursing Innovation Talent Development Program Shines!

University -Level Academic Research Institute — Biomedical Artificial Intelligence Academy (BAIA)

Author: R.A. I-Ting Wei / Dean Henry Horng-Shing Lu

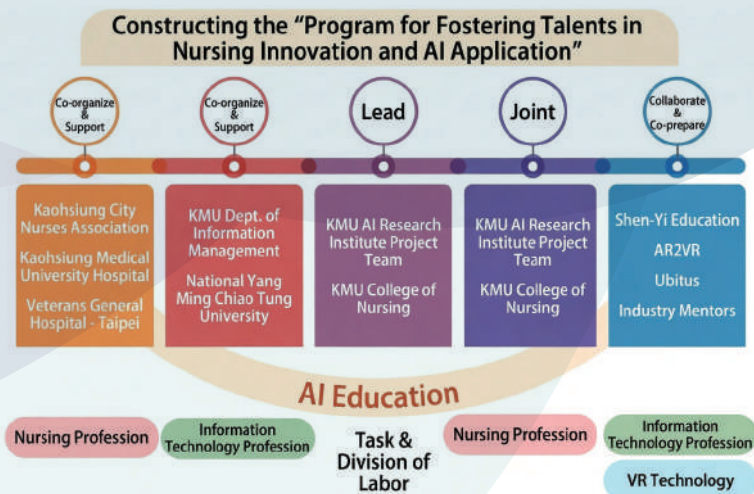
Amid the global shortage of nursing personnel and increasingly high-pressure clinical environments, nurses are burdened with documentation, shift handovers, and patient care responsibilities. Who can help lighten this load? Enabling AI technologies to serve as supportive partners for frontline healthcare professionals has become an urgent priority. The Artificial Intelligence in Biomedical Artificial Intelligence Academy at Kaohsiung Medical University launched the “Nursing Innovation and Artificial Intelligence Application Talent Development Program,” breaking disciplinary boundaries by integrating faculty from nursing and information technology. The program introduced phased, hands-on courses covering generative AI, virtual reality (VR), and robotics applications. A total of 371 participants—from undergraduate students to practicing nurses—joined the courses, achieving an overall satisfaction score of 4.9 out of 5. Starting from real clinical pain points, participants translated technology into practical solutions. Beginning with the “AIxVR Practical Teaching Manual,” the program has opened a new chapter in the digital transformation of nursing education in Taiwan.

The nursing profession is undergoing an AI-driven transformation while simultaneously facing a global workforce shortage and increasing complexity in care demands. Leveraging technology to relieve frontline nursing workload has become a critical and urgent issue. In response, the Academy launched the “Nursing Innovation and Artificial Intelligence Application Talent Development Program,” which received funding support from the Ministry of Education’s Smart Rainforest Industry Talent Development Program. The initiative aims to cultivate nursing professionals capable of integrating technological and clinical care competencies. Through progressive, structured courses, nursing students are guided to engage with AI and digital tools, while cross-disciplinary collaboration and hands-on development training are incorporated. The program is committed to cultivating next-generation nursing talent and building a cross-disciplinary communication bridge between nursing practice and emerging technologies in future clinical settings.

### Cross-Disciplinary Learning and Co-Creation: Diverse Curriculum Built by Interdisciplinary Faculty

The program integrates faculty expertise and facilities from the Artificial Intelligence in Biomedical Artificial Intelligence Academy, the College of Nursing, and the Department of Healthcare Administration and Medical Informatics. Through interdisciplinary collaboration, a thematic curriculum cluster combining nursing and AI applications was successfully developed. The curriculum spans four major dimensions: Nursing Innovation, AI Concepts, AI Applications, and AI Technical Practice. Five hands-on courses were offered, including “Fundamentals of Multimedia Design,” “Fundamentals of Robotics Design,” “Introduction to AI Applications + Multimedia Design,” “Fast x Precise x Powerful: Building Your Own AI Research Workflow,” and “Constructing Immersive VR Learning Environments for Nursing Using AI.” The courses deeply integrate advanced technologies such as AI applications (e.g., Gemini, NotebookLM), VR environment design (e.g., 3D Vista), and robotics platforms (e.g., Kebbi Robot), bringing a new paradigm to nursing talent development.

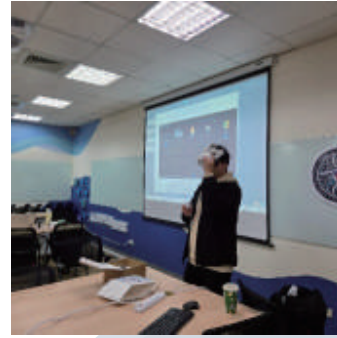
In addition, three keynote lectures were organized, focusing on experiences in addressing clinical pain points. Topics included “The Future Hospital: Applications and Practice of Medical AI,” “Smart Nursing Integration: Taipei Veterans General Hospital Smart Nursing Experience Sharing,” and “Artificial Intelligence and Nursing Science.” By inviting experts from clinical settings to share healthcare transformation after AI implementation, these sessions provided benchmark insights, strengthened theory-to-practice integration, and stimulated innovative thinking among participants.



## Bridging Practice Through Broad Collaboration: Translating Learning into Real-World Impact

To ensure practical implementation, the program emphasized hands-on learning and cross-sector resource integration, successfully connecting three major systems—academia, hospitals, and professional associations—along with educational technology providers. Cross-disciplinary experts participated from healthcare institutions (KMU-affiliated hospitals, National Yang Ming Chiao Tung University, Taipei Veterans General Hospital), educational technology companies (Shenyi Education, Ubiqda, AR2VR), and professional organizations (Kaohsiung Nurses Association, Taiwan Union of Nurses Association). Through comprehensive resource integration spanning northern to southern Taiwan, participants explored emerging technologies from diverse perspectives and developed potential applications for future clinical environments.

With industry-academia collaboration, participants not only acquired operational skills in AI and VR tools but also, under expert mentorship, aligned their learning directly with real clinical needs and developed practical projects. This hands-on model transformed collaboration from resource sharing into genuine problem-solving capability, strengthening resilience and innovation for both clinical practice and industry.



## Strong Curriculum Recognition: High Satisfaction and Capability Growth

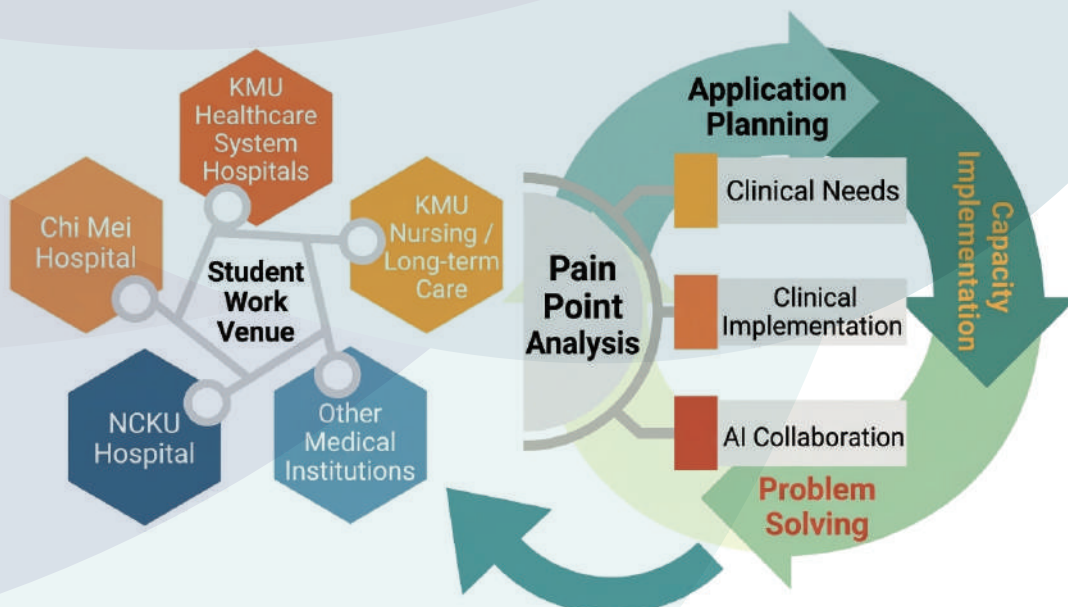
A total of 371 enrollments were recorded, with participants from diverse backgrounds including nursing, healthcare administration and informatics, and long-term care programs. The cohort spanned undergraduate students, graduate students, doctoral candidates, nursing faculty, and practicing clinical nurses. This diversity fostered deep interdisciplinary exchange and encouraged faculty to transition into cross-disciplinary digital mentors, co-creating innovations in smart nursing with students. Faculty simultaneously incorporated AI tools into teaching design, achieving the goal of technology-empowered education.

Post-course feedback indicated an average satisfaction score of 4.9 out of 5, reflecting significant improvements in AI literacy. Additionally, 60% of participants reported increased confidence in applying AI tools and technologies. The courses provided timely solutions, enhanced technical proficiency, and stimulated interest in exploring additional digital tools, demonstrating the program's strong initial impact.

## Looking Ahead: Continuing to Advance AI Nursing Talent Development

Guided by the philosophy of integrating foundational AI knowledge with hands-on nursing applications to cultivate innovative thinking, the Academy will continue optimizing course content based on faculty and student feedback and expert recommendations. Future course offerings will further align with learner needs. Collaboration mechanisms have already been planned with southern clinical partners, including KMU-affiliated hospitals, long-term care centers, and clinics. These partnerships will provide observational placements, internships, and clinical site visits, enabling students to understand frontline challenges and propose targeted solutions.

Building on this foundation, the Academy will expand the "AIxVR Practical Teaching Manual" into a comprehensive "Nursing and Smart Talent Development Curriculum." Through structured integration of cross-departmental resources, the program will continue injecting technological innovation into healthcare environments and cultivate outstanding nursing professionals equipped with both clinical expertise and digital competencies.



# UNIVERSITY RESEARCH CENTER COLUMN

## 2025 KMU International Conference on BioMedicine: Parallel Session of Research Center for Precision Environmental Medicine - AI Application in Air Pollution and Health Promotion

University-Level Academic Research Center —  
Research Center for Precision Environmental Medicine (RCPEM)  
Author: Prof. Chih-Hsing Hung / CEO

During the “2025 KMU International Conference on BioMedicine” hosted by Kaohsiung Medical University, the Research Center for Precision Environmental Medicine, in collaboration with Kaohsiung Municipal Siaogang Hospital, co-organized a parallel session titled “Artificial Intelligence in Air Pollution and Health Promotion.” The session focused on leveraging artificial intelligence to analyze the impacts of air pollution on human health, while incorporating international insights to propose solution strategies and health promotion interventions, thereby contributing positively to public health.

From October 10 to 12, 2025, Kaohsiung Medical University (KMU) hosted the “2025 KMU International Conference on BioMedicine,” covering key themes including Precision Environmental Medicine, health policy, and University Social Responsibility (USR). The event highlighted the KMU’s achievements in advancing interdisciplinary integration and fostering international collaboration.

As part of the conference, RCPEM, in collaboration with KMSH, organized the parallel session entitled “AI Application in Air Pollution and Health Promotion.”, focusing on innovative applications of AI in air pollution and health-related issues. Distinguished speakers included Dr. Fujitani Yuji from the National Institute for Environmental Studies (Japan), Dr. Tzong-Shi Lu from Harvard University (USA), Prof. Chih-Da Wu from the Department of Geomatics at National Cheng Kung University, and Dr. Da-Wei Wu from the Division of Pulmonary and Critical Care Medicine at Siaogang Hospital. They shared the latest research advance and findings on the application of AI in air pollution exposure assessment, elucidation of disease mechanisms, and precision health care.

Simultaneously, participating scholars engaged in in-depth discussions on future directions, exploring strategies to establish more comprehensive air pollution-related health risk assessment models and early warning systems, with the aim of improving the prevention and management of related diseases. The session featured dynamic and productive exchanges, fostering interdisciplinary integration and knowledge sharing, while further expanding opportunities for both domestic and international collaboration. It also highlighted the RCPEM’s research capacity and global impact in the field of precision environmental medicine.



Special Lecture by Dr. Fujitani Yuji from the National Institute for Environmental Studies. (Japan)



Special Lecture by Dr. Tzong-Shi Lu from Harvard University. (USA)



Special Lecture by Dr. Da-Wei Wu at KMSH.



Special Lecture by Dr. Chih-Da Wu at National Cheng Kung University.



Q&A Session



Q&A Session



Group Photo of All Participants



Group Photo of Distinguished Guests

## Connecting Globally, Focusing on Innovation: The 2026 Taiwan Regenerative Medicine Summit Enhances the Visibility of Our University in Regenerative Medicine

University-Level Academic Research Center —  
Regenerative Medicine and Cell Therapy Research Center (RCC)

Author: R.A. Chun-Ya Kao / CEO Chung-Hwan Chen

Building upon the important international collaborations established in 2025, the Regenerative Medicine and Cell Therapy Research Center at Kaohsiung Medical University hosted the 2026 Taiwan Regenerative Medicine Summit on March 13, 2026. The summit brought together leading scholars from Taiwan and around the world, focusing on cutting-edge topics such as stem cell technologies, genetic engineering, and clinical applications. The event highlighted the University's strong research capabilities and achievements in international collaboration in the field of regenerative medicine.

Centered on the theme of "Advancing Clinical Translation and International Collaboration in Regenerative Medicine," the program covered a wide range of topics, including the application of induced pluripotent stem cells (iPSCs) in kidney diseases, the development of genetic engineering and nanodelivery systems for muscle regeneration, and regenerative therapeutic strategies for osteoarthritis and cardiovascular diseases. The agenda comprehensively demonstrated the integration from basic research to clinical application.

In terms of international collaboration, the summit featured five distinguished international experts, including scholars from Kyoto University's Center for iPS Cell Research and Application (CiRA), Japan, and Dongguk University, Korea. Their participation strengthened Taiwan's partnerships with leading global research institutions and further expanded international research collaboration and talent development networks.

In addition, a student poster competition was organized to provide young researchers with a platform to present their work and engage in academic exchange. This initiative fostered talent development and academic continuity, showcasing the University's commitment to sustainable growth in regenerative medicine.

Through interdisciplinary integration and international collaboration, this summit not only facilitated the exchange of key technologies and innovative applications in regenerative medicine, but also promoted the translation of research findings into clinical practice. Ultimately, it contributes to accelerating the development of Taiwan's regenerative medicine industry while enhancing the University's global visibility and impact in the biomedical field.



Group Photo of Invited Domestic and International Speakers and Distinguished Guests



Group Photo of Invited Domestic and International Speakers and Attending Guests at the Luncheon Forum



Group Photo of Invited Domestic and International Speakers and Distinguished Guests



Live Session of the Lecture



Experts and Scholars Engaging in In-Depth Discussions on Key Topics



Experts and Scholars Engaging in In-Depth Discussions on Key Topics

## Other Important Highlights:

### 1. Collaboration with Kaohsiung American School (KAS) to Promote the “KAS Future Leaders Program”

To advance education outreach and academic exchange in the biomedical field, the Center has partnered with Kaohsiung American School (KAS) to implement the “KAS Future Leaders Program.” Through winter and summer internship programs, the initiative aims to enhance high school students’ understanding of regenerative medicine and cell therapy, while cultivating future talent in the biomedical field. In addition, Professor Yin-Chih Fu has been invited for two consecutive years to deliver talks at KAS. On March 27, 2026, he visited the school to share his career development experiences with students, delivering an inspiring and insightful lecture.



Professor Yin-Chih Fu Posing for a Group Photo with School Administrators During His Lecture at Kaohsiung American School.



Professor Yin-Chih Fu Delivering a Lecture at Kaohsiung American School

### 2. Professor Yen-Hsiung Wang Led Students from Niigata University, Kagoshima University, and Tohoku University (Japan) for Laboratory Observation and Internship

Professor Yan-Hsiung Wang led a group of students from Niigata University, Kagoshima University, and Tohoku University to visit Kaohsiung Medical University’s School of Dentistry for a one-week academic exchange and laboratory internship. During their visit to our laboratory, the students were introduced to the establishment and development of the Orthopaedic Research Center, as well as Professor Wang’s previous research work. They also participated in hands-on experiments involving stem cell osteogenic differentiation. As the students had limited prior experience in molecular biology experiments, the program provided them with valuable hands-on learning opportunities. They expressed that the experience was highly rewarding, rare, and deeply enjoyable.



Prof. Yan-Hsiung Wang with Students from Niigata University in the Laboratory



Prof. Yan-Hsiung Wang with Students from Kagoshima University and Tohoku University in the Laboratory

## Rethinking Diabetic Nephropathy: More Than High Blood Sugar, It Is Also an Immune-Inflammatory Disease

University-Level Academic Research Center —  
Drug Development and Value Creation Research Center (DVCR)

Author: Dist. Prof. Ya-Ling Hsu / CEO Chih-Hung Chuang

Diabetic nephropathy is one of the most common and serious chronic complications of diabetes. It has long been viewed mainly as a consequence of persistent hyperglycemia causing damage to the glomeruli and renal tubules. However, our research suggests that immune dysregulation and chronic inflammation are already involved at an early stage and continue to drive disease progression. By integrating single-cell RNA sequencing, diabetic mouse models, and clinical data from patients with type 2 diabetes, we found that the diabetic kidney shows marked immune cell infiltration early in the disease course. Among these cells, pro-inflammatory CCL4<sup>+</sup> myeloid-derived suppressor cells (MDSCs) were particularly prominent and were associated with increased expression of inflammatory molecules such as S100A9. In parallel, KYNU was significantly upregulated in proximal tubular cells, indicating that the kynurenine pathway also contributes to disease progression. These findings show that diabetic nephropathy is not simply a consequence of poor glucose control, but a complex disorder involving immune activation, metabolic disturbance, and microenvironmental remodeling. This new understanding may open the way to earlier diagnosis and more precise treatment strategies.

Diabetic nephropathy (DN) is one of the most common and serious complications of diabetes. It has traditionally been viewed mainly as a consequence of long-term hyperglycemia damaging the glomeruli and renal tubules. However, new evidence suggests that immune dysregulation and chronic inflammation are already deeply involved at the early stage of disease and continue to drive progression over time.

Our research team integrated single-cell RNA sequencing, diabetic mouse models, and clinical data from patients with type 2 diabetes (T2D) to map the dynamic immune-inflammatory landscape of DN from early to late stages. One of the key findings was that immune cell infiltration appears very early in the diabetic kidney. Among the infiltrating cells, CCL4<sup>+</sup> myeloid-derived suppressor cells (MDSCs) emerged as the predominant population. These cells showed a strongly pro-inflammatory profile, with high expression of molecules such as S100A9, CXCL2, CXCL3, CCL3, and CCL4, suggesting that they are active drivers of disease rather than passive bystanders.

Our study further identified S100A9 as a particularly important molecule in these CCL4<sup>+</sup> MDSCs. Because its expression increased early in diabetic mouse models, S100A9 may serve as a promising early molecular indicator of DN. The long non-coding RNA MALAT1 was also broadly expressed in MDSCs and appeared to help maintain their functional state, potentially sustaining inflammatory activity in the diabetic kidney.

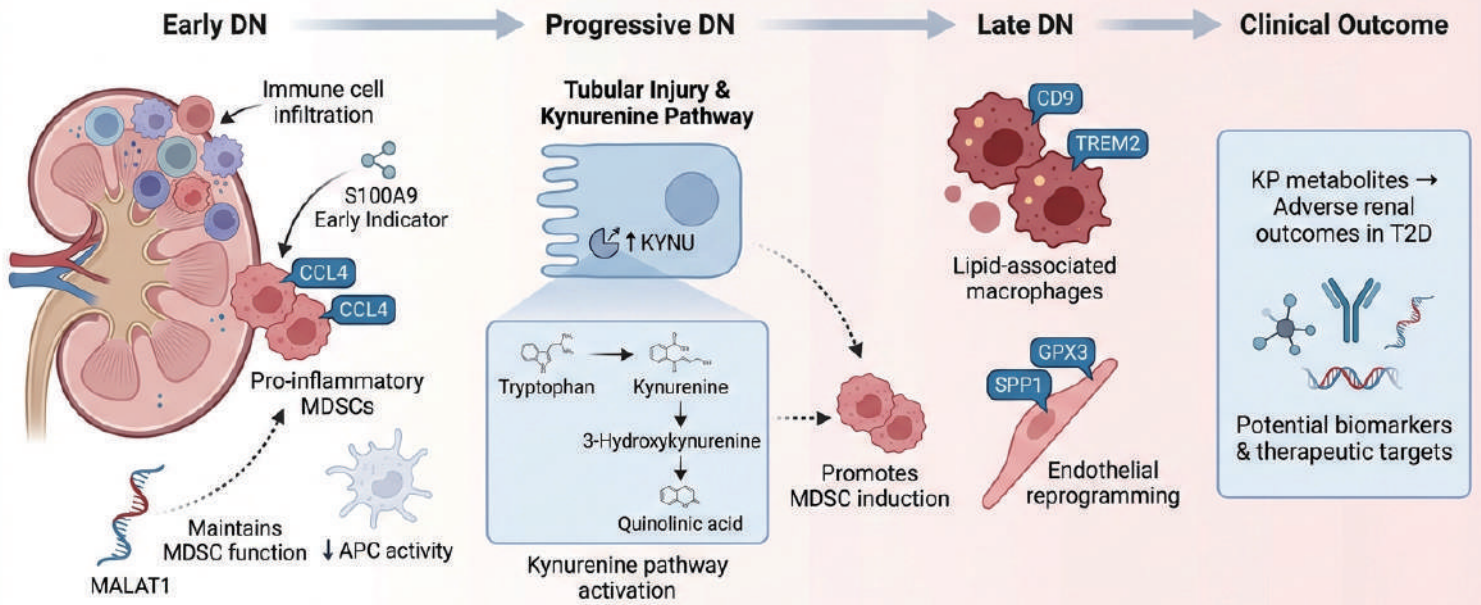
In parallel, we also found metabolic alterations in kidney tubular cells. In proximal tubule cells, KYNU was markedly upregulated and was identified as an early marker of tubular injury. KYNU is a key enzyme in the kynurenine pathway (KP). Importantly, KP metabolites such as kynurenine, 3-hydroxykynurenine (3-HK), and quinolinic acid (QA) were shown to enhance MDSC induction in mice and were also associated with adverse renal outcomes in patients with T2D.

At later stages of DN, macrophages in the kidney displayed increased expression of CD9 and TREM2, indicating the presence of lipid-associated macrophages. This suggests that, as DN progresses, immune dysregulation becomes increasingly intertwined with abnormal lipid metabolism. In addition, endothelial cells underwent reprogramming characterized by GPX3 and SPP1, showing that the renal vascular microenvironment is also remodeled during disease progression.

Importantly, these findings were not limited to animal models. The study also reported that patients with type 2 diabetes had elevated circulating MDSCs compared with healthy individuals, supporting the clinical relevance of these immune changes. Taken together, this work highlights a major shift in our understanding of DN: it is not simply a metabolic kidney disorder caused by high blood sugar, but a dynamic disease involving immune-cell infiltration, inflammatory signaling, metabolic rewiring, and tissue microenvironment remodeling from the earliest stages onward.

Our study suggests that future strategies for the early detection and treatment of diabetic nephropathy may need to look beyond glucose control and proteinuria, and instead pay closer attention to emerging markers such as MDSCs, MALAT1, KYNU, and the kynurenine pathway.

(This article was published in 2026 in the *International Journal of Biological Sciences* (Int J Biol Sci. 2026 Jan 8;22(3):1389–1406), an SCI-indexed international journal with a reported Journal Impact Factor of 10.0).



Dynamic immune-inflammatory changes in diabetic nephropathy. Early diabetic nephropathy is characterized by marked immune-cell infiltration, particularly CCL4<sup>+</sup> MDSCs, together with increased S100A9, MALAT1, and KYNU expression. In late-stage disease, CD9<sup>+</sup>/TREM2<sup>+</sup> lipid-associated macrophages and GPX3/SPP1 endothelial reprogramming become prominent. These progressive immune and metabolic alterations are closely associated with worsening renal outcomes.

## Other Important Highlights:

- On March 27, 2026, the Center hosted a keynote lecture by Academician Jaung-Geng Lin, titled “My Philosophy of Life: Identifying and Solving Problems.” As the first Academician of Academia Sinica from the field of Traditional Chinese Medicine (TCM), Academician Lin has also been invited to speak at UNESCO. His medical achievements and life wisdom are recognized and esteemed globally.



An inspiring keynote lecture by Academician Jaung-Geng Lin.



Interactive Q&A Session



Dean of Industry-Academia Collaboration Fang-Rong Chang (left) presents a souvenir to Academician Jaung-Geng Lin (right) following his inspiring keynote speech.

## A New CA19-9 Cut-Off Value Identifies Lewis Antigen Status and Refines Prognostic Stratification in PDAC

University-Level Academic Research Center —  
Center for Cancer Research (CCR)

Author: Yung-Yeh Su Assistant Research Fellow, Asst. Prof. Jeng-Shiun Du,  
Prof. Shih-Chang Chuang / CEO Li-Tzong Chen

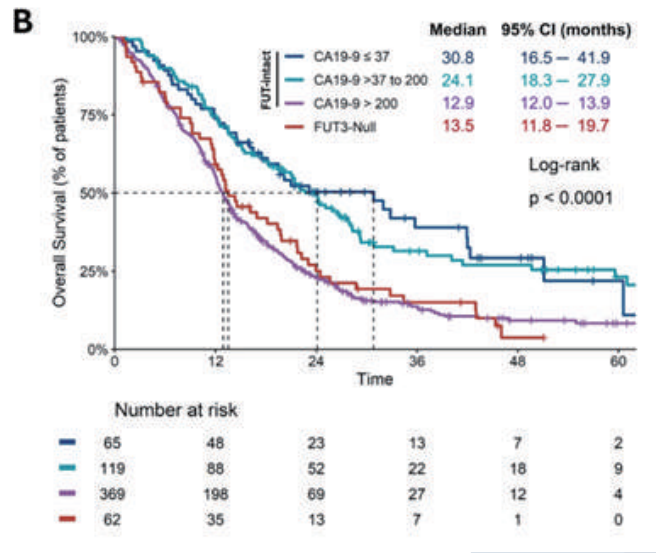
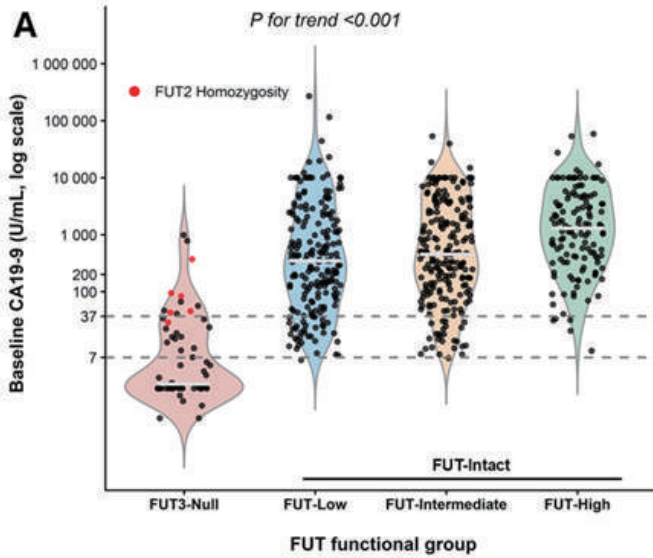
Lewis antigen-negative「Le(a-b-)」 pancreatic cancer patients are generally with low serum level of CA 19-9, a prognostic and treatment-decision reference tumor marker, that may lead to inappropriate prognostic grouping and management plan. Current study provides a simple and cost-effective method, CA 19-9 < 7 U/mL, to identify a subgroup of high-risk, Lewis antigen-negative patients whose clinical outcome was similar to those patients with CA 19-9 >200 U/mL and inferior to those with CA 19-9 between 7 and 200 U/mL. This dual-threshold model may improve risk stratification and management planning for pancreatic cancer patients with CA 19-9 non-producer phenotype.

### Background Information

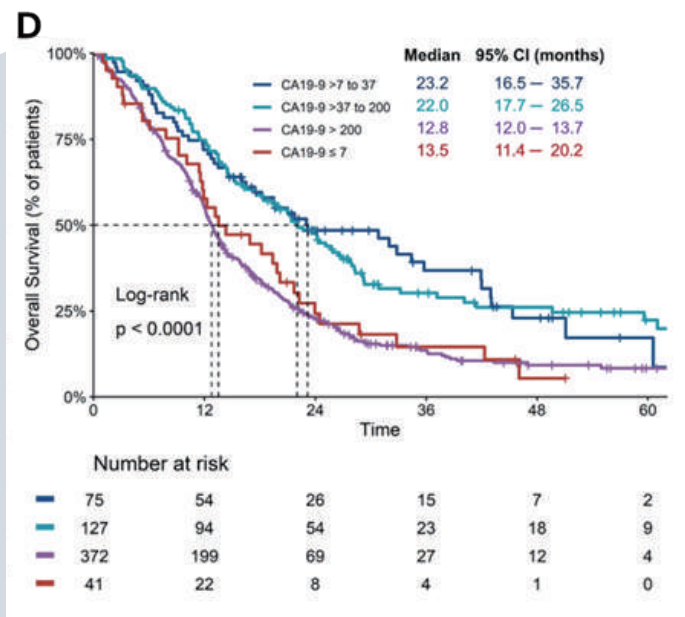
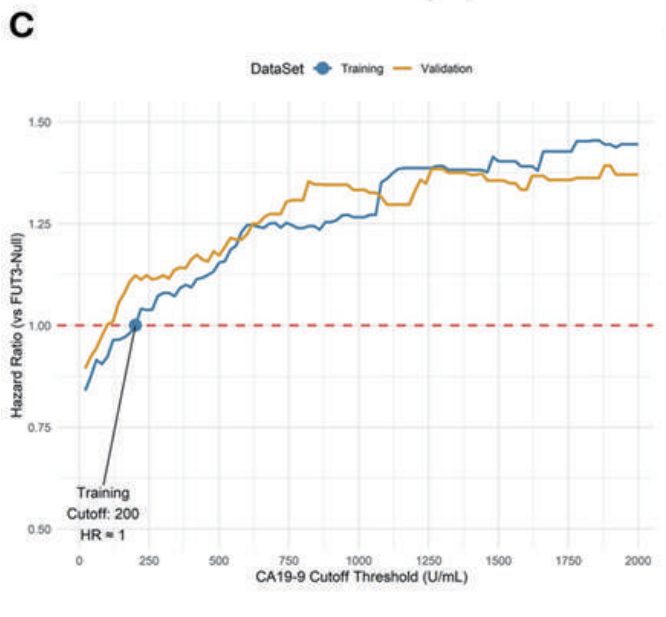
Lewis antigens are components of a blood group system and belong to the category of soluble tissue antigens. They are synthesized in secretory glands and the liver by fucosyltransferases encoded by FUT3 (Le gene) and FUT2 (Se gene), and passively adsorbed onto the red blood cell membrane after being secreted in plasma. According to the pattern of antigen presentations, they can be divided into three phenotypes: Le(a+b-), Le(a-b+), and Le(a-b-). Some of the tumor-associated antigens that are highly expressed on the cell membranes of various epithelial cancers (such as pancreatic cancer, gastric cancer, colorectal cancer, and prostate cancer), are Lewis blood group antigens with altered glycosylation structures. The most well-known glycosylated tumor antigen is sialylated Lewis-a antigen (sialyl Lewis-a / sLea, CA 19-9), which is an important marker for the diagnosis, monitoring, and prognosis of pancreatic cancer. Approximately 10% of individuals exhibit the Le(a-b-) phenotype, due to loss of FUT3 activity secondary to the presence of homogeneous loss-of-function recessive alleles, FUT3 le/le). These individuals are usually conceived to be CA 19-9 non-producers. The applicability of serum CA 19-9 in monitoring pancreatic cancer patients with the Le(a-b-) phenotype is frequently questioned. Interestingly, not all pancreatic cancer patients with germline FUT3 le/le genotype have low, either below normal range (<37 U/mL) or undetectable, serum CA19-9 levels. Coupled with the lack of routine accessibility of FUT3 genotyping, some recent studies have attempted to define CA 19-9 non-producers with arbitrarily determined CA 19-9 thresholds, such as <2-5 U/mL, and excluded them from clinical trials involving preoperative chemotherapy followed by surgical resection.

# Methods and Results

This study used whole exome sequencing to determine the germline FUT2/FUT3 genotype with FUT3 le/le genotype determined according to known function-losing single nucleotide polymorphism (SNP) variations in literature. A total of 615 pancreatic cancer patients were included in the study, 62 (10.1%) had the FUT3 le/le genotype (FUT3-null phenotype) whose median serum CA19-9 level was significantly lower than those of patients with FUT-intact (low, intermediate and high) phenotypes (Figure A). Comparing to patients with FUT-intact phenotypes, the clinical outcomes of FUT3-null individuals was similar to that of patients with CA 19-9 >200 IU/mL, but inferior to those with CA 19-9 37-200 U/mL and CA 19-9 < 37 U/mL. The median overall survival in corresponding subgroup of patients was 13.5 (95% CI, 11.8-19.7), 12.9 (12.0-13.9), 24.1 (18.3-27.9), and 30.8 (16.5-41.9) months, respectively (Figure B).



Since only 51 out of 62 (70.3%) patients with FUT3-null phenotype had serum CA19-9 levels below the normal range (<37 U/mL) (Figure A), we further used ROC curves (Receiver Operating Characteristic curves) to select the optimal signal detection model and found that 7 U/mL was the most optimal threshold to distinguish between FUT3-null and FUT-intact patients (Figure C) or to define CA 19-9 non-producers. If only serum CA 19-9 levels are considered for grouping, the overall survival of the CA 19-9 < 7 U/mL subgroup was similar to that of CA 19-9 > 200 IU/mL subgroup, but inferior to those of CA 19-9 37-200 IU/mL and CA 19-9 < 37 IU/mL subgroups. The median overall survival of corresponding subgroups was 13.5 (95% CI, 11.4-20.2), 12.8 (12.0-13.7), 22.0 (17.7-26.5), and 23.2 (16.5-35.7) months, respectively (Figure D).



# Conclusion

Our data supported that serum level of CA 19-9 is an important prognostic factor for pancreatic cancer, and proposed <7 U/mL as an optimal threshold to identify a group of CA 19-9 non-producers with poor clinical prognosis. It provides a "dual-threshold model" for clinicians to properly categorize CA19-9 non-producer (serum level ≤ 7 U/mL) pancreatic cancer patients into high-risk subgroup as those with >200 U/mL for treatment planning.

## Partnering with Waseda University to Strengthen International Collaboration in Sports Science

### University-Level Academic Research Center — Precision Sports Medicine and Health Promotion Center (PSMHPC)

Author: R.A. Chan-Chih Hsu / CEO Lan-Yuan Kuo

The Department of Sports Medicine at Kaohsiung Medical University, in collaboration with the Precision Sports Medicine and Health Promotion Center, formally signed a Memorandum of Understanding (MoU) with the Faculty of Sport Sciences at Waseda University, Japan, on February 2, 2025, establishing an international academic partnership.

Through this collaboration, both institutions will integrate their strengths in sports science, clinical medicine, and health promotion to advance international research, talent cultivation, and the development of long-term databases. The partnership also aims to expand the application of sports medicine across different generations and populations, thereby enhancing the University's global visibility and research capacity.

The Department of Sports Medicine at Kaohsiung Medical University, in collaboration with the Precision Sports Medicine and Health Promotion Center, officially signed a Memorandum of Understanding (MoU) with the Faculty of Sport Sciences at Waseda University, Japan, on February 2, 2025, at KMU. This agreement establishes a long-term academic partnership and marks the beginning of international collaboration in the fields of sports medicine and health promotion.

Waseda University holds a leading international position in sports science and has long conducted large-scale cohort research on exercise and health, including WASEDA's Health Study, which has generated extensive findings on physical activity, lifestyle, and chronic diseases. Leveraging interdisciplinary resources from KMU's Colleges of Health Sciences, Nursing, and Medicine, as well as its affiliated hospital, the Center is dedicated to developing an exercise-based precision health promotion model. This aligns closely with Waseda University's long-standing research experience.

Future collaboration will focus on the application of sports science across different generations and populations, including younger individuals, older adults, athletes, and the general public. The partnership will explore the effects of exercise on enhancing physical performance and preventing non-communicable diseases, while advancing the development of precision exercise intervention strategies grounded in scientific research.

This collaboration not only strengthens KMU's international connections in sports medicine but also leverages the platform capacity of the Precision Sports Medicine and Health Promotion Center. It lays a solid foundation for future international research collaboration, talent development, and the establishment of exercise-based health databases, further enhancing KMU's overall capacity in precision sports medicine and health promotion.



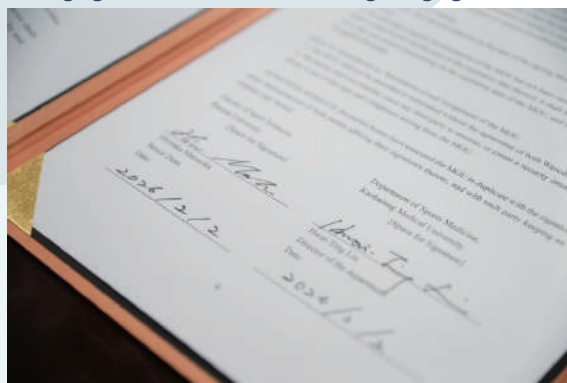
Professor Huai-Ting Lin and Dean Hiroataka Matsuoka of the Faculty of Sport Sciences at Waseda University took the stage to sign a Memorandum of Understanding (MoU) on behalf of their respective institutions.



Assistant Professor Yong-Feng Hung of the Department of Sports Medicine at Kaohsiung Medical University, also an alumnus of Waseda University, delivered a lecture titled "The Anti-Aging Effects of Resistance Training on Aging Skeletal Muscle."



Group photo of the Department of Sports Medicine members with Waseda University.



Both parties formally signed a Memorandum of Understanding (MOU) to establish a partnership with Waseda University.

## Early Screening for MASLD: Transforming Fatty Liver Disease Into the Starting Point of Preventive Health Management

University-Level Academic Research Center —  
Center for Metabolic Disorders and Obesity (CMDO)

Author: Postdoc. Edward His / Deputy CEO Jee-Fu Huang

Metabolic dysfunction-associated steatotic liver disease (MASLD) has emerged as one of the most common chronic liver diseases worldwide. Importantly, its clinical significance extends far beyond the liver. MASLD is increasingly recognized as a key component of the cardiovascular-kidney-liver-metabolic syndrome (CKLM) spectrum and is closely linked to the future development of diabetes, cardiovascular disease, chronic kidney disease, and other major non-communicable diseases.

As our understanding of MASLD epidemiology and disease burden continues to evolve, the clinical and public health focus has shifted from simply recognizing disease prevalence to developing effective strategies for early detection and intervention. One of the major challenges today is that many individuals with fatty liver disease remain unidentified or insufficiently managed. In routine health examinations, patients are often informed that they have fatty liver disease but receive little guidance regarding follow-up evaluation or long-term risk management. Because MASLD is frequently asymptomatic during its early stages, opportunities for timely intervention are often missed. For this reason, establishing structured screening pathways and risk stratification systems has become a critical priority in modern MASLD management.

### Identifying High-Risk Populations

MASLD frequently develops before patients meet the traditional diagnostic criteria for chronic metabolic diseases. Hepatic steatosis and metabolic dysfunction may already be present even when blood glucose, blood pressure, or lipid levels remain within near-normal ranges.

Therefore, restricting screening only to patients with established diabetes or cardiovascular disease may overlook a large proportion of individuals at an earlier and potentially reversible stage.

In clinical practice, several commonly available indicators are able to identify individuals at increased risk for MASLD:

- Overweight or central obesity (BMI  $\geq 23$  kg/m<sup>2</sup>; waist circumference  $> 90$  cm in men and  $> 80$  cm in women)
- Abnormal glucose metabolism (fasting glucose  $\geq 100$  mg/dL or HbA1c  $\geq 5.7\%$ )
- Hypertriglyceridemia (triglycerides  $\geq 150$  mg/dL)
- Elevated blood pressure (systolic  $\geq 130$  mmHg or diastolic  $\geq 85$  mmHg)
- Sedentary lifestyle and insufficient physical activity (less than 150 minutes of moderate-intensity exercise per week)

These parameters are readily obtainable through routine health examinations and provide a practical framework for population-level risk assessment. The coexistence of multiple metabolic risk factors often reflects underlying insulin resistance and systemic metabolic dysfunction, both of which strongly increase the likelihood of MASLD.

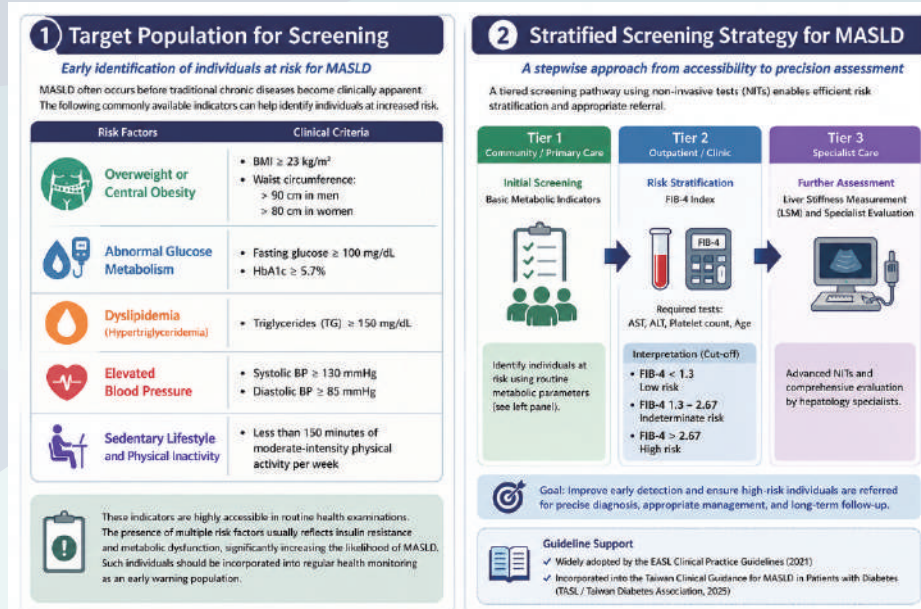
Accordingly, individuals with these risk profiles should be incorporated into regular metabolic health surveillance programs.

### Non-Invasive Screening and Risk Stratification

Effective MASLD screening requires a balance between accessibility, scalability, and diagnostic accuracy. In recent years, stepwise screening strategies based on non-invasive tests (NITs) have become increasingly adopted in both clinical practice and public health settings.

Abdominal ultrasonography remains the most widely used first-line tool for detecting hepatic steatosis. However, identifying steatosis alone is not sufficient. The key clinical question is whether the disease has progressed to advanced fibrosis or cirrhosis, which are strongly associated with long-term liver-related and systemic complications.

This has led to the development of tiered risk stratification approaches using different assessment tools according to clinical setting and resource availability.



## Stratified Screening Approaches: From Accessible Tools to Precision Assessment

Different screening tools serve distinct roles across the healthcare system. At the specialist level, advanced integrated models such as Agile-3+ and Agile-4 combine liver stiffness measurement (LSM) with multiple clinical variables to improve prediction of advanced fibrosis and cirrhosis. These models were validated in the international G-MASLD study published in *Hepatology* (2025), which analyzed data from 17,792 biopsy-confirmed patients across 41 countries.

The study demonstrated that integrated models significantly outperformed single-parameter assessments for identifying  $\geq$ F3 fibrosis and F4 cirrhosis. It also highlighted important ethnic and regional differences in diagnostic performance, with the Kaohsiung Medical University (KMU) team contributing critical validation data from Asian populations.

Although highly accurate, these tools require specialized equipment and are therefore more suitable for specialist referral centers rather than large-scale population screening.

In routine practice, the FIB-4 index remains one of the most practical and widely used intermediate-risk assessment tools. Because it relies only on AST, ALT, age, and platelet count, it offers good feasibility and cost-effectiveness for everyday clinical use.

## Standardized Referral Pathways

By integrating multiple screening tools into a stepwise framework, a structured referral pathway can be established:

- First tier (community and primary care): Initial screening using basic metabolic indicators
- Second tier (outpatient evaluation): Risk stratification using FIB-4 thresholds (1.3 and 2.67)
- Third tier (specialist referral): Liver stiffness measurement and further hepatology assessment

This “two-step” approach has been widely endorsed by international guidelines, including the EASL Clinical Practice Guidelines (2021), and has also been incorporated into the Taiwan Clinical Guidance for MASLD in Patients with Diabetes (2025), developed with participation from the KMU team.

The goal of this framework is not only to improve early detection, but also to ensure that high-risk patients are appropriately referred for specialist evaluation and long-term monitoring.

## MASLD as a Systemic CKLM Risk Indicator

Within the CKLM framework, MASLD should be regarded as a marker of systemic metabolic risk rather than an isolated liver disorder.

Research from the KMU team demonstrated a significant association between higher FIB-4 scores and coronary artery calcification (CAC), even among asymptomatic individuals (*Journal of Gastroenterology and Hepatology*, 2026). These findings suggest that FIB-4 may reflect both liver fibrosis severity and underlying cardiovascular risk. Importantly, this supports the concept that MASLD may serve as an early clinical entry point for identifying patients at elevated CKLM risk.

This evolving cross-organ perspective reflects a major shift in MASLD management—from single-organ diagnosis toward integrated metabolic risk assessment.

## Smart Screening and Nationwide Implementation

To improve early detection and long-term management of MASLD, academic institutions, healthcare systems, and industry partners in Taiwan have jointly launched a nationwide smart screening initiative.

In November last year, the Taiwan Liver Research Association, Kaohsiung Medical University, National Sun Yat-sen University, Novo Nordisk Taiwan, and Taiwan Biomedical Big Data Co. signed a memorandum of understanding (MOU) to establish the “Smart Screening Program for Risk Stratification and Management of Metabolic Fatty Liver Disease and Obesity.”

The program integrates:

- Non-invasive screening technologies
- Big data analytics
- Clinical decision support systems (CDSS)
- Personalized health management strategies

Initial implementation began this April at Kaohsiung Medical University Hospital as a pilot demonstration site. Over the next three years, the program is expected to expand to 25 hospitals and primary care systems across Taiwan, forming a nationwide MASLD prevention and management network.

This initiative reflects an important transition in MASLD care—from passive diagnosis toward proactive identification, risk stratification, and precision prevention.

## Conclusion

MASLD is frequently asymptomatic, yet it already reflects underlying systemic metabolic dysfunction. Its greatest clinical and public health value lies in its role as an early warning signal for future chronic disease risk. Accordingly, two priorities should be emphasized:

- Expanding routine metabolic health screening
- Establishing structured follow-up and risk stratification systems

MASLD should not be viewed simply as a radiologic or laboratory finding. Instead, it should be recognized as the starting point for preventive metabolic health management. Through the integration of disease burden analysis, non-invasive stratification tools, and smart screening systems, MASLD has the potential to become a central entry point for chronic disease prevention and precision public health.



# QUARTERLY IMPORTANT EVENTS

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# QUARTERLY IMPORTANT EVENTS

## KMU AI seminar

### The Innovative Journey of Quanta Smart Healthcare

Mike Huang (Director of Sales, 12th Business Division, Quanta Computer)

Organizer: Biomedical Artificial Intelligence Academy (BAIA)

Co-Organizer:

Department of Artificial Intelligence in Medicine, Post Baccalaureate Medicine, Kaohsiung Medical University  
Medical AI Innovation and Application Center, Kaohsiung Medical University Chung-Ho Memorial Hospital

Date /Time

2026/01/14  
12:10~13:20

Venue

IR630 Conference Room, 6F,  
International Academic Research Building, KMU

Abstract:

Since entering the healthcare industry in 2010, Quanta has established the QOCA brand, dedicated to smart healthcare solutions. Through three major innovations and technological breakthroughs, Quanta has gradually grown from its initial exploratory stage into a global leader in intelligent healthcare. The company continues to leverage innovative technologies to enhance the quality of medical services and to build a smarter, more human-centered healthcare ecosystem.

高醫AI餐桌：對話智慧醫學未來  
KMU AI Table: Conversations on the Future of Smart Medicine

## 廣達智慧醫療的 創新之路

**現職：**  
廣達電腦第十二事業部業務處長

**學歷：**  
國立政治大學 經營管理碩士

**研究領域：**  
智慧醫療系統、遠距醫療、遠距照護、智慧病房管理、病患風險預測

**廣達電腦  
黃喜業務處長**

2026/01/14(三) 12:10-13:20  
高醫大國研六樓IR630會議室

高醫大人工智慧生醫研究院      高醫人工智慧創新應用中心



# QUARTERLY IMPORTANT EVENTS

## KMU AI seminar

### Using Multimodalities Machine Learning to Predict the Prognosis of Brain Injury Patients

Ming-Chin Lin (Vice Superintendent, Taipei Medical University Wan-Fang Hospital)

Organizer: Biomedical Artificial Intelligence Academy (BAIA)

Co-Organizer:

Department of Artificial Intelligence in Medicine, Post Baccalaureate Medicine, Kaohsiung Medical University  
Medical AI Innovation and Application Center, Kaohsiung Medical University Chung-Ho Memorial Hospital

Date /Time

2026/01/21  
12:10~13:20

Venue

IR630 Conference Room, 6F,  
International Academic Research Building, KMU

Abstract:

This study, led by Dr. Ming-Chin Lin from Wan Fang Hospital, Taipei Medical University, aims to predict the prognosis of patients with brain injury using multimodal machine learning techniques. Traditionally, the assessment of consciousness in patients with brain injury has relied primarily on clinical scales such as the Glasgow Coma Scale (GCS). However, these methods have notable limitations and are often insufficient for accurately predicting whether patients will regain consciousness, the extent of recovery, or the time required for recovery.

To address these challenges, the research team developed the Brain Response Clinical Decision Support System (BRes-CDSS), which integrates Internet of Things (IoT) and artificial intelligence technologies to analyze brain activity through task-based electroencephalography (EEG). The system employs connectivity metrics such as the weighted Phase Lag Index (wPLI) and weighted Symbolic Mutual Information (wSMI) to evaluate functional connectivity between different brain regions, thereby distinguishing between conscious and unconscious states.

To date, more than 800 patients have been enrolled across multiple medical centers, including Shuang Ho Hospital, Wan Fang Hospital, National Taiwan University Hospital, and Hualien Tzu Chi Hospital. The results demonstrate that a multimodal model incorporating age, GCS, and EEG connectivity features achieves an area under the curve (AUC) of up to 0.84 in predicting six-month outcomes. In addition, the team has developed a wearable Bluetooth EEG device, advancing toward real-time clinical monitoring applications. Overall, this research provides an objective and quantitative auxiliary tool for neurological prognosis assessment in patients with brain injury.

高醫AI餐桌：對話智慧醫學未來  
KMU AI Table: Conversations on the Future of Smart Medicine

### 使用多模態機器學習 預測腦損傷患者的預後

現職：  
世界醫學資訊學會 副總裁  
台灣醫學資訊學會 理事長  
臺北市立萬芳醫院 專案副院長  
臺北市立萬芳醫院 數位創新中心主任  
臺北市立萬芳醫院神經外科 專任主治醫師  
衛生福利部雙和醫院 神經外科 兼任主治醫師  
臺北醫學大學 醫學資訊研究所 副教授

研究領域：  
脊椎微創手術、脊椎機器人手術、腕隧道症候群、加馬刀立體定位放射線手術、頭部外傷、出血性腦中風

2026/01/21(三) 12:10-13:20  
高醫大國研六樓IR630會議室

高醫大人工智慧生醫研究院      高醫人工智慧創新應用中心



# QUARTERLY IMPORTANT EVENTS

## KMU AI seminar

### The development of clinical AI cycle from signal discovery to pragmatic trials and real-world deployment

Chin Lin (Associate Professor, School of Medicine, National Defense Medical University)

Organizer: Biomedical Artificial Intelligence Academy (BAIA)

Co-Organizer:

Department of Artificial Intelligence in Medicine, Post Baccalaureate Medicine, Kaohsiung Medical University  
Medical AI Innovation and Application Center, Kaohsiung Medical University Chung-Ho Memorial Hospital

Date /Time

2026/01/29  
12:10~13:20

Venue

IR630 Conference Room, 6F,  
International Academic Research Building, KMU

Abstract:

The AI models developed by the team for electronic medical records have been integrated into the hospital information system (HIS), enabling real-time high-risk alerts and clinical interventions through SMS notifications and internal hospital systems. These applications cover more than 50 phenotypes, including hyperkalemia detection, sudden cardiac death risk, rapid STEMI identification, reduced ejection fraction, atrial fibrillation, and others. Multiple models have completed or are currently undergoing multicenter randomized controlled trials (RCTs) to validate their impact on improving clinical outcomes.

The team has also extended AI-ECG and AI-CXR applications to community and rural settings and launched home-care programs that integrate wearable ECG monitoring for patients with end-stage renal disease and heart failure. In addition, AI-CXR has been applied in the OPSCAN program for osteoporosis screening, successfully identifying large numbers of high-risk individuals for dual-energy X-ray absorptiometry (DXA) examinations.



高醫AI餐桌：對話智慧醫學未來  
KMU AI Table: Conversations on the Future of Smart Medicine

**THE DEVELOPMENT OF CLINICAL AI CYCLE-FROM SIGNAL DISCOVERY TO PRAGMATIC TRIALS AND REAL-WORLD DEPLOYMENT**



國防醫學大學  
醫學院醫學系  
林崧副教授

現職：  
三軍總醫院 數位醫療中心 人工智慧  
核心實驗室 主任  
國防醫學大學 醫學院醫學系 副教授  
國防醫學大學 醫學科技教育中心 副  
主任  
國防醫學大學 公共衛生研究所 兼任  
助理教授

研究領域：  
深度學習、時間序列分析、  
電腦視覺、自然語言處理、  
電腦輔助醫療系統與技術

2026/01/29(四) 12:10-13:20  
高醫大國研六樓IR630會議室

高醫大人工智慧生醫研究院      高醫人工智慧創新應用中心



# QUARTERLY IMPORTANT EVENTS

## Special Lecture

### From Interoperability to Intelligence: The Next Frontier in Smart HealthCare

Yang C. Fann (Director, NIH AI Task Force and Health AI Committee,  
Office of Intramural Research)

Organizer: Biomedical Artificial Intelligence Academy (BAIA)

Date /Time

2026/02/11  
12:10~13:20

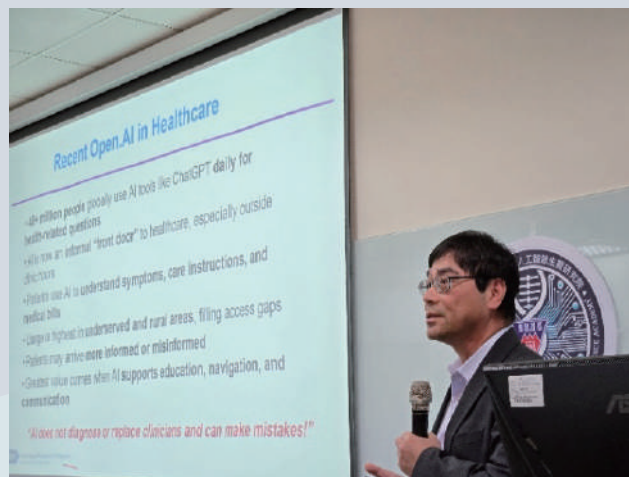
Venue

IR630 Conference Room, 6F,  
International Academic Research Building, KMU

#### Abstract:

As healthcare systems become increasingly interconnected, the focus is shifting from data sharing toward transforming interoperable data into actionable intelligence that supports clinical decisions and improves patient outcomes. This presentation examines how large language models and recent advances in artificial intelligence (AI) can enable more proactive, integrative, and personalized care beyond traditional interoperability.

Using practical and scalable examples from the United States, the talk highlights how AI built on interoperable systems can assist clinicians with early risk identification, precision diagnosis, improved care coordination, and decision support while reducing administrative burden. The presentation also introduces the vision of TDHI, a new research institute dedicated to advancing intelligence-driven healthcare through global collaboration, secure data platforms, and responsible AI development.



# QUARTERLY IMPORTANT EVENTS

## Special Lecture

### From Clinical Data to Knowledge: Building a Semantic Foundation for Healthcare Interoperability

Stanley Huff (Clinical Professor, Department of Biomedical Informatics, University of Utah)

Organizer: Biomedical Artificial Intelligence Academy (BAIA)

Date /Time

2026/03/24  
12:10~13:20

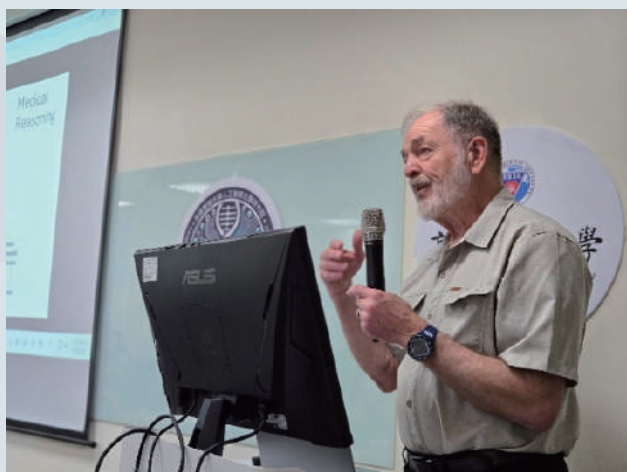
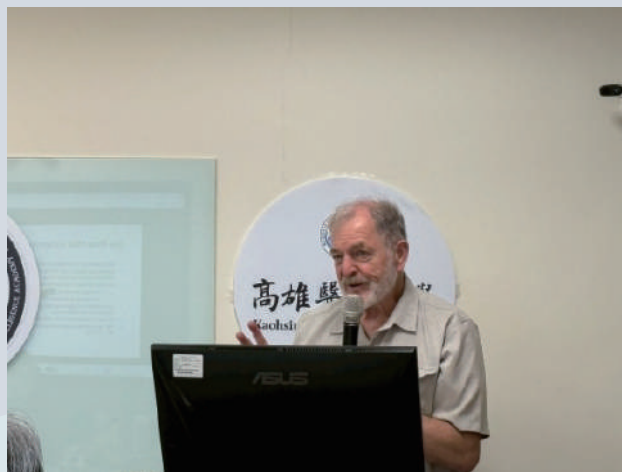
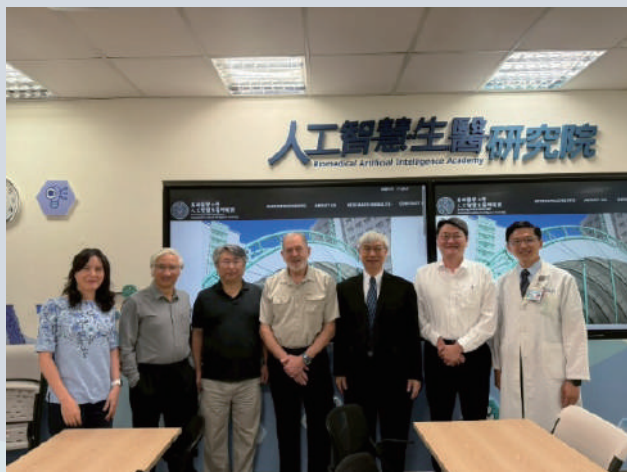
Venue

IR630 Conference Room, 6F,  
International Academic Research Building, KMU

#### Abstract:

“Meaningful healthcare interoperability does not begin with exchange standards, but with a coherent and well-defined semantic architecture.”

In this lecture, Prof. Huff will draw on more than three decades of experience at Intermountain Healthcare to share how a clinically driven, standards-based data architecture can be built from the ground up. He will explain why such an architecture is essential for transforming raw healthcare data into actionable clinical knowledge. The talk will also invite participants to reflect on Taiwan’s current challenges, including fragmented medical terminologies and inconsistencies in Common Data Elements (CDEs), setting the stage for subsequent topics in this lecture series.



# QUARTERLY IMPORTANT EVENTS

## Special Lecture

### Multi-Scale Fibroblast Plasticity and Reprogramming in Tissue Regeneration

Dr. Hans I-Chen Harn

Organizer: Precision Sports Medicine and Health Promotion Center (PSMHPC)

Co-Organizer: Department of Sports Medicine, Kaohsiung Medical University

Date /Time

2026/01/05  
13:00~14:00

Venue

IR458·IR459, 4F,  
International Academic Research Building, KMU

#### Abstract:

To promote international academic exchange and broaden the research perspectives of faculty and students, Kaohsiung Medical University recently hosted a special academic lecture. Dr. Hans I-Chen Harn, Assistant Professor in the Department of Pathology at the University of Southern California (USC), was invited to share his research findings and experiences in overseas academic development, attracting enthusiastic participation from faculty members and students. The lecture was structured into two main sessions. In Session 1, Dr. Harn delivered a talk titled

“Multi-Scale Fibroblast Plasticity and Reprogramming in Tissue Regeneration,” in which he provided an in-depth exploration of the roles and regulatory mechanisms of fibroblasts in tissue repair and regeneration. Adopting a multi-scale research perspective, he elucidated the critical functions of cellular plasticity in regenerative processes and shared his latest research findings, offering attendees new insights into the field of regenerative medicine.

Session 2 featured a round table discussion titled “From KMU to USC: Things I Wish I Knew.” Drawing from his own academic journey, Dr. Harn shared valuable experiences and reflections on transitioning from Kaohsiung Medical University to the international academic arena. Topics included research direction selection, international collaboration, academic career planning, and cross-cultural adaptation, providing meaningful guidance and inspiration for students and early-career researchers in attendance.

This event not only demonstrated KMU’s strong connections with leading international academic institutions, but also enhanced the University’s research capacity and global perspective through interdisciplinary knowledge exchange and experience sharing. Moving forward, KMU will continue to promote international academic collaboration and exchange, fostering medical and sports science professionals with global competitiveness.

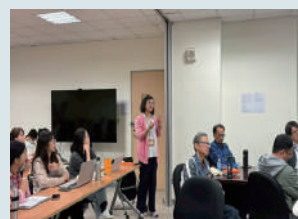
Session 1: 12:00-13:00  
**纖維母細胞在組織再生中的  
多重可塑性與重新編程**  
Multi-Scale Fibroblast Plasticity and Reprogramming  
in Tissue Regeneration

Session 2: 13:00-14:00  
Round table discussion  
**從高醫到南加大: 希望早點知道的事**  
From KMU to USC: things I wish I knew

**SPEAKER**  
**韓逸成**  
Dr. Hans I-Chen Harn  
美國南加州大學病理學系助理教授

2025/1/5 (一)  
12:00 - 14:00  
高雄醫學大學 國研大樓 4F  
IR458+459 共同討論室1&2

主辦單位: KMU 精準運動醫學健康促進中心  
協辦單位: KMU 運動醫學系



Dr. Hans I-Chen Harn Lecture

Director Shang-Jyh Hwang (left) and Dr. Hans I-Chen Harn (center).

# QUARTERLY IMPORTANT EVENTS

## Summer Slimming Program – Fat Loss Challenge

Organizer: Precision Sports Medicine and Health Promotion Center (PSMHPC)  
Co-Organizer: Division of Health Service

Date /Time

2026/03/16-  
03/20

Venue

IR840, 8F,  
International Academic Research Building, KMU

### Abstract:

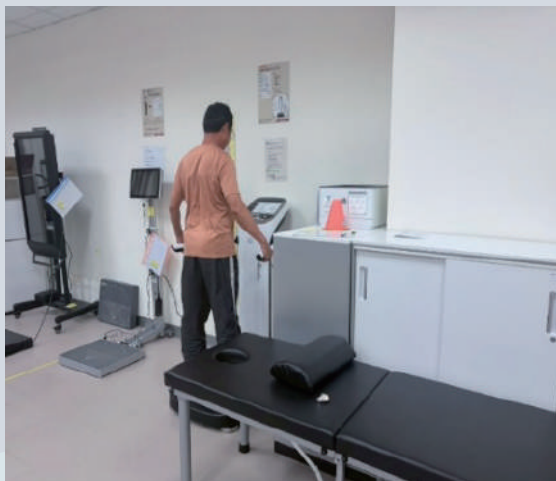
To promote a culture of health on campus and enhance health awareness among faculty, staff, and students, Kaohsiung Medical University launched the “Summer Slimming Program – Fat Loss Challenge.” By integrating exercise, health education, and team-based activities, the program guides participants to develop healthy lifestyle habits in a fun and engaging environment, helping them move toward improved physical fitness and well-being.

The program is organized by the Precision Sports Medicine and Health Promotion Center, addressing common modern health concerns such as high body fat, sedentary lifestyles, and insufficient physical activity. A series of health promotion-oriented interventions has been designed, including guided exercise sessions, basic health assessments, and lifestyle modification recommendations, to help participants establish correct concepts of exercise and health.

Featuring an “edutainment” approach, the “Summer Slimming Program – Fat Loss Challenge” incorporates team-based competitions, outcome tracking, and interactive challenges to enhance motivation and adherence. In doing so, health promotion is transformed from passive instruction into an engaging and rewarding lifestyle practice. The program is open to both students and faculty members, encouraging participation across different groups and fostering a supportive and health-oriented campus environment.



Faculty and staff waist circumference measurement.



INBODY body composition measurement for faculty and staff.



Faculty and staff participating in the Fat Loss Challenge.



Review and verification of measurement results.



**KMU**  
**Kaohsiung Medical University**

**RESEARCH CENTER QUARTERLY REPORT**

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Hao-Ya Chang  
Issue Day: May 2026

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