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目　　錄

林新年報

林新年報為收集院內醫師、醫事人員及行政人員，最近一年的論文，其來源來自於投稿林新年報的論文及已刊登於國內外雜誌論文，期待本院同仁儘量發表，提高本院醫療、護理及醫管專業的水準。論文的電子稿，請 E-mail 至教研部秘書。

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序

林新醫院自民國 88 年遷院以來，以「創新、溫馨、效率、品質」的理念，於三年內由地區醫院升格為區域教學醫院，全體同仁的努力有目共睹。醫院的角色也由「全方位的社區醫療服務」另須兼顧「教學的任務」。

「全面醫療品質提昇」及「以病人為中心的服務導向」為本院既定的方針，院方希望全體同仁能提高自己專業的能力，除接受繼續教育訓練外，更鼓勵將寶貴的經驗、想法寫成論文發表。因此除了本院原已制定的論文獎金制度外，更於民國 91 年開始籌劃成立林新醫學年報～LinShin Medicial Annual Report～，鼓勵全院同仁投稿。

很欣慰的林新醫學年報創刊號終於出版了。

一種高水準雜誌的形成是非常不容易的，林新醫學年報創刊號，不論其內容水準如何，畢竟是大家努力的心血。我很誠心的希望「林新醫學年報」能夠長久持續下去，內容更豐富，水準更高。

最後我要感謝全院同仁的支持，在我們共同的努力之下，使夢想成真，踏出了第一步。同時也希望全院同仁共同努力，持續將研究成果投稿於林新醫學年報。

林新醫院 院長 林仁卿

JAN.16, 2026

編者的話

林新年報自民國 92 年創刊以來，如今已進入了第 20 年。回顧過去，在院長、歷任副院長、部主任及所有院內同仁的努力下，這本屬於林新醫院的年報，終能按時一期又一期的出版。在院長的帶領及鼓勵下，每一年投稿的件數及論文的品質皆有顯著的進步。希望藉著林新年報，能提高院內同仁論文寫作的動機，將臨床寶貴經驗及想法付諸文字，以達流傳保留目的，提升同仁專業水平，並為醫院留下重要的醫學資料，以利後進學習。希望有朝一日，這份年報能成為同儕審查的醫學期刊，這是我們的目標，也將是林新醫院向醫學中心水平邁進的重要里程碑之一。

我們已將林新年報電子化，取消紙本印刷，除了響應環保議題外，亦可讓員工在院內任何一台電腦經院內網路讀取年報資料，增加閱讀可近性。

最後我們感謝院內同仁在忙碌的醫療服務之中，還能踴躍的寫作及投稿，才能使這份年報順利出刊。期望未來每一年的年報，都能有更豐富的內容。

林新醫院教研部副院長 張光遠

JAN.16, 2026

RESEARCH

Generative-AIBasedHealthAdvisorySystemforPatientswithChronicDiseases

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Abstract

With the increasing prevalence of chronic diseases, global public health systems are facing unprecedented challenges, prompting active exploration of innovative health management solutions powered by artificial intelligence (AI). In recent years, strategies such as intervention personalization and data-driven decision making have played a critical role in improving the effectiveness of chronic disease prevention and control. Simultaneously,AI assisted conversational systems have been increasingly applied to patient education and health support services, demonstrating greater immediacy and interactivity compared to traditional care models. Moreover, the deep integration of human expertise with AI systems is driving an irreversible transformation toward smarter and more efficient healthcare infrastructures. In response to these developments, this study presents a generativeAI-based health advisory system specifically designed to deliver real-time, personalized recommendations for individuals with chronic diseases, obesity, or metabolic syndrome. The system utilizes LINE, a widely adopted communication platform in Taiwan, as the primary user interface, and integrates the ChatGPTA P I w i t h R e t r i e v a l - A u g m e n t e d G e n e r a t i o n (R A G) t e c h n i q u e s . B y l e v e r a g i n g u s e r s ' basic physiological profiles and accu- mulated health data, the system dynamically generates dietary suggestions, drug interaction alerts, and interpretations of medical checkup results.

KeywordsGenerative AI · Health advisory system · Chronic disease management · LINE chatbot · Retrieval- augmented generation · Large language models

1 Introduction

Theincreasingnumberofindividualswithchronicdiseases has become a heavy burden on public health,necessitating innovativeh e a l t h m a n a g e m e n t s t r a t e g i e s i n t e g r a t e d with artificial intelligence (AI) [1]. In recent years, numerous studies have highlighted the importance of precision medicine and data-driven decision making in the preventionof chronicdiseases[1].Atthesametime,AIassistedconversationalagents(chatbots)havebeguntobeappliedinpatient

Tung-MinYuandKuo-HsiungShucontributedequally.

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education and support for chronic diseasemanagement, offeringmorefrequentandeffectiveinteractionsthantradi- tional care models [2]. Furthermore, as human intelligence merges with AI technologies, the development of efficient medicalapplicationshasemergedasakeytrendinthetrans- formation of modern healthcare systems [3].

Taiwan is currently facing a severe public healthchallenge. According to the National Health Interview Survey conductedbytheHealthPromotionAdministration,Minis- try of Health andWelfare, more than 42.9% of adults have at least one chronic disease, with hypertension (15%), dia- betes (6.7%), and hyperlipidemia (16.8%) being the most common conditions [4]. More notably, obesity is showinga significant trend toward affecting younger populations: among individuals aged 18 and over, 23.2% are classified as obese[4],indicatingthatoneineveryfiveadultsisover- weight or obese.This demonstrates that traditional preventivestrategiesaimedprimarilyat olderadultsareno longer sufficient to meet current needs. These figures align with globaltrends,asmanydevelopedcountriesareexperiencing asimilarincreaseintheburdenofchronicdiseases,posinga significant threat to global public health [5].

Chronic diseases and their associated metabolic abnormalities not only significantly increase the risk of severe complications such as cardiovascular disease, kidney disease,andretinopathy[6],butalsoimposeenormousfinancialand caregiving pressures on healthcare systems.According toareportbytheNationalDevelopmentCouncil,overone- third ofTaiwan's annual National Health Insurance expenditures are directly related to chronic diseases [7], with the majorityofresourcesconcentratedonmanagingadvanced- stage complications.This reflects a need for improvements in early prevention and proactive disease management within the current healthcare framework.

Against this backdrop, "Personalized HealthManagement" has emerged as a critical breakthrough to address these challenges and drive the development of health technologies.TherapidadvancementofAItechnologies—especiallygenerativeAImodelsandnaturallanguageprocessing (NLP)—hasopenedupunprecedentedpossibilitiesforinte- grating heterogeneous health data, interpreting complex medical texts, and generating personalized health recommendations[8].WithAImodelsassistingusersinreal-time dietary intake analysis, health checkup interpretation, andmedicationinformationcomprehension,thereisgreatpotentialtosignificantlyenhancetheeffectivenessofdiseasepre- vention and the efficiency of daily self-management.

Although ChatGPT has strong languagecomprehension andgenerationcapabilities,itstillfaceslimitationsinmedicalapplications,suchasunclear datasources,overlygeneralizedresponses,andatendencytoproducehallucinations. Therefore,this study proposes an application framework featuring a clear graphical interface, a personalizeddatabase, RAG technology, and integration with LINE-based conversations(Fig.1)toconstructasolutionwithbothprofessional orientation and task-specific functionality.

Conversely, individuals with chronic disease often face difficultiesintheirdailylives,suchasalackofclarityabout nutrients, challenges in interpreting health examination reports, and uncertainty regarding medication usage.Coupledwiththelimitedavailabilityofhealthcarepersonnel[9] (Fig.2), they are frequently unable to receive timely and appropriateguidance.Thesechallengeshighlighttheneces- sity of an integrated intelligent health advisory system.

Inrecentyears,generativeAIhasdemonstratedoutstandingpotentialinthefieldofmedicalandhealthmanagement, particularly in the areas of personalized recommendations, data insights, and health promotion [10]. For instance, by combiningadvancedtechnologiessuchasnaturallanguage processing (NLP) and RAG, the public can be better supportedi n understandingcomplexmedicalinformation and receiving real-time, customized health guidance [11]. Aligning with this trend, the present study aims to develop a generative AI-based health advisory system (Fig.3) that integrates the LINE instant messaging platform, large language models (such as the ChatGPT API), and RAGtechnology.

First,inthearea offoodandnutritionanalysis,following the "Dietary Reference Intakes (DRIs)" established by the Health Promotion Administration of Taiwan's Ministryof HealthandWelfare[12]isessentialformaintaininghealth. However, many people find it hard to know if their diet meets these standards. Public understanding of why nutrients like polyphenols, minerals, and proteins are important is also still lacking. This is a major challenge in improv- ing the population's nutritional literacy [13]. Therefore, developing a tool that quickly analyzes nutrition and gives personalized advice through image or text input can help improvepublichealthknowledgeandsupporthealthiereat- ing habits [14].

Second, in drug information analysis, many patients don't fully understand their medications' ingredients,uses, side effects, or interactions. This lowers treatment success and adherence [15], while drug interactions raise hospitalizations and healthcare costs [16]. The proposed system evaluates drug composition to enhance user comprehension of medication-health relationships, thereby promoting safety and adherence.

Third, most people have limited understanding ofthe meaning behind health checkup results. They often depend only on alerts (like red text) to judge their health, missingsignsthatsomevaluesarealreadynearrisklevels.Thisover-reliance can delay early prevention [17]. Helping patients better understand their test reports is a pressing need [18].

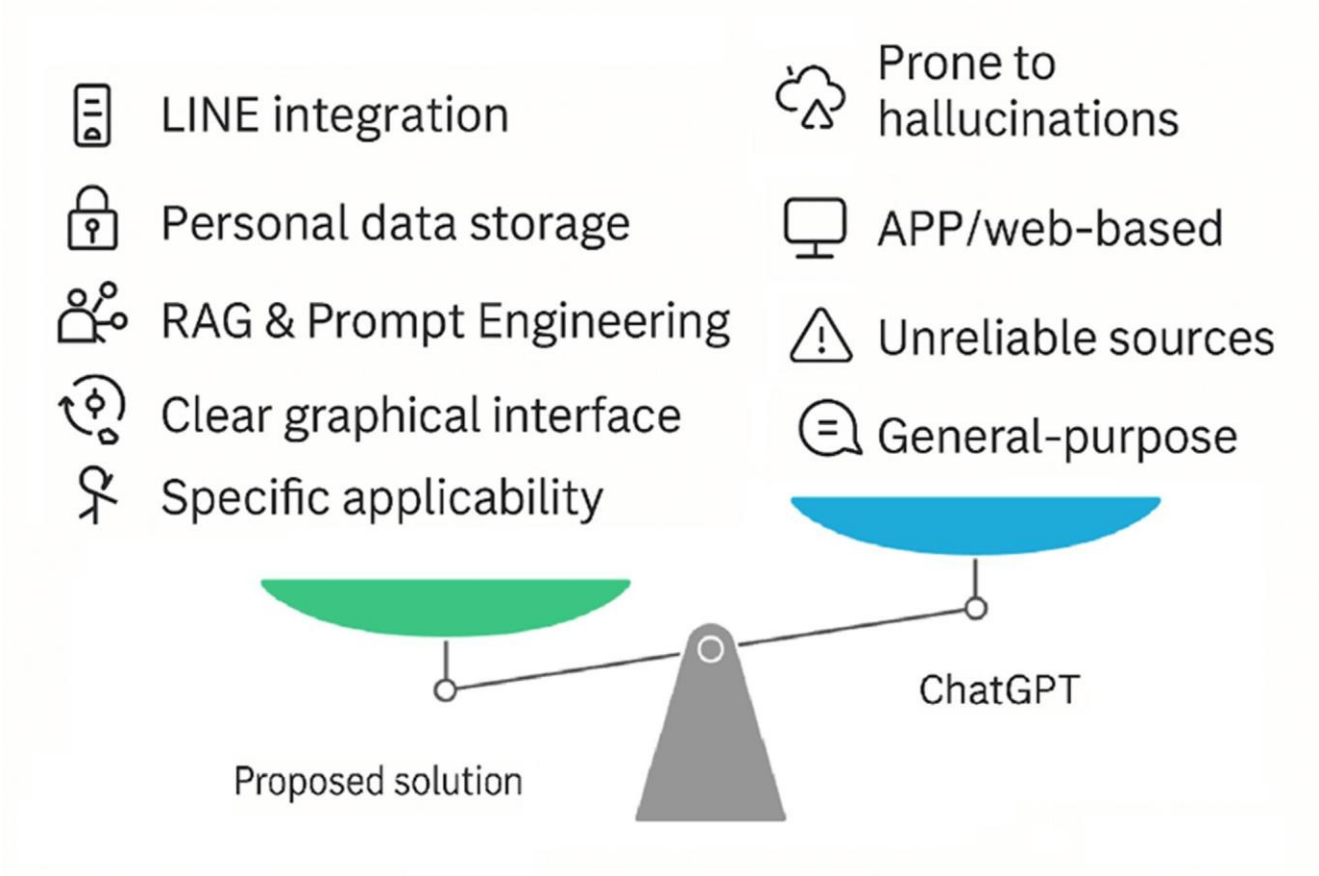


Fig. 1 Comparative diagram highlighting the advantages of the proposed solution over the general-purpose ChatGPT

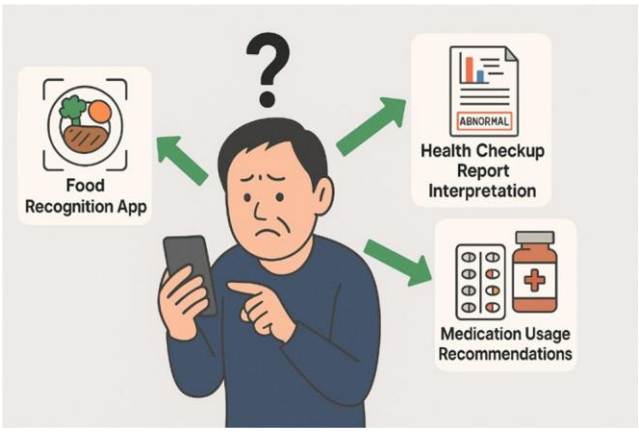


Fig. 2 Illustrative diagram of common situations where users experience difficulty understanding health information

2 Related Works

In recent years, AI has gained attention in diet and nutrition assessment. Using deep learning, image recognition, and natural language processing, it can automatically analyze food records, reducing the errors and gaps often seen with manual tracking.

2.1 AI in Dietary Assessment and Personalized Nutrition Applications

Using meal image recognition, the system can detect food types, estimate portions, and turn them into standard nutrition data. This makes diet tracking more accurate and convenient [19,20], reducing user input errors and helping with diet intervention programs. In addition, generative AI models like ChatGPT are now being used to create personalized diet plans. They estimate daily energy and nutrient needs using basic user data (age, gender, weight, height, and activity level) and suggest meals accordingly [21,22]. While early results look promising, studies note that these AIs still have issues with detail accuracy, ethics, and personal differences, showing a need for improvement [22]. Personalized nutrition not only affects eating habits but also impacts the gut microbiome. AI-designed meal plans can improve gut diversity and function, helping with insulin sensitivity, fat distribution, and inflammation [23]. This shows the strong potential of generative AI in precision nutrition.

This study also summarizes the current leading AI health management systems in terms of application objectives, platforms, AI technologies, and core features (Table 1),

Fig. 3System Architecture

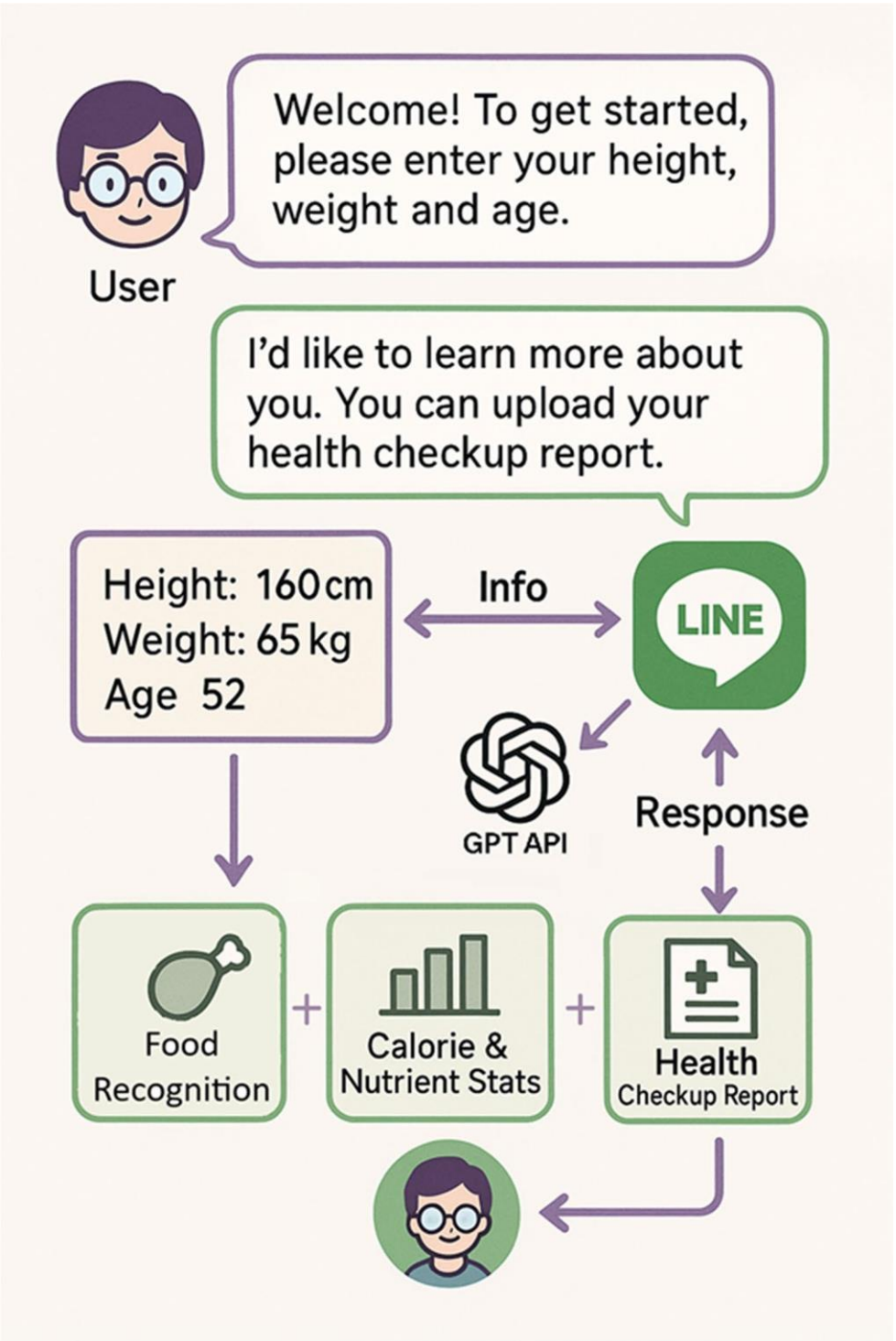


Table1Comparativeanalysisofapplications

ApplicationName	FoodAnalysis	HealthReportInterpretation	Medica-tionPhotoAnalysis	PersonalizedChronicDis- easeAdvice	AITechnology	Notes
AdaHealth[24]	✕	✓	✕	✓(Symptom-basedsuggestions)	Propri-etaryinference engine+AI	Provides chronic disease advice aftersymptomassessment,butlacks direct food or medication analysis
MyFitness-Pal[25]	✓	✕	✕	✕ (General healthtracking)	Food data-base+learning model	Offerscompletedietarylogging,but lacks personalization for chronicdiseases
Wellory[26]	✓	✕	✕	✓ (Nutritionistinvolvement)	AI+humannutritionist support	Focusesonhealthyeatingconsulta- tion; suitable for chronic diseasemanagement
Medisafe[27]	✕	✕	✓	✓ (Medicationreminders)	Medication managementAI	Providesdrugremindersandinter- action alerts; suitable for chronic disease medication management
ThisStudy	✓	✓	✓	✓(Recommendations basedonmedicalhistory)	ChatGPT+RAG	Integratesfood,healthreports,and medicationdatasources;offersthe most comprehensive features

serving as a reference for further discussion of thedevelopmentpositioningandadvantageanalysisoftheproposedsystem.

2.2 AIInteractiveHealthAssistantanditsFunctions

AI chatbots show strong potential in promoting health and changing behaviors. They help users build healthyeating habits,stayactive,followtreatments,andlearnabouthealth [28]. With features like real-time feedback, personalized tips, and reminders, they can improve both engagementand long-term results. For example, the nutrition chatbot "Fridolin" wasdesignedforolderadults[29].Itusedaparticipatory design approach, making it more suited to their needs. This boosted user interest and encouraged self-care. The chatbot helped with tracking food intake, promoting balancednutrition,andsettinghealthgoals.However,most currenthealthchatbotsarestillmainlydesignedforyounger users.Theyoftenoverlooktheneedsofolderadults,suchas cognitive changes, lower digital skills, and sensory issues. Future chatbot development should focus on more adapt- able and inclusive designs to better support the elderly.

2.3 Applications and Challenges of AI inElderlyCare and Chronic Disease Management

Inelderlycare,generativeAIandsmartsystemsarechang- ing traditional health management. AI helps older adultsget personalized advice, medication reminders, and alerts for abnormalhealthsignsorchronicdiseaserisks[30].This booststheirabilitytomanagetheirownhealth,slowsdown functional decline, and reduces healthcare use. In chronic disease management, AI uses machine learning to analyze largeamountsofpersonaldata[31],helpingtoclassifydiseaserisk,predictoutcomes,andprovidetailoredtreatment

plans. This precision approach is proving valuable in managing conditions like diabetes, hypertension, heart disease, and kidney disease.

Despitetheirpotential,currentAIhealthtoolsfacechallenges like biased data, lack of transparency, and weak ethical guidelines. This is especially concerning for older adults—if AI systems don't consider issues like cognitive decline, mobility limits, or multiple chronicconditions, they may worsen health disparities and deepen the digital divide [32,33]. So,AI solutions must be designed with the elderly's specific needs and ethical considerations in mind.

Thisstudyalsoincludesacomparisonofdifferentapplications in terms of health promotion impact, suitability for chronic disease management, and elderly-friendlydesign (Table2) to guide the system's development.

2.4 AI in Clinical Nutrition DecisionSupportApplications

In clinical nutrition management, AI is showinggrowing potential.Forexample,theMUST-Plusmodelusesmachine learning to better identify hospitalized patients at high risk of malnutrition. Studies show it improves both sensitivity and specificity compared to traditional methods [34]. AI also helps reduce the workload on clinical staff, making nutrition assessments faster and more accurate.

Integration of natural language processing (NLP)with AI is now a key part of clinical decision support systems (CDSS). Studies show that NLP can automatically extract keyinformationfrommedicalrecordsandfeedthemintoAI systems, improving the accuracy and usefulness of clinical recommendations.This holds considerable significance for improving the quality of nutritional care and overall treatment outcomes for hospitalized patients [35].

Table2Comparative analysisofhealth managementApplications

Appli-cationName	TargetUsers	Platform	AIFunctions
AI Health Advi-sorySystem (This Study)	Older adults, patientswithchronic diseases	LINEApp	ChatGPT,RAG,Deep
AI-Based Dietary Assess-mentApp(IADA-type)[19,20]	General public, diabetic patients	App	Foodimagerecogni-ti DeepLearning
Person- alized Nutri-tionRecom-menda-tionPlatform [21–23]	Health-con-sciousindi-viduals	App/Web	Machine Learning, (
MUST-Plus(Malnu-trition Screen-ingTool)[34]	Hospi- talized patients	Integrated medical system	Machine Learning

3 SystemArchitecture

This system adopts a multi-layered architecture, encompassing the front-end interface, back-end services,and external API integration, to deliver real-time and personalized health management services to users. Interaction is conductedthroughtheofficialLINEaccount,withthefront endresponsibleformessagecollectionandpreliminarypro-cessing,whiletheback-endhandlesdataanalysis,AImodel inference, data storage, and third-party API connections.

3.1 System Architecture and Integration with LINEAPI

Thefront-endinterfaceisbuiltaroundtheLINEMessaging API,supportingvariousinteractivemodessuchastextinput and button selection. The back end is deployed on a cloud platform and consists of the following main modules:

- User Data Management Module (utilizingencryption and access control technologies, compliant with Taiwan's Personal Data Protection regulations).
- API Integration Module (integrating LINEMessaging API, ChatGPTAPI, and food recognitionAPIs such as LogMeal and FatSecret).
- RAG Inference and Knowledge BaseManagementModule.
- Natural Language Processing and GenerationModule (NLP-Based Response Generation).

Themessageflowprocessisasfollows(Fig.4):Usersends a message➔Webhook receives it➔Backend parses the content➔RAG retrieval and generation is triggered➔MessageisreturnedviaLINE➔Personalhealthdatabase is simultaneously updated.

3.2 DetailedBreakdownofRAGTechnology

The core of this system is based on the RAG architecture, integratedwithseveraladvancedoptimizationtechniquesto enhance overall retrieval accuracy, generation quality, and system efficiency (Fig.5).

3.2.1 StandardRAGArchitecture

The standard RAG architecture combines vector retrieval with a generation model, aiming to address challenges in updating knowledge within large language models and mitigating hallucination issues. Its core design integrates a retriever and a generator: given a user query q, thequeryis first encoded into a vector using an encoder $\varepsilon(q)$. Then, the system retrieves the k most relevant passages from the knowledge base D based on vector similarity:

$$\{d_1, d_2, \ldots, d_k\} = Retriever(\varepsilon(q), D) \quad (1)$$

These retrieved passages are then combined with the original query q and fed into the generation model G to produce the final response a:

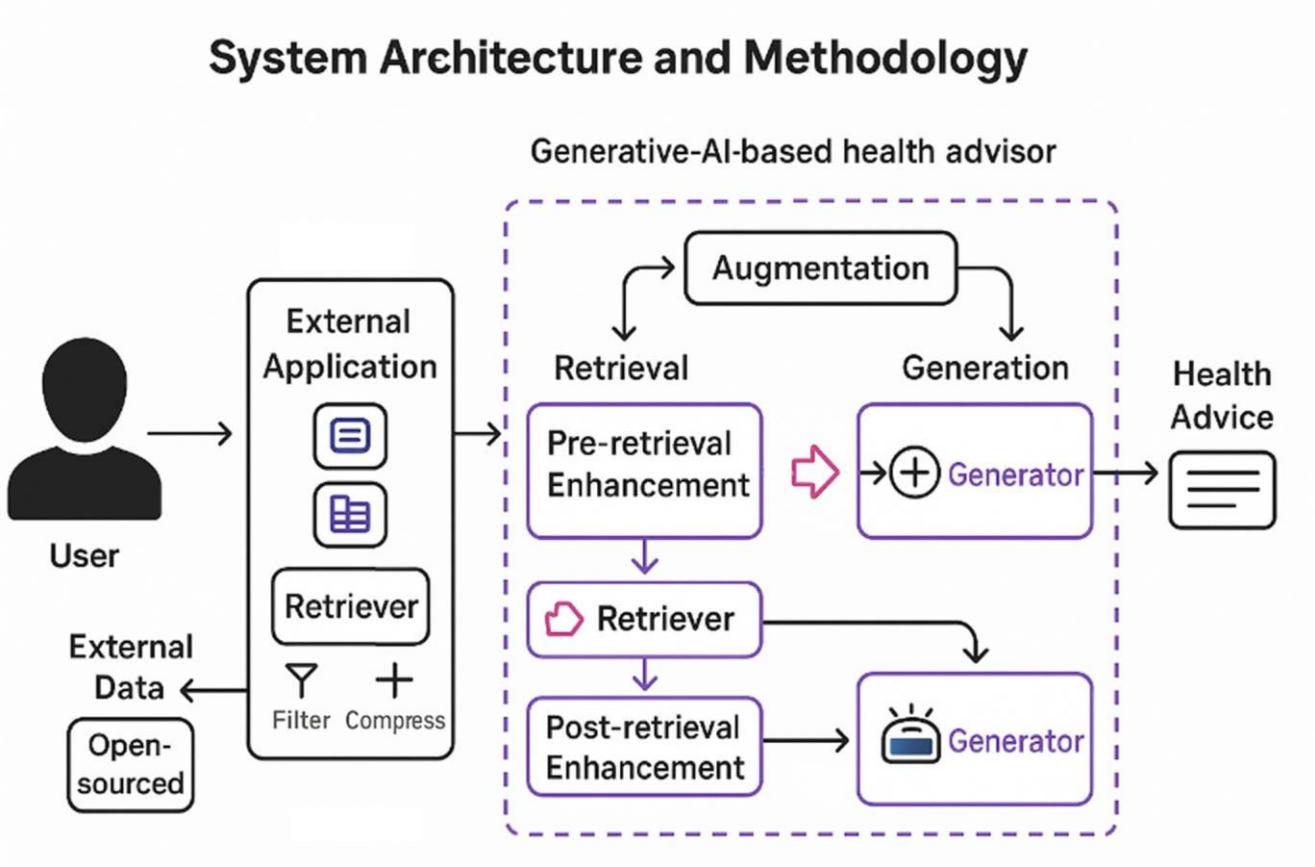


Fig.4DiagramoftheMulti-layeredArchitectureoftheProposedSystem

$$\alpha=G(q,\{d\_1,d\_2,\ldots,d\_k\}) \quad (2)$$

3.2.2 End-to-EndDifferentiableRAG

Traditional RAG treats retrieval and generation as separately trained modules, which may lead to amismatch between the retrieved results and the needs of the generation component.To address this issue, the End-to-End Differentiable RAG architecture allows generation loss to be backpropagatedtotheretriever,enablingjointoptimization through collaborative learning. This system incorporates a differentiable retrieval mechanism, allowing the retrieval process to receive gradient feedback from the generation loss for coordinated optimization.

Define the retrieval scoring function as S(q, d), and let the generation loss be the retrieval loss be$L_{retrieval}$,The overall loss is then formulated as:

$$L=\lambda L_{retrieval}+(1-\lambda)L_{gen} \quad (3)$$

where:

- $L_{retrieval}$measuresthealignmentbetweentheretrieval scoreandtheactualinformationalneed.
- λ∈[0,1]isabalancingcoefficient.

Inaddition,toenhancetheretriever'ssensitivitytoresponse quality, the system further introduces a regularization term basedondynamicadjustmentoftheresponsescore,aiming to improve the stability of model training.

3.2.3 RAGDollRobustnessandControllableGeneration

To enhance the consistency and faithfulness of responsesin the retrieval-generation system, this system introduces a denoising mechanism to filter out noisy information from the retrieved passages. By applying noise filtering before the generation stage, the fidelity and controllability of the generated content can be improved.

Define the filtering function F(d), which retains only those passages with scores exceeding a threshold θ:

$$D'\{d\in D|S(q,d)>\vartheta\} \quad (4)$$

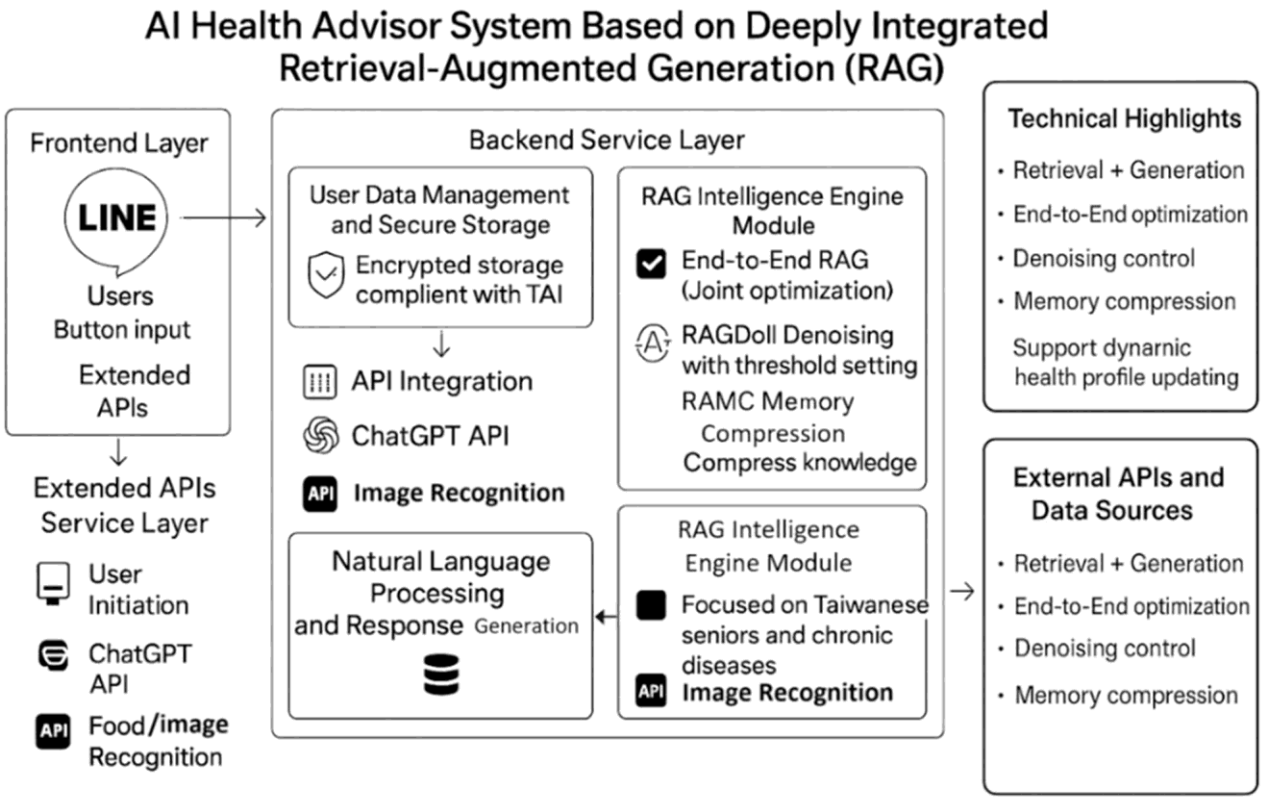


Fig. 5 Diagram of the System's Multi-layered Structure and RAG Technology Integration

The filtered set D′ is then used as input to thegeneration model to enhance the controllability and reliability of the output. A dynamic threshold adjustment strategy is implemented, whereby the value of θis adaptively tuned basedon the distribution of the current knowledge base retrieval results, in order to balance recall and precision.

3.2.4 RAMC Memory Compression andRetrievalOptimization

As the size of the knowledge base expands, retrievalcosts and latency also increase accordingly. To address this, the systemintegratesRetrieval-AugmentedMemoryCompres- sion (RAMC) technology to reduce computational over- head. The specific process is as follows:

1. Evaluate each passage using a knowledgeimportance indicator I(d).
2. Selectinformation-denseandlow-redundancypassages to compress into a compact knowledge base Dc:
3. During query processing, perform fast retrievalwithin Dcasapriority,andfallbacktothefullknowledgebase only when necessary.

$$Dc: D\ c = Compress(D) \tag{5}$$

This approach significantly reduces average retrieval time and enhances the real-time responsiveness of the system.

3.3 Deep Integration of RAG with theProposedSystem

Toenhanceoverallsystemperformanceanduserinteraction experience,thisstudysystematicallyintegratesand optimizes RAG technology across several key dimensions: First, in terms of the retrieval and generation mechanism, thesystemadoptsthestandardRAGarchitecture tosup- portreal-timeknowledgeupdatesandfurtherintroducesan end-to-end differentiable optimization process.This allows retrievedpassagestobedynamicallyadjustedbasedongen- eration requirements, thereby improving the relevanceand consistency of the generated responses [36,37]. Addition- ally, to reduce hallucinations and enhance controllability, a denoisingpassagefilteringmechanismisappliedprior to generation. Only high-confidence

passages are retained as the basis for generation, effectively improving the faithfulness of the answers.

Second, in terms of knowledge base management,the system employs Retrieval-Augmented Memory Compression (RAMC) technology to perform knowledge compression and build a refined knowledge base Dc.Ahierarchical query strategy is implemented, where the system chooses between the full or compressed knowledge base depending onqueryimportance,significantlyreducinglatencyand resource consumption [38]. The knowledge base is con- structed based on frequently asked questions from chronic disease patients inTaiwan, guidelines from the Ministry of Health and Welfare, and international clinical standards, ensuring high clinical relevance of retrieval results.

Third, in the design of the user interaction flow, this system automatically converts LINE messages—including dietaryintakerecords,physicalactivity,andhealthcheckup data—into semantic query vectors. These vectors are then used by the retrieval module to search for relevant knowl- edge fragments in real time.After generating personalized health recommendations, the results are synchronously writtenbacktotheuser'spersonalhealthrecord.Theentire data flow is triggered by a Webhook event and seamlessly connects the RAG module, response generation, and per- sonal health record updates, forming a complete intelligent feedback loop.

In addition, the system adopts a multi-turn fine-tuning approach, incorporating users' historical interactiondata into the training samples. This continually improves the alignment and accuracy between the retriever and generator. Such a design enables the system not only to respondt o newqueriesinrealtimebutalsotodynamicallyadaptits recommendations based on users' evolving behaviors and health status.

In summary, this system successfully integrates several advanced technologies—including standard RAG,differentiableretrieval,denoisingcontrol,andmemorycompression—anddeeplyembedsthemintothehealthmanagement application scenario. This results in a generativeAI health advisory platform characterized by high efficiency, high accuracy, and strong personalization [39]. RAG technology servesasthesystem'scoreintelligentengine,powering every stage from data collection and knowledge retrievalt o response generation and personal health management, thereby realizinganinnovativeAI-supportedmodelforself-directed health management.

4 SystemFunctions

The overall system architecture integrates cloud storage, large language model (LLM) inference, RAGtechnology, and a containerized execution environment to ensure real-timedataprocessingandservicestability.Thesystem'score functionalitiesspansixmajorareas:foodnutritionanalysis, daily nutrient statistics, health checkup reportexplanation, personal health data confirmation, medication usage sug- gestions, and more. These features are logically connected into a unified operational workflow (Fig.6).

Thisworkflowdesignensuresthatuserscancompletethe entire process—from data input to the generation ofhealthrecommendations—withinacohesiveandefficientplatform.It significantly reduces the barrier to use and enhances the feasibility of implementing health behavior interventions.

Consideringtheusabilityneedsofelderlyusersandindi- viduals with chronic diseases, the system is specifically designedwithanintuitiveuserinteractioninterface.Thesix mainfunctionsaredisplayedonthehomepageusingacom- bination of icons and text, accompanied by character-style illustrations of healthcare professionals to enhance visual friendliness and recognizability (Fig.7).

Users can easily perform operations such as analyzing the nutritional content of food, checking for druginteractions, and interpreting health checkup reports through simple button selections. This effectively reduces learning barriers caused by overly complex information structures.

The interface design aims to improve overall system usability and user engagement, thereby promoting thesustainability and integration of health management behaviors into daily life.

4.1 DailyDietaryAnalysis

Dietary behaviors are key to preventing chronic diseases and maintaining health. Excessive, insufficient, orimbalanced nutrient intake in daily meals is closely linked to issueslikediabetes,hypertension,hyperlipidemia,andkid- ney disease. Therefore, tracking daily calorie and nutrient intake accurately and promptly is crucial for good disease control and overall health.

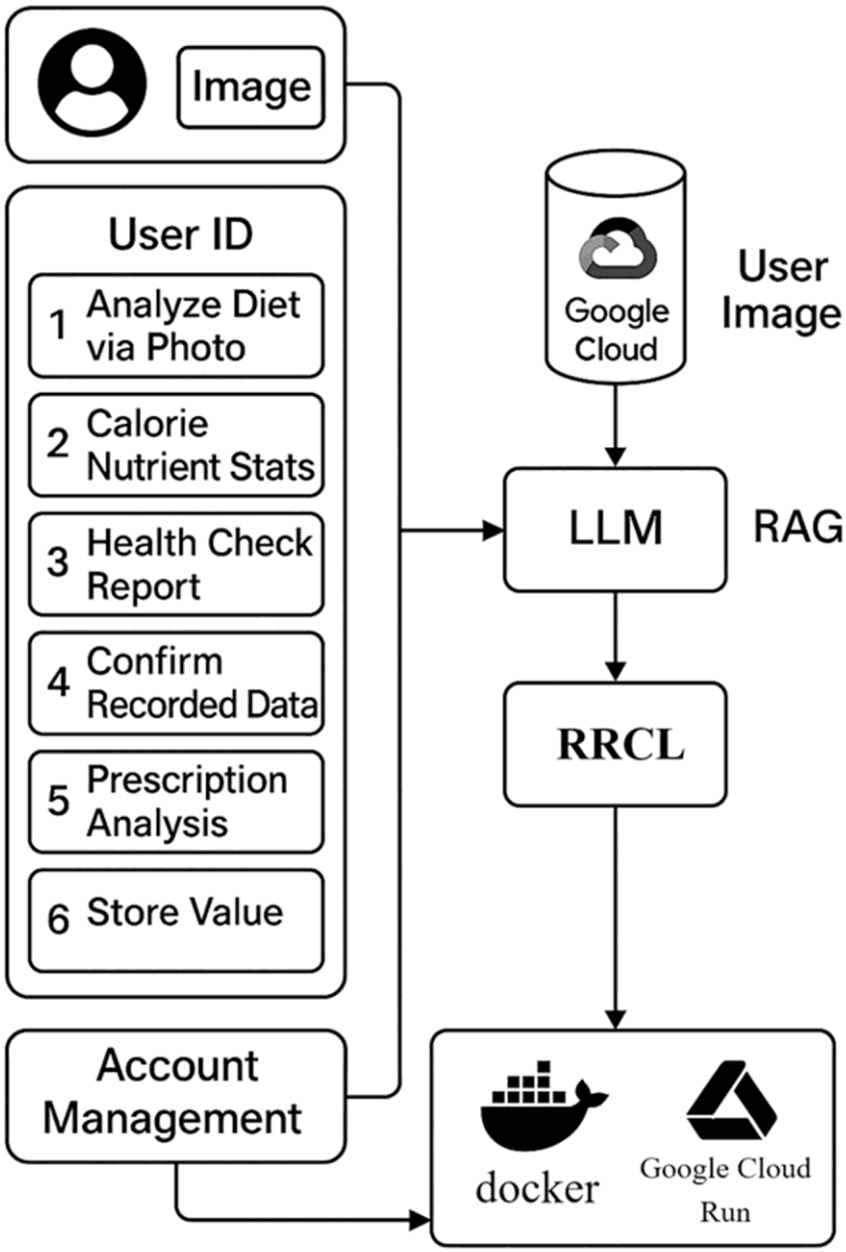
However, for the general public, it's hard to accurately trackt heirdietusingmemoryorbasicmanualr ecords. To address this issue, the system features a food analysis module that provides real-time nutrition analysis and daily summaries.This helps users easily understand their dietary patternsandcontinuouslyoptimizethembasedonpersonal health goals.

4.1.1 FoodNutritionAnalysis

Inthenutritionanalysismodule,mealscanbeassessedeitherthro ughimagecaptureortext-basedfoodinput.Byintegrat- ing image recognition and NLP technologies, the system automaticallyidentifiesandextractskeynutritionalcompo-

nents.Theanalysisincludesmacronutrients—totalcalories,
protein,fat,andcarbohydrates—aswellasawiderangeof

Fig. 6 Diagram of system function and workflow design



micronutrients and minerals, such as vitaminA, vitamin C, sodium, calcium, magnesium, and potassium (Fig.8). All nutritional data are compared against the "DRIs" forthe Taiwanese population (Fig.9), providing the percentage of each nutrient relative to the recommended daily intake.

Thesystemintegratesthisnutritionalanalysiswithusers' uploaded health checkup reports and provides personalized dietary advice based on individual disease risk and health conditions. In addition to generating feedback for specific abnormalindicators—suchashighbloodglucose,elevated cholesterol, or impaired kidney function—the systemalso supportscustomizedrecommendationsaccordingtochronic disease types, including chronic kidney disease, heart dis- ease, cardiovascular conditions, diabetes, and cancer.

For example, users with chronic kidney disease receive advice to limit foods high in potassium and phosphorus. Diabeticusersareguidedtocontrolcarbohydrateandsugar intake while increasing dietary fiber to help regulateblood glucose levels.

Fig. 7 Graphical interaction via the LINE interface

Through real-time feedback and clearly visualized nutrient intake proportions, users can easily see their eating habits and adjust them based on health checkup results and chronic conditions. This enhances disease prevention, nutritional balance, and daily self-care, while encouraging the long-term healthy eating habit.

4.1.2 Daily Nutrition Summary

To help users better understand their daily nutrition, the system offers a "Daily Nutrition Summary" feature. Unlike single meal analysis, this function looks at the whole day's intake to show overall trends. It automatically adds up total calories, tracks changes in macronutrients, and shows key micronutrient levels. It also highlights potential health risks based on the day's intake. This helps users reflect on their eating habits and make healthier long-term choices.

The system automatically adds up all daily food records to calculate total calories and amounts of protein, carbohydrates, and fat. It also shows key micronutrients like sodium, potassium, fiber, and sugar. Based on health risks, it highlights the share of high glycemic index (GI) foods, high-sodium items, and anti-inflammatory foods. If too much high-GI or salty food is detected, the system sends alerts to help users adjust upcoming meals. If more anti- inflammatory foods are eaten, it gives positive feedback to encourage healthy habits.

With this daily analysis and health prompts, users can better understand how their diet affects chronic disease risk and are more likely to make positive changes.

4.2 Medication Usage Recommendations

The system's medication analysis module is designed for chronic disease patients taking multiple long-term medications. It aims to prevent drug interactions and check how food may affect drug metabolism. Users can enter a drug name, upload a photo, or scan a prescription bag barcode.

Fig. 8 Nutritional analysis

The system connects to a medication database to analyze the drug's ingredients, uses, side effects, and precautions (Fig. 10). It also checks interactions between drugs, alerting users to possible risks like enhanced effects, reduced effectiveness, or increased side effects.

In addition to drug-drug interactions, this module also considers the potential effects of food on drug absorption and metabolism. For example, grapefruit juice may inhibit certain drug-metabolizing enzymes, leading to elevated drug concentrations in the bloodstream, while high-fat foods may alter the absorption rate of lipophilic medications. The system provides personalized alerts for known food-drug interactions.

If a user has a history of liver or kidney problems, the system warns against medications that may strain these organs. This helps reduce the risk of drug accumulation toxicity, adverse reactions, and acute kidney injury. Through real-time interaction detection and personalized alerts, this module is dedicated to improving medication safety and therapeutic stability for patients.

4.3 Health Checkup Report Explanation

Health checkup reports often include many physiological and biochemical indicators that are difficult for the general public to understand. To address this, the system's health checkup analysis module is designed to help users quickly understand their results, identify abnormal indicators, and provide recommendations for follow-up improvement.

Users can upload images of their health checkup reports, and the system utilizes optical character recognition (OCR) and structured data extraction techniques to automatically

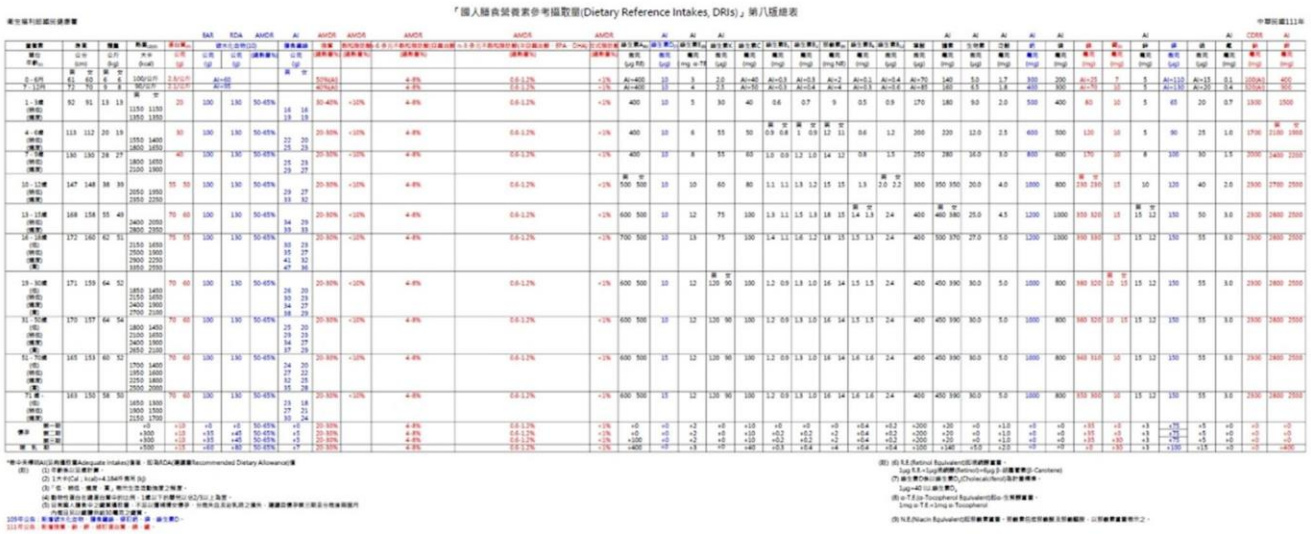


Fig. 9 Illustration of DRIs

analyze common health indicators such as blood glucose, lipid profiles, liver function, kidney function, and physiolog-ical measurements. Each value is compared to current clini-cal standards and color-coded to show whether it's normal, borderline, or clearly abnormal. For abnormal results, the system provides clear explanations of their meaning (e.g., high blood glucose may signal diabetes risk; kidney mark-ers may point to early chronic kidney disease) (Fig. 11).

The system also gives specific suggestions for improve-ment, like cutting refined sugars, exercising more, or regularly tracking certain metrics. A future upgrade will include chronic disease risk prediction based on indicator trends, enhancing personalized health management.

By simplifying the interpretation of checkup data and offering tailored advice, this module helps users understand their health, take early action, and work toward disease pre- vention and wellness.

5 Evaluation and Results

To comprehensively validate the performance of the gen-erative AI health advisory system developed in this study under real-world application scenarios, this chapter presents a systematic evaluation and analysis of the system's core functional modules. Given that the system encompasses multiple features—such as food nutrition analysis, medica- tion ingredient parsing, and health checkup report interpre- tation—the evaluation is specifically designed to simulate real-life usage contexts, ensure data diversity, and align test conditions with practical operations.

In addition, this chapter details the design principles of the test cases, the process of establishing gold stan dards, the rationale for selecting evaluation metrics, and the final analysis results. These components collectively provide a thorough view of the system's operational effectiveness and areas for potential improvement. The content is organized sequentially by testing design, standard construction, evalu- ation metrics and methods, and result analysis.

5.1 Test Case Design

This study established 50 test cases, categorized according to the system's main functional modules (Table 3):

The overall testing design aims to simulate diverse, real-world data scenarios, using exclusively image-based inputs to evaluate the system's capabilities in visual understanding and inference.

5.2 Gold Standard Construction

To ensure the objectivity and standardization of the evalu-ation results, each test case in this study was independently annotated by two healthcare professionals to establish a gold standard. The annotators included one physician specialized in internal medicine and one licensed dietitian.

Each expert followed the procedure below to construct the gold-standard answers:

(1) Provide the correct interpretation or recomme ndation based on the input content of the test case.
(2) When necessary, annotate the key reasoning and ratio-nale behind the interpretation.

If discrepancies arose between the two experts' responses for the same case, a double-blind arbitration process was

Fig. 10 Analysis of Medication Ingredients

Fig. 11 Detection of abnormali-ties in health checkup reports

Table3Typesofdata

Category	NumberofTestCases	DataType	Descripti
Food Nutri-tionStatistics	20	Mealimages	Coversv and dietar relatedtoc
Medication Ingredient Analysis	15	Drugappear- ance images	Includes medicatio diseases a potentialir
Health Checkup Report Interpretation	15	Healthreportscreenshots	Includes abnorma blood glucose,l

conducted to resolve the conflict, ensuring consistencyand neutrality in the final gold standard.

Belowisanexample ofagold-standardanswer:

Case D-013: The total caloric content of this meal is approximately 620 kcal, with 18 g of protein and 2.4 gof sodium—exceeding the recommended daily sodium intake limit for patients with hypertension.

5.3 EvaluationMetricsandMethodology

Toobjectivelyandsystematicallyevaluatetheperformance of the health advisory system across its core modules— food nutrition analysis, medication analysis, and health report interpretation—this study uses standardized metrics commonly applied in medical AI: Accuracy, Precision, Recall, and F1-Score. These metrics assess the system's prediction quality and real-world usefulness from differentperspectives.

Intheevaluationprocess,eachfunctionalmodule(food, medication,andhealthcheckup)isassessedseparately,with performance metrics calculated individually. The overall system performance is then evaluated using aggregated averages across all modules. In addition, the study records the consistency between the system's outputs and the gold standards to perform a more detailed classification error analysis. This multi-layered evaluation approach not only captures the system's overall effectiveness but also identifiesspecificareasforimprovement,ensuringtherobustness and reliability required for clinical application.

5.4 ResultsandAnalysis

A detailed analysis was conducted on the system's output acrossmultiplefunctionalmodules,includingthepresentationofoverallperformancemetrics,comparativeevaluation ofclassificationresultsforeachmodule,breakdownoferror types,andexaminationoftheconsistencybetweenthegold standard and the AI system outputs.

Table4Performancemetricsbasedonfourkeyindicators

TaskCategory	No.ofTest Cases	Accu-racy(%)	Preci-sion(%)	Recall (%)	F1-Score (%)
FoodNutritionStatistics	20	92.5	91.7	91	91.3
MedicationIngredientAnalysis	15	90.2	89.5	89	89.2
HealthCheckupReportInterpretation	15	91.7	91	90.5	90.7
OverallAverage	**50**	**91.5**	**90.7**	**90.2**	**90.4**

5.4.1 OverallPerformance

The system completed the evaluation of output results for all 50 test cases, achieving an overall accuracy of90%. This demonstrates the system's strong inference capability across various image input types, including meal photos, medication appearance images, and health checkup report screenshots. Detailed metrics for each functional module are shown in Table4.

In addition to accuracy-based evaluation, the system's responsivenesswasmeasuredtoassessitsreal-timeapplicability.Theaverageend-to-endresponsetimefrommessage submissiontosystemreplywas1.9s,withastandarddeviation of 0.6 s. The maximum observed latency was 3.2 s, which remains well within the acceptable range for instant messaging applications. These findings indicate that the proposed system not only achieves high accuracy but also meets the real-time interaction requirements of the LINE platform, ensuring both technical reliability and practical feasibility for real-world deployment.

5.4.2 DetailedErrorTypeAnalysis

To better understand the types and causes of errors during the system's inference process, this study conducteda detailedclassificationofallidentifiedmistakes.Bycomparing the system's outputs with the gold standard, three main types of errors were found: Hidden Nutrient Misclassification,FalseDrugInteractionWarning,andBorderlineValue Misinterpretation.Thefollowingsectionsprovideadetailed explanation of each error type:

The first error type, Hidden NutrientMisclassification, occurredmainlyinthefoodnutritionsummarymoduleand accounted for 50% of all identified errors.

Specifically, the system tends to underestimatepotential risks when processing meals that appear visually healthy butactuallycontainhighlevelsofsodiumorfat.Forexample,clearsoupsmayseemlightbutincludelargeamountsof saltyseasoning,orsaladsmayappearhealthyyetcomewith high-fat dressings that raise total fat intake.

These cases highlight the system's current limitation in detecting hidden ingredients when relying solely on visual analysis. To improve accuracy, future enhancements should incorporate textual menu descriptions and ingredient pre- diction models, enabling better identification of hidden nutritional risks.

The second major error type, False Drug Interaction Warning, made up about 33% of all identified errors. This occurs when the system wrongly flags safe medication com- binations as having potential interactions. To address this, the system includes disclaimers stating that the drug infor- mation is for reference only and that users should always follow their physician's guidance.

These errors refer highlight the need for more refined interaction databases and better context awareness to reduce unnecessary alerts while maintaining safety. The main causes of this issue include:

1. Unclear labeling on certain medications, leading to incorrect identification of ingredients.
2. Delays in updating the internal drug interaction knowl- edge base, resulting in failure to reflect the most recent clinical data.
3. The system adopts an overly conservative inference strategy, opting to flag potential interactions to enhance safety.

While conservative warnings are generally safer in medi- cal applications, an excessive number of false alerts may negatively affect user trust and willingness to continue using the system. Therefore, future improvements should focus on refining the contents of the knowledge base and designing more nuance d interpretation rules to achieve an optimal bal- ance between alert accuracy and user awareness.

The third error type, Borderline Value Misinterpretation, occurred in the health checkup report interpretation mod- ule and accounted for approximately 17% of all errors. This type of error happens when test values fall near the thresh- old between normal and abnormal. The system may mis- classify these borderline cases. For example:

1. An HbA1c value of 6.4% (with the normal upper limit at 6.5%) was incorrectly flagged as abnormal by the system.
2. An LDL cholesterol level of 130 mg/dL (a borderline high value) was not properly flagged by the system.

The analysis showed that the system is too strict when handling borderline values, causing misclassification of edge cases. This is a limitation in processing continu- ous numerical data near threshold values. While there is a manual calibration option to correct misinterpr etations, future improvements could include using Fuzzy Logic or Confidence Intervals to better handle values close to clinical thresholds with more flexibility and accuracy.

5.4.3 Consistency Analysis between Gold Standard and AI Output

To further examine the system's inference accuracy and degree of standardization, this study designed a consistency analysis comparing the AI outputs with the gold standard. The gold standard was jointly reviewed and constructed by a board-certified internal medicine physician and a regis- tered dietitian, serving as the reference for correct answers in all test cases. Each system output was compared indi- vidually against the gold standard to evaluate the model's reliability and robustness in practical applications.

The consistency distribution based on 50 test cases is as follows:

- Fully consistent (100%): 44 cases, accounting for 88% of all test cases.
- Highly consistent (80%–99%): 4 cases, accounting for 8%.
- Moderately consistent (60%–79%): 2 cases, accounting for 4%.
- Low consistency (below 60%): 0 cases, accounting for 0%.

The results show that 88% of cases matched the expert- defined gold standard, indicating that the system can accu- rately replicate expert-level judgment in most situations. This highlights the system's strong performance in food nutrition analysis, medication evaluation, and health report interpretation, as well as the clinical relevance and reliabil- ity of its knowledge base and reasoning process.

For the highly consistent cases (4 cases), analysis revealed the following main causes:

1. The system showed slight discrepancies in interpret- ing values near clinical thresholds in health checkup reports.
2. Minor errors occurred in identifying medication ingre- dients when drugs with similar appearances (e.g., differ- ent dosage forms or packaging) were processed.

Although such deviations did not cause major diagnostic errors, they could impact the accuracy of recommendations in certain cases, especially in chronic disease management or complex medication reviews.

Importantly, none of the test cases showed less than 60% consistency with the gold standard. This means there were no severe errors or complete mismatches, confirmin g that

the system's overall performance is stable and suitable for practical use.

For cases that did not achieve full consistency, thisstudy proposes the following directions for future system optimization:

1. Enhance threshold handling mechanisms: Forhealth checkup values near clinical boundaries, implement fuzzyr e a s o n i n g o r c o n f i d e n c e i n t e r v a l e v a l u a t i o n to improve the flexibility of interpreting continuous numerical values.
2. Improvemixed-typemealanalysis:Applymulti-modal learning by integrating various sources of information suchasimagesandtextualdescriptionstoovercomethe limitations of image-only recognition.
3. Continuouslyupdatethemedicationdatabase:Synchro- nize the latest drug formulations and ingredient information to prevent recognition errors caused by outdated data. Additionally, include contextual alerts, such as "consult your cardiologist for cardiac medications" or "consultyournephrologistforrenal-relatedwarnings."
4. Introduce a human–AI collaborative interface:When system inference is uncertain, design an assisted query mechanism to allow users to supplement necessary information and reduce inference bias.

By implementing these measures, the system isexpectedt o f u r t h e r i m p r o v e i t s c o n s i s t e n c y w i t h t h e g o l d s t a n - d a r d , r e d u c e m i s c l a s s i f i c a t i o n i n b o r d e r l i n e s c e n a r i o s , a n d e n h a n c e itsapplicabilityandtrustworthinessinhealthman- agement contexts.

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AuthorContributionsY.W. Chuang contributed to the designand implementation of the research, to the analysis of the results, and to thewritingofthemanuscript.Kuo-HsiungShuandTung-MinYucon- ceivedtheoriginalideaandsupervisedtheproject.Y.W.Chuangper- formed the experiments. All authors reviewed the manuscript.

DataAvailabilityNodatasetsweregeneratedoranalysedduringthe current study.

Declarations

CompetingInterestsTheauthors declarenocompetinginterests.

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Clinical Outcomes of Renal Transplant Recipients With and Without Post-Transplant Post-Infectious Glomerulonephritis: A Propensity Score-Matched Analysis

Number of figures and tables: 2 tables and 3 figures

Words of abstract:229 ; Words of article: 3816

Supplementary data: 1 figure

Short run title: Outcome between PIGN and Non-PIGN in RTX

ABSTRACT:

Background

Post-infectious glomerulonephritis (PIGN) is a rare but potentially serious cause of kidney injury following infection. This study aimed to compare long-term renal outcomes and comorbidities between kidney transplant recipients who underwent allograft biopsy with and without a diagnosis of PIGN.

Methods

We retrospectively identified patients from a large global multicenter database. De novo PIGN patients were matched 1:1 with non-PIGN patients using propensity score matching based on age, sex, body mass index, systolic blood pressure, comorbidities, and baseline kidney function. Clinical outcomes including acute rejection, chronic kidney disease (CKD) progression, dialysis, malignancy, and mortality were assessed using hazard ratios (HRs) and Kaplan-Meier survival analysis.

Results

The incidence of post-transplant PIGN was 0.016% among renal transplant recipients. After matching, baseline characteristics were comparable. The mean age was 45.4 years in the PIGN group and 43.3 years in the non-PIGN group. Acute rejection was significantly higher in the PIGN group (HR 1.833; 95% CI 1.107–3.037; p=0.012). Malignancy was more common in the PIGN group (p<0.0001). Other outcomes, including acute kidney injury (HR 1.150), stage 3-5 CKD progression, and dialysis use, did not show statistically significant differences. Kaplan-Meier

analysis confirmed a significant difference only in acute rejection (log-rank p=0.049).

Conclusions

PIGN is associated with an increased risk of acute rejection following transplantation. While managing infection in patients with PIGN, immunosuppressive therapy might be tapered cautiously to avoid precipitating allograft rejection.

Keywords: post-infectious glomerulonephritis (PIGN); renal transplant (RTX); chronic kidney disease (CKD); acute rejection

INTRODUCTION

Post-infectious glomerulonephritis (PIGN) is a kidney condition characterized by inflammation of the glomeruli that occurs following certain infections, most notably those caused by group A Streptococcus(1, 2), which leads to diseases such as Streptococcal pharyngitis and scarlet fever. Although the bacteria do not infect the kidneys directly, the immune response to bacterial antigens can result in significant kidney damage. PIGN is particularly notable for its prevalence in children, often presenting with classic symptoms such as hematuria (blood in urine), edema (swelling), and hypertension (high blood pressure), and is recognized as a common cause of acute kidney injury (AKI) in this demographic(3, 4). However, it is still rare in adults. Furthermore, its manifestations and clinical implications in renal transplant (RTX) recipients remain poorly characterized due to limited data. The pathophysiology of PIGN remains an area of ongoing research, with mechanisms including the binding of microbial antigens to the glomerular basement membrane and subsequent activation of inflammatory pathways(5). Diagnosing PIGN involves a combination of clinical evaluation and laboratory tests, including urinalysis and serological markers that indicate recent streptococcal infection. However, if the diagnosis remains unconfirmed and renal function continues to deteriorate, a renal biopsy is warranted to establish the underlying pathology(4). While the prognosis is generally favorable in children, with many experiencing complete recovery within weeks, adults who suffer from chronic debilitating diseases often face more complex outcomes(2). Controversies also surrounding PIGN primarily relate to its treatment protocols, which emphasize supportive care, management of symptoms, and eradication of the

underlying infection to prevent further complications(4). Furthermore, there is currently no evidence supporting the efficacy of immunosuppressive therapy in patients with PIGN(6). Nevertheless, some studies have suggested that corticosteroid therapy may be beneficial in selected cases of PIGN(7).

In addition to the aforementioned controversies regarding PIGN in adults, data on PIGN in RTX recipients is exceedingly limited. Immunosuppressive therapy may increase their susceptibility to infections while potentially reducing the immunologic risk for developing PIGN but still remains unclear. Renal outcomes of PIGN following RTX remain uncertain due to the lack of robust evidence. Emerging evidence suggests that deposition of the terminal complement complex C5b-9 within renal tissues is a characteristic finding in patients with PIGN(8), implicating complement-mediated cytotoxicity as a key mechanism linking infectious triggers to glomerular injury. The C5b-9 was also associated with antibody-mediated rejection (9). Thus, the risk and characteristics of allograft rejection in patients with PIGN following RTX are poorly defined. To date, reports of post-RTX PIGN in adult recipients have been limited to isolated case reports(10-18). No cohort or matched studies have investigated post-transplant PIGN compared to no PGIN groups.

Based on the aforementioned considerations, we aimed to investigate the impact of PIGN in adult RTX recipients by evaluating renal outcomes and allograft rejection risk, compared to non-PIGN recipients, using a matched cohort study design.

MATERIALS and METHODS

Database of TriNetx

This retrospective cohort study utilized data from the TriNetX Global Collaborative Network, which comprises 151 healthcare organizations (HCOs) across 15 countries. The network provides access to de-identified electronic health records (EHRs) and insurance claims data from over 155 million individuals. Within this network, a subset of 11.2 million patients with both EHR and claims data was available, allowing for the construction of a unified, longitudinal health profile for each patient.

TriNetX is an established real-time clinical research platform that harmonizes data using standardized coding systems, including ICD-10-CM for diagnoses, Anatomical Therapeutic Chemical (ATC) or RxNorm classification for medications, and Logical Observation Identifiers Names and Codes (LOINC) for laboratory measurements. As of this writing, more than 1,660 peer-reviewed publications utilizing TriNetX data have been indexed in PubMed, attesting to the platform's utility and validity in clinical research.

The dataset incorporated comprehensive information, including demographics, comorbidities, medication prescriptions, laboratory results, and healthcare utilization metrics. All data used in the present analysis were obtained exclusively from the TriNetX platform. The contributing HCOs encompassed a wide range of healthcare settings, including tertiary referral centers, primary care clinics, and specialty hospitals, representing both insured and uninsured populations.

Cohort selection was performed using standardized definitions for inclusion and exclusion criteria. The index event and index date were precisely defined, and a pre-specified window was used to extract baseline characteristics. Comparative analyses were conducted between cohorts using TriNetX's built-in 1:1 propensity score matching (PSM) algorithm, with careful consideration of matching covariates to minimize residual confounding. Follow-up duration, time-to-event outcomes, and censoring rules were also pre-defined to ensure analytic consistency and methodological rigor.

Ethics statement

This study was conducted using de-identified data retrieved from the TriNetX platform, which operates in full compliance with the Health Insurance Portability and Accountability Act (HIPAA) in the United States and the General Data Protection Regulation (GDPR) in the European Union. Owing to the de-identified and aggregate nature of the dataset, individual informed consent was not required. The Western Institutional Review Board (WIRB) has formally determined that research conducted using the TriNetX platform is exempt from IRB review, as it involves only the analysis of anonymized patient-level data without the possibility of re-identification.

In addition to the general compliance framework of TriNetX, this specific study protocol received ethical approval from the Institutional Review Board. The IRB granted approval under protocol number SE22220A-1, acknowledging the study's retrospective design and use of fully anonymized data. The work has been reported in line with the STROCSS criteria(19).

Patients recreuitment and population creation

The patient recruitment algorithm is illustrated in Figure 1A. Data were extracted from the TriNetX Global Collaborative Network, a federated research platform incorporating longitudinal health records from multiple healthcare organizations worldwide. The geographic distribution of patients is presented in Supplementary Figure 1. The study period extended from the inception of the TriNetX database up to March 17, 2025, which marked the date of cohort creation. Renal transplant (RTX) recipients were initially identified based on procedural codes for kidney transplantation (CPT 1008098) or relevant ICD-10 diagnostic codes (ICD-10-CM Z94.0). Among these patients, two cohorts were established: those with a diagnosis of PIGN and those without. Identification of PIGN cases was based on ICD-10 coding (ICD-10-CM N00.3), and all cases were required to have histopathological confirmation by renal biopsy to ensure diagnostic accuracy. All recipients with a history of PIGN prior to renal transplantation were excluded. In accordance with

the local ethical regulations, only patients aged 18 years and older were included in the study. After applying all inclusion criteria, patients in the PIGN and non-PIGN groups were subjected to 1:1 propensity score matching (PSM) to minimize baseline differences and facilitate comparative analysis of clinical outcomes.

Study design

The study designs for the PIGN and non-PIGN cohorts are illustrated in Figures 1B and 1C, respectively. In the PIGN group, the index event was defined as the initial diagnosis of PIGN, and the date of this diagnosis was designated as the index date. To ensure temporal clarity, patients in the PIGN cohort were required to have record of renal biopsy after RTX. Eligible cases required an allograft biopsy performed post-transplant, proximate to the index PIGN diagnosis date, which was used to anchor cohort entry and outcome ascertainment. In the non-PIGN group, the index event was defined as the first recorded renal biopsy. The date of this biopsy served as the index date. Patients in this group must not have received a diagnosis of PIGN at any point during the study period.

For both groups, baseline clinical and laboratory data were extracted from the period spanning one year to one day prior to the index date. The most recent values within this window were used for baseline characterization. To minimize reverse causality, outcome data collection commenced seven days after the index date and extended up to ten years post-index, allowing for robust long-term follow-up.

Baseline data and outcome definitions

For both cohorts, we collected a comprehensive set of baseline and outcome-related variables, including demographics, comorbidities, laboratory measurements, immunologic profiles, and relevant medications. Demographic variables included age, sex, race, and body mass index (BMI; code 9083). Comorbidities of interest were heart failure (ICD-10-CM: I50), ischemic heart disease

(ICD-10-CM: I20–I25), and neoplasms (ICD-10-CM: C00–D49). Laboratory data included glycated hemoglobin (HbA1c; code 9037), estimated glomerular filtration rate calculated by the CKD-EPI equation (eGFR; code 62238-1), and systolic blood pressure (code 9085). Immunologic assessments comprised B-cell crossmatch (code 38357-0), T-cell crossmatch (code 35459-7), and HLA antibody screening (code 46993-2). Additionally, the use of induction therapy with basiliximab (code: 196102) and maintenance therapy with steroids (ATC: H02A), cyclosporine (RxNorm: 3008), tacrolimus (RxNorm: 42316), mycophenolic acid (RxNorm: 7145), sirolimus (RxNorm: 35302), and everolimus (RxNorm: 141704) was recorded. All variables were mapped to standardized coding systems embedded within the TriNetX platform, including LOINC for laboratory values and RxNorm for medications. Due to the limitation of database, donor-specific variables (donor type, age and renal function) are unavailable.

To minimize the risk of reverse causality, outcome assessment began seven days after the index date. Patients with a history of the outcome prior to the index date were excluded, thereby ensuring that all outcomes evaluated were incident events. Acute kidney injury (AKI) was identified using ICD-10-CM code N17. Chronic kidney disease (CKD) stages 3, 4, and 5 were defined using ICD-10-CM codes N18.3, N18.4, and N18.5, respectively, while end-stage kidney disease (ESKD) was defined by code N18.6. Hemodialysis was identified using the following codes: SNOMED CT 302497006, ICD-9-CM 39.95, CPT codes 1012752 and 1006747. Peritoneal dialysis was defined by VA code IR200, and SNOMED CT codes 71192002, 718308002, 428648006, and 238321006, as well as ICD-10 code Z99.2. The general category of dialysis encompassed patients receiving either hemodialysis or peritoneal dialysis. Final kidney function was evaluated using the eGFR based on the CKD-EPI equation, identified through LOINC code 62238-1. Kidney acute rejection was determined using ICD-10-CM codes T86.10 and T86.11. Malignancy was defined using ICD-10-CM code C80.1.

Statistical Analyses

In this study, propensity score matching (PSM) was performed using the built-in functionality of the TriNetX platform to generate balanced cohorts in a 1:1 ratio. Matching variables included demographic characteristics (age, sex, race, and body mass index), comorbid conditions (heart failure, ischemic heart disease, and neoplasms), laboratory parameters (glycated hemoglobin, estimated glomerular filtration rate [eGFR] calculated using the CKD-EPI equation, and systolic blood pressure), immunologic markers (B-cell crossmatch, T-cell crossmatch, and HLA antibody screening), and immunosuppressive medication (basiliximab). This approach ensured comparability between the PIGN and non-PIGN groups with respect to key baseline characteristics.

The PSM technique was seamlessly incorporated into the TriNeTx system. This was achieved by employing a greedy nearest neighbor matching algorithm with a caliper set at 0.1 times the pooled standard deviations (SDs). In cases where the Standardized Mean Difference (SMD) was less than 0.1, it indicated a minimal difference, demonstrating the effectiveness of the matching process.

Subsequently, hazard ratios (HRs) with corresponding 95% confidence intervals (CIs) were calculated to assess outcome differences between the PIGN and non-PIGN groups. The proportional hazards assumption was evaluated using the generalized Schoenfeld residual method integrated within the TriNeTx analytics platform. For continuous variables, comparisons between groups were performed using Student's T-test, with results presented as mean ±SD.

In our Kaplan–Meier survival analyses, patients were censored at the point when they no longer contributed information relevant to the outcome of interest. Censoring was applied under two specific conditions: (1) If the last recorded clinical event for a patient occurred within the predefined follow-up window, the patient was censored on the day immediately following that event. (2) If a patient experienced the outcome after the index date but prior to the start of the follow-up window—resulting in a temporal gap between the index event and the analysis period—

the patient was censored at the beginning of the observation window. This approach ensured accurate handling of incomplete follow-up and avoided potential biases from reverse causality.

RESULTS

Baseline characteristics of this cohort before and after matching

Out of 224,793 renal transplant recipients, only 35 (0.016%) confirmed cases of PIGN were identified. Before PSM, a total of 35 patients were included in the PIGN group and 37,673 patients in the non-PIGN group (Table 1). Patients in the PIGN group tended to be younger (45.4 ± 17.9 vs. 49.4 ± 16.5 years, $p = 0.163$), and more frequently male (65.6% vs. 59.2%, $p = 0.460$), although neither difference reached statistical significance. BMI was similar between groups (28.6 ± 6.0 vs. 28.4 ± 6.1 kg/m², $p = 0.871$). A higher proportion of White race was observed in the PIGN group (62.5% vs. 48.6%, $p = 0.117$), and a lower proportion of patients had comorbid neoplasms (46.9% vs. 29.1%, $p = 0.026$). Notably, basiliximab use was significantly higher in the PIGN group (31.3% vs. 10.4%, $p < 0.001$).

After 1:1 PSM, 32 matched pairs were retained, and baseline characteristics between the PIGN and non-PIGN groups were well balanced. The SMDs for all covariates were <0.1, indicating successful matching. The mean age was 45.4 ± 17.9 years in the PIGN group and 43.3 ± 17.7 years in the non-PIGN group (SMD = 0.094). Male sex was slightly more prevalent in the non-PIGN group (75.0% vs. 65.6%, SMD = 0.206), but the difference was not statistically significant. BMI remained similar between groups (28.6 ± 6.0 vs. 28.3 ± 5.2 kg/m², SMD = 0.054), as did systolic blood pressure and key laboratory values including estimated glomerular filtration rate (eGFR; 32.7 ± 26.1 vs. 32.5 ± 27.2 mL/min/1.73 m², SMD = 0.006) and glycated hemoglobin (6.0 ± 1.1% vs. 5.7 ± 1.1%, SMD = 0.075). The proportions of patients with heart failure, ischemic heart disease, and neoplasms were also equivalent after matching. Use of basiliximab remained consistent at 31.3% in both groups post-matching.

Clinical Outcomes After Propensity Score Matching between PIGN and non-PIGN groups

Following 1:1 PSM, clinical outcomes were compared between patients with PIGN and matched non-PIGN controls in table 2 and figure 2. The mean duration of follow-up was 6.38 ± 3.39 years in the PIGN group and 3.93 ± 2.56 years in the non-PIGN group. The incidence of AKI was comparable between groups (23 vs. 20 patients; HR: 1.150, 95% CI: 0.814–1.624; p = 0.424). For CKD progression, 10 patients in each group progressed to stage 3 CKD (HR: 1.812, 95% CI: 0.966–3.400; p = 0.070), which approached statistical significance. In contrast, differences in stage 4 CKD, stage 5 CKD, and mean final eGFR were minimal and not statistically significant.

A significantly higher incidence of kidney allograft acute rejection was observed in the PIGN group compared to controls (22 vs. 12 patients), with a HR of 1.833 (95% CI: 1.107–3.037; p = 0.012), indicating a markedly increased risk. The incidence of hemodialysis was higher in the PIGN group (15 vs. 10 patients), although this difference was not statistically significant (HR: 1.500; 95% CI: 0.797–2.824; p = 0.200). Similarly, the use of peritoneal dialysis was comparable between groups (14 vs. 13 patients; HR: 1.077; 95% CI: 0.606–1.912; p = 0.800).

Interestingly, the incidence of malignancy was significantly higher in the PIGN group (10 vs. 0 patients) (p < 0.0001). There was no significant difference in all-cause mortality between groups (11 vs. 10 patients; HR: 1.100; 95% CI: 0.545–2.220; p = 0.790).

Kaplan–Meier Survival Analysis of Outcomes Between PIGN and Non-PIGN Groups

Kaplan–Meier survival curves were generated to compare time-to-event outcomes between the PIGN and non-PIGN groups (Figure 3). The survival probability for AKI did not differ significantly between groups (log-rank p = 0.893) (Figure 3A). Similarly, there were no significant differences observed in the progression to stage 3 CKD (p = 0.832) (Figure 3B), stage 4 CKD (p = 0.659) (Figure 3C), or stage 5 CKD (p = 0.336) (Figure 3D).

However, a statistically significant difference was observed in the incidence of kidney acute rejection, with the PIGN group showing a higher cumulative incidence compared to the non-PIGN group (log-rank p = 0.049) (Figure 3E), indicating inferior graft survival in patients with a history of PIGN. The timing of rejection after the diagnosis of PIGN was 381.85 ± 464.88 days, with a median (IQR) of 214 days (22.0, 562.25). Notably, eight patients (36.7%) experienced rejection within one month following the diagnosis of PIGN.

For other clinical outcomes, including malignancy (p = 0.527) (Figure 3F), all-cause mortality (p = 0.255) (Figure 3G), hemodialysis initiation (p = 0.128) (Figure 3H), and peritoneal dialysis initiation (p = 0.989) (Figure 3I), no significant differences were identified.

These results further support the finding that PIGN is associated with a higher risk of graft acute rejection, while other long-term outcomes appear comparable between groups.

DISCUSSION

The incidence of PIGN following RTX remains extremely low, despite the increased risk of infection associated with immunosuppressive therapy. To date, only case reports have been published(10-18), and incidence estimates have been limited to single-center experiences. Our study is the first to report the incidence of post-transplant PIGN using a global, multicenter network database, revealing a incidence of approximately 0.016%. Our study is also the first to show that post-RTX PIGN patients had a significantly higher risk of kidney allograft acute rejection compared to the non-PIGN group; however, the overall renal long-term outcomes remained similar between groups.

According to previous case reports(10-18) , the renal outcomes of PIGN were heterogeneous. The main reason is that it is difficult to determine whether the progression is due to PIGN, infection, or both(18). Therefore, no standardized treatment has been established(6). Some patients received steroid pulse therapy, plasmapheresis, or no treatment at all. According to case reports and

existing literature(18), the outcomes of post-transplant PIGN are generally poor(14, 15, 18, 20-23). Outcomes reported in existing case studies generally assess the clinical course of individual patients before and after the onset of post-transplant PIGN, thereby implicitly comparing affected individuals to the broader population of renal transplant recipients. Within this framework, it is not unexpected that patients with PIGN exhibit poorer outcomes. However, to date, no studies have conducted a direct comparison of clinical outcomes between biopsy-confirmed renal transplant recipients with PIGN and those without, limiting the ability to contextualize the impact of PIGN within comparable patient cohorts. This is the first well-matched, cohort-based study to investigate long-term renal outcomes and acute rejection risks in RTX patients with PIGN compared to those undergoing biopsy for other reasons. Prior to this study, existing literature consisted solely of case reports (18 cases) lacking appropriate control groups. Our findings demonstrate that although post-RTX PIGN is associated with a higher risk of rejection, the long-term renal outcomes appear comparable to those of non-PIGN patients.

PIGN is an immune complex–mediated disorder in which the host immune system is activated by bacterial or viral antigens, leading to glomerular inflammation (2). In our study, post-transplant PIGN was associated with a significantly higher risk of acute rejection compared to biopsy-confirmed recipients without PIGN. This finding is consistent with prior case reports, including one by Moroni G et al (18), in which acute rejection occurred shortly after the diagnosis of PIGN. Several immunopathological mechanisms may underline this increased risk of rejection. First, infection is often the dominant clinical concern in patients with PIGN, prompting a reduction or temporary withdrawal of immunosuppressive therapy—an approach that may inadvertently elevate the risk of allograft rejection. Second, viral or bacterial infections have been shown to function as immunologic adjuvants, enhancing alloimmune responses and precipitating acute rejection episodes (24). Third, infections can heighten the host immune response to donor antigens, thereby increasing susceptibility to rejection (24). Fourth, cross-reactivity between microbial antigens and allograft-

derived antigens may activate immune effector cells, further contributing to acute rejection (25). Finally, infections are known to stimulate the release of pro-inflammatory cytokines (26, 27), which in turn promote T and B cell activation and amplify the alloimmune cascade (28, 29). Therefore, compared to other diagnosis of graft biopsy, PIGN was associated with a higher risk of acute rejection. While infection management is essential, immunosuppressive therapy should not be excessively tapered, as doing so may increase the risk of acute rejection. Optimal treatment requires a careful balance between controlling infection and maintaining adequate immunosuppression.

The observed excess risk of malignancy in renal transplant recipients who developed PIGN may be explained by several factors. First, there may be residual differences in baseline malignancy risk factors between groups that were not fully matched. As this study was not specifically designed to evaluate malignancy outcomes, baseline variables associated with malignancy risk were not systematically included or adjusted during cohort construction. Second, patients with PIGN may have received more intensive or prolonged immunosuppressive therapy prior to the diagnosis. Although immunosuppression is often tapered after PIGN, these patients may already have accumulated a higher cumulative exposure, thereby increasing their risk of malignancy. Third, the development of PIGN often reflects a clinically significant infection (bacterial, viral, or other pathogens), which is associated with oncogenic viral reactivation, such as Epstein–Barr virus (EBV)(30), human papillomavirus (HPV)(31-33), hepatitis B virus (HBV)(34, 35), and hepatitis C virus (HCV)(36, 37), as well as chronic inflammation. Certain infectious triggers of PIGN may also exert direct oncogenic effects, for example EBV leading to post-transplant lymphoproliferative disorder (PTLD)(38) or HPV contributing to squamous cell carcinoma(39, 40). However, due to the limitation of TriNetX (the platform restricts disclosure of detailed counts to prevent potential re-identification of individual patients)(41), we cannot have data of specifying the tumor sites. Finally, PIGN itself represents ongoing immune injury and inflammatory activity in the graft, which may further promote systemic pro-oncogenic signaling through oxidative stress and cytokine release.

Taken together, these mechanisms may underlie the higher risk of malignancy observed in patients with PIGN compared with those without. Future prospective studies specifically designed to assess malignancy outcomes are warranted to clarify this relationship.

This study has several limitations that should be acknowledged. First, data regarding the primary etiology of ESKD prior to transplantation was unavailable. Second, important donor-related information—such as donor type (living vs. deceased), HLA mismatch and baseline donor renal function—was not captured, which may influence both graft survival and immune response. Third, the baseline renal function of our cohort was already compromised, with a mean eGFR of approximately 32 mL/min/1.73 m^2, potentially limiting the sensitivity to detect further renal decline over time. Fourth, the causative organisms of PIGN were not identified. Fourthly, although our study utilized a large-scale multicenter database, the number of biopsy-confirmed PIGN cases after RTX remained limited, which may affect the statistical power and generalizability of the findings. Sixth, the diagnosis of PIGN was based solely on ICD codes. Nonetheless, given its characteristic pathological features (e.g., exudative glomerulonephritis with neutrophils, ‘starry-sky’ C3 deposits, and subepithelial hump-like deposits), ICD coding is considered reasonably sufficient for case identification. Finally, causal relationships cannot be established due to the observational study design. Despite these limitations, our study provides novel and clinically relevant evidence demonstrating that RTX recipients with PIGN have a significantly higher risk of acute rejection compared to matched non-PIGN recipients, even in the setting of similar long-term renal function outcomes. These findings underscore the importance of vigilant monitoring and further research to better understand the immunological implications of PIGN in transplant populations.

CONCLUSION

This is the first study to show that PIGN following RTX was associated with a significantly higher risk of allograft acute rejection compared to non-PIGN biopsy-matched recipients. However, long-term renal function appeared to be comparable between the two groups. While managing infection in

patients with PIGN, immunosuppressive therapy might be tapered cautiously to avoid precipitating acute rejection. Further prospective studies are warranted to guide the management of PIGN in RTX recipients.

Ethics approval and consent to participate: our study was approved by the Human Research Review Committee (approval number SE22220A-1).

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Figure legends

Figure 1. Patient selection algorithm and definition of groups

A. Patients selection algorithm

B. Definition of PIGN group

C. Definition of non-PIGN group

Figure 2. Forest plot of outcomes between PIGN and non-PIGN

Figure 3. Kaplan - Meier survival analysis for patients' outcome (purple: PIGN, green: non-PIGN)

A. Acute kidney injury (log-rank p=0.893)

B. Stage 3-CKD (log-rank p=0.832)

C. Stage 4-CKD (log-rank p=0.659)

D. Stage 5-CKD (log-rank p=0.336)

E. Kidney rejection (log-rank p=0.049)

F. Malignancy (log-rank p=0.527)

G. Mortality (log-rank p=0.255)

H. Hemodialysis (log-rank p=0.128)

I. Peritoneal dialysis (log-rank p=0.989)

The effect of probiotic (Clostridium butyricum) on adult patients with atopic dermatitis: a retrospective cohort study from TriNetX

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ABSTRACT

Background: Previous research on probiotics has mainly focused on eczema in infants and pregnant women, withlimitedbenefitsobservedinadults.Miyarisan,aprobioticknownforsupportinggutbarrierfunction,hasnot been extensively studied for its effects on eczema in adult populations.

Methods: WeusedtheTriNetXglobalnetwork(2014–2024)tocompareMiyarisanuserswithnon-usersamongeczema or dermatitis patients. Propensity score matching (PSM) reduced bias, and hazard ratios (HRs) with 95 %confidenceintervals(CIs)andKaplan-MeiercurvesassessedskinoutcomesbasedontheSCORADindex.Sub-groupanalysesexploredvariationsbysex,age,andmedicationrefillfrequency,withasensitivityanalysis focusing on atopic dermatitis patients.

Results: *Following* 1:1PSM,thestudyanalyzed1600casesineachgroup(Miyarisanusersandnon-users)withoutdifferencebetweenbaselinevariables.Theincidenceofitching(HR = 0.372, 95%CI:0.287–0.481,p < 0.001),redness(HR = 0.065,95%CI:0.040–0.108,p < 0.001),dryness(HR = 0.358,95%CI:0.285–0.449, p < 0.001),swelling(HR = 0.164,95%CI:0.101–0.265,p < 0.001),scratching(HR = 0.426,95%CI: 0.296–0.612,p < 0.001),andthickening(HR = 0.325,95%CI:0.225–0.467,p < 0.001)weresignificantly lowerintheMiyarisangroupcomparedtothenon-Miyarisangroup.Thesebenefitswereconsistentacrossdifferent gender andagesubgroups.According toindividualSCORAD measures,reducedskin rednesswasconsistently observed across all subgroups. When focusing on atopic dermatitis, Miyarisan users also showed alowerriskofadverseskinoutcomes,similartopatientswitheczemaordermatitis.

Conclusion: *Miyarisan* useinadultsmayreducetherecurrenceofeczemaordermatitis,withconsistentbenefits across both sex and age groups. These findings are also observed in patients with atopic dermatitis.

1. Introduction

Eczemaordermatitis,achronicinflammatoryskincondition,is closelylinkedtotheimmunesystemandoftenshowsfamilialaggrega- tion[1]. Thegut constitutes the largest component of the human im-mune system[2–4]. Therefore, The World AllergyOrganization(WAO) guidelinessuggestapotentialbenefit ofprobiotics inreducing therisk ofatopic dermatitis during pregnancy (risk reduction of 20 %) [5]. However,theefficacyofprobioticsinpreventingatopicdermatitisin childrenoverfouryearsofageremainsinconclusiveduetoinsufficient evidence. Cochrane reviews in 2008 [6] and 2018 [7] reported no significantdifferencesineczemaoutcomesbetweenprobioticusersand non-usersin thisage group. Arecentsystematicreview[8]including fourrandomizedcontrolledtrialsandtwonon-randomizedtrials, demonstratedtheefficacyoftheexperimentaltreatmentusing measurableoutcomessuchastheScoringAtopicDermatitisIndex (SCORAD) [9].

Theuncertaineffectofprobioticsoneczemamaybeattributedto

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variationsinbacterialstrainsacrossdifferentprobioticformulations, whichcanresultindifferingtherapeuticeffects.Miyarisanisaprobiotic containingClostridiumbutyricum.ClostridiumbutyricumMIYAIRI (CBM),astrainofC.butyricum,isanobligateanaerobic,spore-forming bacterium that produces butyric acid. CBM588 was first isolated from humanfecalmaterial[10]in1933byDr.MiyairiattheDepartmentof Hygiene,ChibaMedicalCollege.Presently,Miyarisanisapprovedfor treating diarrhea, constipation,and irritable bowel disease. In a murine study,theadministrationofC.butyricumwasfoundtoenhancethe inhibitoryeffects ofspecific immunotherapyon allergicinflammation withintheintestinaltract[11].Anotherstudyinmicedemonstratedthat C. butyricum significantly alleviated symptoms of intestinalanaphylaxisinmodelsof foodallergy.[12]. Inahuman studyinvolving full-term infants [13], the supplementation of C. butyricum during the neonatal periodfacilitatedtheestablishmentofabalancedintestinalmicro-ecology,whichwasassociatedwithareducedincidenceofatopic dermatitisHowever,theeffectofMiyarisanoneczemainolderin- dividuals remains unknown.

Thisstudyaimedtoinvestigate theeffects ofMiyarisanondermatitisoreczemainadultpatientsusingdatafromaglobalc ollaboratedatabase.

2. MATERIALSandMETHODS

2.1. DatabaseofTriNetX

WeutilizedtheextensivedatasetprovidedbyTriNetX'sGlobal CollaborativeNetwork,whichincludesdatafrom131prominent healthcareorganizations.TriNetXintegratesinformationfromElec-tronicHealthRecordsandinsuranceclaimsintoaunified,longitudinal record,coveringover139millionindividualsacross15countries.To date,TriNetXhascontributedtomorethan1019articlesindexedin PubMed.TheTriNetXdatabasecapturescomprehensive,structured clinicaldata,includingdetaileddemographicinformation,diagnoses codedusingICD-10-CM,proceduresdocumentedthroughICD-10-PCS andCPT,andclinicalconceptsmappedviaSNOMEDCT.Medication recordsarealignedwiththeVeteransAffairsNationalFormulary,while laboratoryresultsarestandardizedusingLOINCcodes.Thedatasetalso includes metrics on healthcare utilization. Data are aggregated from a widerangeofcaresettings,includingtertiaryhospitals,primarycareclinics, andspecialty centers. Operating as afederated network, TriNetXensures strict compliance with data privacy regulations while support-inglarge-scale,real-worldevidencestudies,makingitapowerful resource for global clinical research.

Sincethe data isanonymized, informedconsent wasnotrequired. Our use of the TriNetX platform for this study received approval from theInstitutionalReviewBoard(IRB)atTaichungVeteransGeneral Hospital (approval number: CE23480C#1).

2.2. Studydesign

DetailedstudydesignsarepresentedinFig.1AfortheMiyarisan groupandFig.1Bforthenon-Miyarisangroup.Theconstructionofthe entirecohortisshowninFig.1C.FortheMiyarisangroup(Fig.1A),the index eventis the use of Miyarisan, and the reference time is the index date.Anydiagnosisofezcemashouldprecedetheindexeventbyatleast oneday.Inthenon-Miyarisanstudydesign(Fig.1B),includedpatients shouldnothavetakenanyMiyarisanduringthestudyperiod.Theindex event is the diagnosis of ezcema. The time windows for baseline data collectionforbothgroupsarethesame:withinoneyearbeforetheindex event, and we collect the most recent data available. The time window for the outcome follow-up is at least one month after the index event untilendoffollow-uptoavoidreversecausality.Forourstudy,we analyzed data spanning a decade (from January 1, 2014, to January 1, 2024),leveragingthecomprehensiveglobalcollaborativenetwork facilitatedb y T r i N e t X , w h i c h c o m p i l e s s e c o n d a r y , d e - identified

electronicmedicalrecords (EMRs)and claimsdata fromparticipating healthcare organizations.

2.3. Cohortselection

ThestudypopulationwasdefinedusingICD-10-CMcodesL20-L30 foreczemaanddermatitis.Individualsundertheageof18were excludedinaccordancewithregulatoryrequirements.Inoursensitivity analysisfocusedonatopicdermatitis,weusedICD-10-CMcodesL20, L20.8,andL20.9.Baselinecomorbiditiesandmedicationsassociated with skin lesions were collected (Supplementary Table 1).

Forsubgroupanalysis,thestudypopulationwascategorizedintothefollowinggroups:malevs.female,individualsaged18–65vs.thoseaged65andabove,andbyfrequencyofprescriptionrefills(atleast1, 3,6,9, and 12 times). Since most eczema cases are atopic dermatitis, we also conductedoutcomestudiesspecificallyforpatientswithatopicdermatitis.

2.4. Outcomeascertainment

To prevent reverse causality, the follow-up period commenced one monthaftertheindexeventandcontinueduntiltheendofthestudy.Weused the SCORAD (SCORing Atopic Dermatitis) tool to assess skinlesionoutcomes[9],includingredness,swelling,oozing/crusting,scratch marks,skinthickening(lichenification),anddryness(Supplementary Table1).Theabouveclinicaloutcomessuchasatopicdermatitisand eczemawereidentifiedusingICD-10diagnosiscodesdocumentedin patientrecords.Thesewerenotself-reportedbutderivedfrom provider-entered diagnostic codes.

2.5. Statisticalanalyses

Inthisstudy,weapplied1:1propensityscorematching(PSM)using theTriNetXplatformtoensurecomparablebaselinecharacteristics, using a greedy nearest neighbor matching with a 0.1 caliper. Matching variables included demographics (age, gender, race) and medical conditions(cellulitis,acutelymphangitis,pepticulcer).Continuousvariableswerereportedasmean ± SD,andcategoricalvariablesasn(%), withcomparabilityassessedbystandardizedmeandifference(SMD). Post-matching,hazardratios(HRs)foroutcomeswerecomputedfortheMiyarisan and non-Miyarisan groups, and Kaplan-Meier survival curveswere plottedforsignificantHRs (vialog-ranktest),withstatisticalsig-nificance set at 95 % CI. In TriNetX database analyses, HRs are typicallycomputedusingCoxproportionalhazardsregressionmodels,whicharebuiltintotheTriNetXanalyticsplatform.KMsurvivalcurvesare computed using standardnon-parametricsurvivalanalysismethods, withthecomputationandplottinghandledbytheplatform'sbuilt-in analytics engine.

InTriNetXdatabaseanalyses,p-valuesarecalculatedusingstandard statisticaltests basedonthe typeof dataandanalysis.Forcomparisons ofcategoricalvariables,the*Chi*-squaretestisused,orFisher'sexacttest whenappropriate.Forcontinuousvariables,theindependentsamples*t*-testisappliedfornormallydistributeddata,whiletheMann–Whitney*U*testisusedfornon-normallydistributeddata.Fortime-to-eventanalyses,thelog-ranktestisemployedtocomparesurvivaldistributions between groups. A p-value of less than 0.05 is considered statisticallysignificant.

3. Results

3.1. Patientselectionalgorithms

ThepatientselectionalgorithmissummarizedinFig.1C.We enrolledpatientswitheczema,aged≥18yearsold,withintherecent10 years(fromJanuary01,2014toJanuary01,2024).Initially,therewere 7,275,910patientsdiagnosedwithdermatitisandeczema.Amongthem,

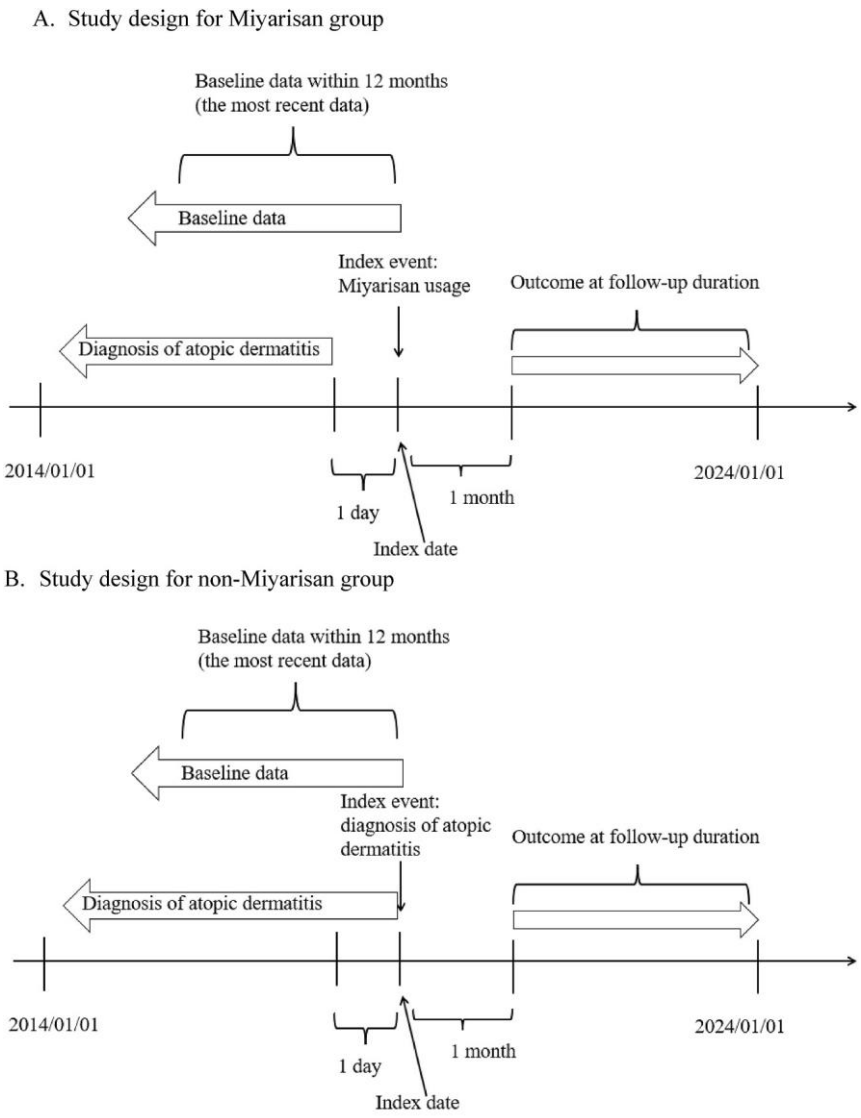

Fig. 1. Study design (Miyarisan (A) and non-Miyarisan (B) group), and flowchart of cohort construction (C).

6,037,310 never used Miyarisan, while 1061 had used Miyarisanafter theirdiagnosis.Afterperforming1:1propensityscorematching(PSM), 1600patientswereincludedineachofthenon-MiyarisanandMiyarisan groupsforfurtheranalysis.Themeanfollow-updurationwas2.4±2.1 yearsfortheMiyarisangroupand2.3±1.9yearsforthenon-Miyarisan group. Inthis cohort(Supplementary Fig.1),91% ofthepatientswere

Outcomeofskin

Patientnumberswithoutcome

Absoluteriskdifference(95 % with

Relativehazardr a t i o (95%

from theUnited States,while9 %werefrom outsidethe UnitedStates.

3.2. Baselinecharacteristicsofthiscohortbeforeandaftermatching

BeforeandafterPSM(Table1),therewerenosignificantdifferencesbetwe entwogroupsinterms ofage,gender, race,percentageof cellulitisand acute lymphangitis, percentage of peptic ulcer disease, andmedi- cation usage (including both topical and systemic antihistamines, cor- ticosteroids,e m o l l i e n t s , a n d a n t i - p s o r i a t i c a g e n t s) . A f t e r P S M , the cohort(bothn=1600)isrelativelyyoung,withameanageof30years, and predominantly female (57.1 %). More than half of the patients had receivedtopicalanti-inflammatoryagents,whilearound40%had receivedsystemiccorticosteroidsandantihistamines.Allassociated variableswerewell-matched(allSMDs<0.1),asshowninSupplemen- taryFig.2.

3.3. Incidence of skin outcomes between miyarisan and non-miyarisangroup

CI)

The skin outcomes of eczema measured using SCORAD, betweenthe Miyarisanandnon-MiyarisangroupsafterPSMarepresentedinTable2 andSupplementaryFig.3.Theincidenceofitching(HR=0.372,95% CI:0 . 2 8 7 – 0 . 4 8 1 , p < 0 . 0 0 1) , r e d n e s s (H R = 0 . 0 6 5 , 9 5 % CI: 0.040–0.108,p<0.001),dryness(HR=0.358,95%CI:0.285– 0.449,p <0.001),swelling(HR=0.164,95%CI:0.101–0.265,p<0.001), scratching(HR=0.426, 95%CI:0.296–0.612, p<0.001), andthick- ening(HR=0.325,95%CI:0.225– 0.467,p<0.001)weresignificantly lower in the Miyarisan group compared to the non-Miyarisan group.

In terms of Kaplan-Meier curves (Fig. 2), Miyarisan group werewith lessrisksofskinitching(Fig.2A,p<0.001),redness(Fig.2B,p<0.001), dryness (Fig. 2C, p<0.001), swelling (Fig. 2D, p<0.001) and thickness (Fig. 2F, p=0.003) compared to non-Miyarisan group.

Table2
IncidenceofskinoutcomesamongMiyarisanandnon-Miyarisangroup(afterp r o s p e r i t y s c o r e m a t c h i n g).

pvalue

	Miyarisan	Non-Miyarisan	wi th CI)		
Itching	74(4.6	201(12.5	**¡0.078**	**0.372**	**<0.001**
	%)	%)	**(-0.097,**	**(0.287,**	
			-0.059)	**0.481)**	
Redness	16(0.010	245(15.3	**¡0.143**	**0.065**	**<0.001**
	%)	%)	**(-0.162,**	**(0.040,**	
			-0.125)	**0.108)**	
Dryness	93(5.8	260(16.3	**¡0.105**	**0.358**	**<0.001**
	%)	%)	**(-0.126,**	**(0.285,**	
			-0.083)	**0.449)**	
Swelling	19(1.2	116(7.3	**¡0.061**	**0.164**	**<0.001**
	%)	%)	**(-0.074,**	**(0.101,**	
			-0.047)	**0.265)**	
Scratch	40(2.5	94(5.9%)	**¡0.034**	**0.426**	**<0.001**
	%)		**(-0.048,**	**(0.296,**	
			-0.020)	**0.612)**	
Thickening	37(2.3	114(7.1	**¡0.048**	**0.325**	**<0.001**
	%)	%)	**(-0.063,**	**(0.225,**	
			-0.034)	**0.467)**	
Crusting	80(5.0	87(5.4%)	−0.004	0.920	0.578
	%)		(−0.020,	(0.684,	

3.4. Subgroup analyses conducted based on gender (male vs. female), age(18-<65y/ovs. (≥65y/o),andfrequencyof medicationprescription(atleast 3, 6, 9, and 12 times)

Baselinecharacteristicsofstudysubjectsarepresentedaccordingto male gender (Supplementary Table 2), female gender (Supplementary Table3),youngage(SupplementaryTable4),olderage(Supplementary Table5),atleast3refilltimes(SupplementaryTable6),atleast6refill times(SupplementaryTable7), atleast9 refilltimes(Supplementary Table 8), and at least 12 refill times (Supplementary Table 9). All sub-groupanalysesdemonstratedwell-balancedpropensityscores,except forthesubgroupswithat least9refilltimesandat least12refilltimes.

Table1
Baselinecharacteristicsofstudysubjects(beforeandafterpropensityscorematching).

	Beforematching				Aftermatching			
CharacteristicName	Miyarisangroup(n =1601)	Non-Miyarisangroup(n= 5,907,769)	pvalue	SMD	Miyarisangroup(n =1600)	Non-Miyarisangroup(n =1600)	pvalue	SMD[a]
Demographicdata								
Ageat Index(y/o)	30.4±32.1	34.9±27.0	<0.001	0.151	30.4±32.1	29.9±31.2	0.656	0.016
Male	690(43.1%)	2,395,092(40.5%)	0.037	0.052	690(43.1%)	687(42.9%)	0.915	0.004
Race								
HispanicorLatino	0(0%)	608,455(10.3%)	<0.001	0.479	0(0%)	0(0%)	–	<0.001
Asian	514(31.2%)	252,205(4.3%)	<0.001	0.774	513(32.1%)	503(31.4%)	0.704	0.013
Comorbidity								
Cellulitisandacute lymphangitis	100(6.2%%)	148,135(2.5%)	<0.001	0.184	100(6.3%)	92(5.8%)	0.552	0.021
Pepticulcerdisease	91(5.7%)	12,259(0.2%)	<0.001	0.328	90(5.6%)	85(5.3%)	0.697	0.014
Medication								
Anti-inflammatoryagents, topicusage	1036(64.7%)	1,059,967(17.9%)	<0.001	1.079	1035(64.7%)	1043(65.2%)	0.767	0.010
Anti-histamineagents,topic	757(47.3%)	833,484(14.1%)	<0.001	0.771	756(47.3%)	756(47.3%)	1	<0.001

usage								
Corticosteroidsforsystemic use	651(40.7%)	1,248,376(21.1%)	<0.001	0.432	651(40.7%)	642(40.1%)	0.746	0.011
Anti-histaminesforsystemic use	748(46.7%)	842,929(14.3%)	<0.001	0.753	747(46.7%)	754(41.7%)	0.804	0.009
Emollients	141(8.8%)	431,026(7.3%)	0.020	0.056	141(8.8%)	141(8.8%)	1	<0.001
Anti-psoriatic	53(3.3%)	54,631(0.9%)	<0.001	0.166	53(3.3%)	54(3.4%)	0.922	0.003

[a]SMD: standardmeandifference.

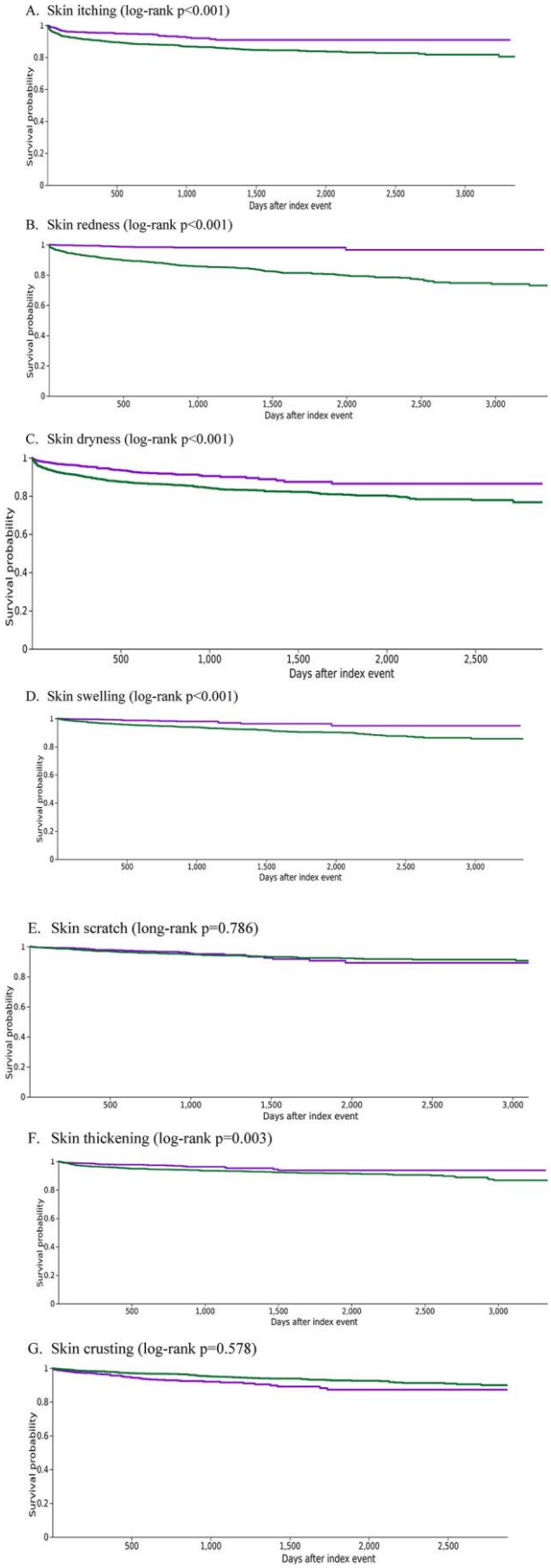

Fig.2.Kaplan-Meiercurvesofskinitching(A),redness(B),dryness(C),swelling (D)scratch(E), thickening(F),andcrusting(G).(purple:Miyarisangroup, green: non-Miyarisan group).

The imbalance in baseline characteristics observed in thesesubgroups maybeattributedtothelimitednumberofcases,whichcouldaffectthe interpretation of the results in these specific analyses.

The skin outcomes of SCORAD for different subgroups after PSMares h o w n i n Table 3. In this table, the Miyarisan group showed reduced skinitching,redness,dryness,swelling,scratching,andthickeninginthe female groupandin thosewith atleast3prescriptions ofMiyarisan.In the male group, the Miyarisan groupshowed similarresults,except for theoutcomeofskinscratching.Forrefilltimesof9or12atleast,duetothe limited number of cases and insufficient baseline matching, only skinrednessshowedasignificantdifferencebetweenMiyarisanusersand non-Miyarisanusers.AccordingtoindividualSCORADmeasures, reducedskinrednesswasconsistentlyobservedacrossallsubgroups. Skin itching was also reduced in Miyarisan users across all subgroups, exceptfortheyoungagegroupandthosewithatleast9refilltimes.Skin drynesswasreducedinMiyarisanusersacrossallsubgroups,exceptfor those with at least 9 and 12 refill times.

3.5. Sensitivity analysis of the effect of miyarisan on skin outcomes inp a t i e n t s w i t h a t o p i c d e r m a t i t i s

For patients diagnosed with atopic dermatitis, the patientselection algorithmisshowninSupplementaryFig.4.Thestudyperiodis consistent with the previous study on all dermatitis and eczema cases (January 1, 2014, to January 1, 2024). After PSM, there were 890 patientsinboththeMiyarisanandnon-Miyarisangroupsforfurtheranalysis. The baselinecharacteristics beforeand after PSM are presentedinSupplementaryTable9.AllSMDswerelessthan0.1,indicating a good match between the groups.

For patients with atopic dermatitis, the incidence of skinoutcomes after PSM is shown inSupplementary Table 11. Miyarisan users had a lowerriskofskinitching(HR=0.441,95%CI:0.309–0.629,p< 0.001),redness(HR=0.089,95%CI:0.047–0.169,p<0.001),dryness (HR=0.609,95%CI:0.442–0.837,p=0.002),swelling(HR=0.236, 95%CI:0.130–0.430,p<0.001),andthickening(HR=0.365,95%CI: 0.218–0.613,p<0.001).Nodifferencewasobservedinskincrusting. Miyarisan users with atopic dermatitis also tended to have a lowerrisk ofskinscratchingnumerically(HR=0.647,95%CI:0.382–1.097,p=0.103).Thesefindingsareconsistentwiththoseobservedin Miyarisan userswitheczemaanddermatitis.

4. Discussion

This is the first study to show that Miyarisan usage can reduce the riskofrecurrenteczema(measuredbySCORAD)inadultpatients.This finding is consistent across age groups, genders,and medicationrefill times. Similar results were observed for atopic dermatitis. Prior to thisstudyonadultpatients,theWAO[5]acknowledgedevidences uggestinga reductioninallergicdiseasesininfantswhosemotherstookprobiotic s duringpregnancy[14].Probioticsmayplayacrucialroleinmaintaining immunebalanceinthegastrointestinaltractbydirectlyinteractingwithimmune cells. However, not all studies support these positive effects. Forexample, a 2009 meta-analysis of 12 randomized trials, including 781 participants,foundthatprobioticswerenomoreeffectivethanaplacebo inreducingsymptomsofatopicdermatitis[15].Furthermore,probiotic usedidnotreducetheneedfortopicalcorticosteroids.Asubsequent meta-analysis of 25 randomized trials with 1600 participants reported thatp r o b i o t i c s w e r e a s s o c i a t e d w i t h o n l y a c l i n i c a l l y insignificant reductioninbaselineSCORADscores(—4.5,95%CI-6.8to—2.2)[16]. Asystematicreviewofrandomizedtrialsalsoidentifiedmanyinconsistencies and imprecision in current research [17]. In a follow-up study, infants whose mothers were exposed to probiotics during pregnancyshowednosignificantpediatrichealthadvantagesregarding allergicdiseases[18].Themajorchallengecontributingtothese inconsistent findings lies in the variability of probiotic bacterial strains used.T h e m o s t - s t u d i e d s p e c i e s f o r g a s t r o i n t e s t i n a l d i s e a s e s include

Table3

Subgroupsanalysisforincidenceofskinoutcomesamong Miyarisanandnon-Miyarisangroup(afterprosperityscorematching).

Outcome	Gender		Age		Medicationrefilltimes			
	Male(n=689)	Female(n=909)	18-65y/o(n=382)	≥65y/o(n=414)	≥3(n=510)	≥6(n=212)	≥9(n=119)	≥12(n=91)
Itching	**0.500(0.322,**	**0.426(0.305,**	0.768(0.530,	**0.440(0.299,**	**0.480(0.329,**	**0.412(0.228,**	0.476(0.234,	**0.556(0.271,**
	0.777)	**0.594)**	1.113)	**0.647)**	**0.700)**	**0.745)**	0.967)	**1.137)**
Redness	**0.106(0.056,**	**0.063(0.033,**	**0.154(0.080,**	**0.156(0.081,**	**0.128(0.067,**	**0.345(0.172,**	**–(–,–)**	**–(–,–)**
	0.202)	**0.118)**	**0.295)**	**0.300)**	**0.245)**	**0.690)**	**(p<0.0001)**	**(p<0.0001)**
Dryness	**0.304(0.206,**	**0.440(0.331,**	**0.552(0.367,**	**0.588(0.426,**	**0.418(0.292,**	**0.405(0.230,**	0.600(0.307,	0.667(0.316,
	0.448)	**0.584)**	**0.829)**	**0.811)**	**0.597)**	**0.716)**	1.171)	1.405)
Swelling	**0.222(0.113,**	**0.219(0.124,**	**0.294(0.147,**	**0.244(0.124,**	**0.355(0.180,**	0.526(0.251,	1(0.432,2.314)	1(0.437,2.286)
	0.437)	**0.387)**	**0.587)**	**0.480)**	**0.698)**	1.105)		
Scratch	0.593(0.322,	**0.489(0.300,**	0.813(0.396,	1.227(0.711,	**0.548(0.307,**	0.714(0.325,	1(0.432,2.314)	1(0.437,2.286)
	1.090)	**0.799)**	1.666)	2.119)	**0.978)**	1.572)		
Thickening	**0.259(0.148,**	**0.407(0.250,**	0.588(0.273,	0.682(0.438,	**0.526(0.311,**	0.500(0.240,	0.909(0.401,	1(0.437,2.286)
	0.452)	**0.663)**	1.268)	1.063)	**0.892)**	1.043)	2.060)	
Crusting	1.227(0.706,	1.039(0.715,	1.130(0.657,	1.130(0.657,	0.846(0.541,	0.722(0.363,	0.667(0.312,	1(0.437,2.286)
	2.133)	1.509)	1.945)	1.945)	1.323)	1.437)	1.424)	

Lactobacillus[19],Bifidobacterium[19],andSaccharomyces[20]. However,theevidenceregardingtheireffectsoneczemaremains inconsistent[21]duetoextensiveheterogeneityofresultsand moderate-to-lowevidencequalitylimitedthegeneralizabilityoffindings.

ClostridiumbutyricumCBM588hasbeenreportedforitsrolein treatinggastrointestinaldiseasesbystabilizingimmunehomeostasis. TheC.butyricumMIYAIRIstrain588hasdemonstratedpreventiveand therapeuticeffectsagainstenterohaemorrhagicEscherichiacoliO157 infectioningnotobioticmice[22].Ithasalsobeenshowntoprevent diarrhea resulting from alterations in intestinal microbiota due to Helicobacterpylorieradicationtherapy[23].Additionally,itpromotes IL-10 productionbyintestinalmacrophagesininflamedmucosa, thereby helping to prevent experimental colitis in mice [24].Our study isthefirsttodemonstratethatC.butyricumcanpreventeczemain humanadults.Theunderlyingmechanismsareasfollows:Firstly, Miyarisanprovidesbutyrate,whichisessentialforrestoringthereduced productionofbutyrate[25].Butyrateservesnotonlyastheprimary energy source for enterocyteregeneration but alsoasan important immunomodulatorymoleculeintheintestine[26].Itsupportsthe maintenance of intestinal epithelial integrity, thereby reducing the risk offoodallergies[12].C.butyricumshiftstheimmunebalancetowards Th1 and Treg responses, with significantly increased Foxp3/Rorγt and Foxp3/Gata3ratiosandasignificantlydecreasedGata3/Tbetratio[12], whichindicatesareducedriskoffoodallergy.Theproposedmechanismsmayalsohelpexplainthefindingsfromthesensitivityanalysison atopic dermatitis (Supplementary Table 11), as the primary underlying causeistypicallyanimmune-mediatedallergicresponse.Theuseof Clostridiumbutyricum(Miyarisan)maycontributetoreducingtherisk ofatopicdermatitisbymodulatingimmunefunction.Secondly,Miyarisanpromotesthethicknessofthemucouslayerandstrengthensthe integrityoftightjunctions[27].Itcanalsoupregulateclaudin-1and occludinexpressionatboththeproteinandmRNAlevels,thereby enhancing the integrity of the colonic barrier [25]. This effect is likely mediatedbystimulationofIL-17releasefromintraepithelialTcells, which reduces the permeability to pathogens and lipopolysaccharides. Additionally,Clostridiummodulatesthefunctionofinnatelymphoid cellsto influencegutepithelialpermeability, therebyreducingallergen translocationintosystemiccirculation[28].Alloftheabovefindings havebeendemonstratedinanimalmodels,whereasourstudyisthefirst to confirm these benefits in adult humans.

Thepotentialpharmacologicinteractions between Clostridium butyricum(Miyarisan)andconventionaltherapiesforatopicdermatitis, suchascorticosteroidsandantihistamines,warrantfurtherinvestigation.Basedonourstudy,Miyarisanhasdemonstratedtheabilityto preventrecurrenceofatopicdermatitis(maybethroughitsimmunomodulatoryeffects),suggestingapossiblesynergisticrelationshipin

whichitmayenhancethetherapeuticefficacyofstandardtreatmentsby stabilizingimmuneresponsesandimprovingskinbarrierintegrity. Alternatively, C.butyricummayact throughindependentpathways withoutinteractingdirectlywithconventionalagents,representinga stateofpharmacologicneutralityorundifferentiation.Althoughno current evidence indicates antagonistic interactions, such a possibility cannotbeexcludedintheabsenceofmechanisticorpharmacodynamic studies. Further research is needed to elucidate the nature of these interactionsandtodeterminewhetherco-administrationofMiyarisan with standard treatments offers additive or modulatory benefits in the long-term management of atopic dermatitis.

Theoptimaltimingfortakingprobioticsremainsunderdebate.WAOguidelinessuggestthatprobioticsmayreducetheriskofatopic dermatitisduringpregnancy[5].Miyarisancanalsobeusedtohelp establishintestinalmicroecologicalbalanceduringtheneonatalperiod, potentiallypreventingatopicdermatitis[13].Thepreventionofeczemawith probiotics (mainly Lactobacillus rhamnosus) appears effective untilthe age of 2 years, with extended effects observed until 4 years of age [29]. Our study is the first to demonstrate that Miyarisan use in adults can still be beneficial in preventing the recurrence of eczema.

There are certain limitations to this study. Firstly, it is an observationalandretrospectivestudy.Tomitigatethispotentialbias,weemployedPSMtoalignasmanyrelevantskin-relatedfactorsaspossible.Secondly, we did not have other markers of inflammation for eczema, such as IgE and cytokines. Despite these limitations, we maintain con- fidence in the robustness of our study to examine the impact of Miyar- isan on adult patients with eczema.

5. Conclusion

ThisstudyisthefirsttodemonstratethatMiyarisanuseinadult patients may be associated with a reduced risk of recurrent eczema or dermatitis. These findings are consistent across gender subgroupsand age groups.

CRediTauthorshipcontributionstatement

Kuo-HsiungShu:Datacuration,Conceptualization.**Yun-Chien Tsai:Formal**analysis,Datacuration,Conceptualization.**Cheng-Hsu Chen:Investigation,**Fundingacquisition,Datacuration,Conceptualization.**Shang-FengTsai:Investigation,**Fundingacquisition,Formal analysis, Data curation, Conceptualization.

Patientconsentstatement

Sincethe data isanonymized, informedconsentwasnotrequired. OuruseoftheTriNetXplatformforthisstudyreceivedapprovalfrom

theInstitutionalReviewBoard(IRB)atTaichungVeteransGeneral Hospital (approval number: CE23480C#1).

Ethicsapprovalandconsenttoparticipate

OurstudywasapprovedbytheHumanResearchReviewCommittee oftheTaichungVeteransGeneralHospital(approvalnumber CE23480C#1). All methods were carried out in accordance with relevantguidelinesandregulations.Allexperimentalprotocolswere approvedbyHumanResearchReviewCommitteeoftheTaichungVet-erans GeneralHospital.Informed consentwasobtained fromall subjectsand their legal guardians.

Consentforpublication

Allauthorsagreeforpublication.

Availabilityofdataandmaterials

Allsubmit.

Funding

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Declarationofcompetinginterest

Theauthorsdeclarethattheyhavenoknowncompetingfinancial interestsorpersonalrelationshipsthatcouldhaveappearedtoinfluence the work reported in this paper.

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n/a.

AppendixA.Supplementary data

Supplementarydatatothisarticlecanbefoundonlineathttps://doi.org/10.1016/j.hnm.2025.200332.

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CompensatoryHyperplasiaofSalivaryGlandin FDG PET-CT

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ABSTRACT

TheinterpretationofF-18fluorodeoxyglucosepositronemissiontomography(F-18FDGPET)inhead/neckcancerisusuallychallenging,especiallyincases post-surgicalmanipulationand/orradiationtherapy. Herein, we report a case of right buccal cancer, of which the F-18 FDG PET showed tumor-like radioactivity on the contralateralsidedevelopingovertheseveral-yeartime period post-treatment. Compensatory hyperplasia of the parotid gland is diagnosed after long-term follow-up.

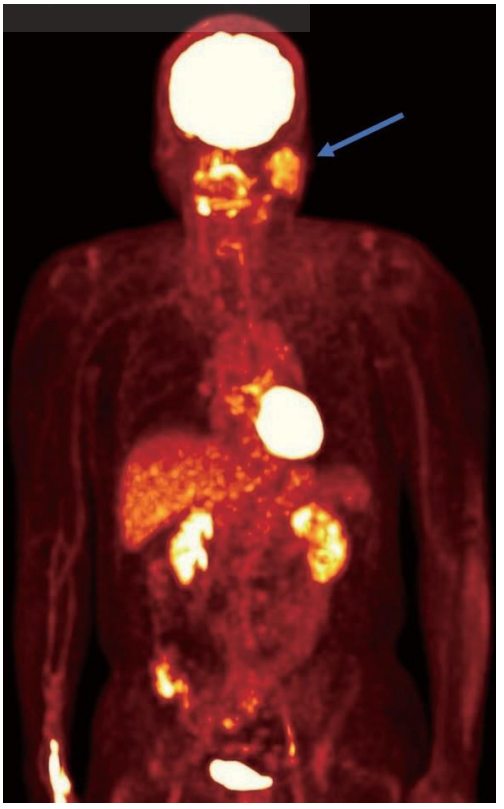

Figure1.一位 57 歲男性，因右頰癌(pT3N0cM0)接受右側頰癌與同側唾液腺手術切除，以及同步化學放射治療(concurrentchemoradiotherapy[CCRT]6,600cGyin33fractions)， 並在接受治療後的四年內持續以 F-18FDGPET/CT 追蹤。本次正子最大強度(PETmaximumintensityprojection,PETMIP)的影像，顯示左側頭頸部有瀰漫性放射活性升高，目視之下疑似腫瘤病灶（藍色箭號處）。然而病人於此處無症狀，且外觀及理學檢查均無疼痛、無異常。

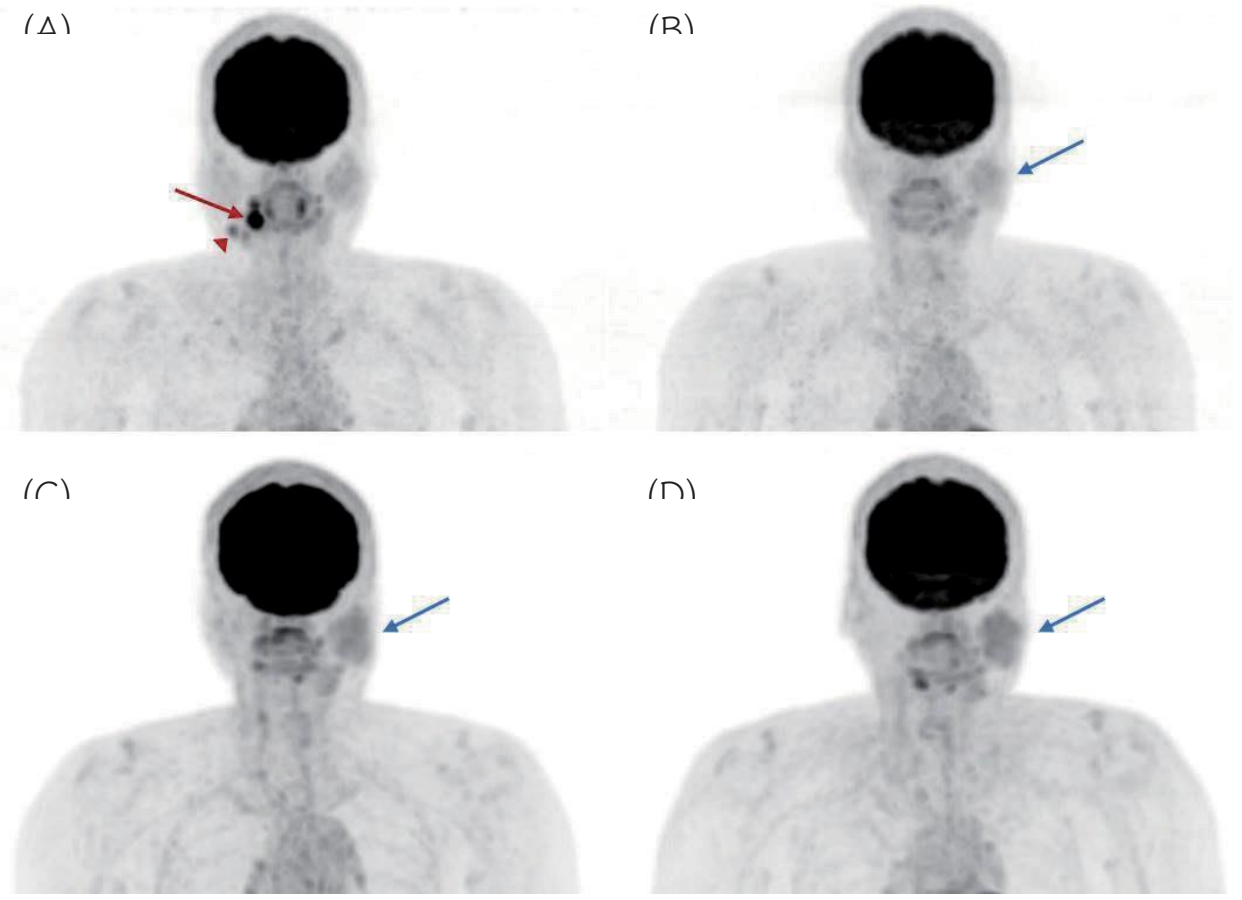

Figure2.詳細比對患者歷年正子檢查-最大強度(PET-maximumintensityprojection,PETMIP)影像，可觀察到左側頭頸局部放射攝取逐年升高：(A)患者在手術及 CCRT 前之 PET 影像，右側頰癌（紅色箭號處）及頸部淋巴結（紅色箭頭處，手術病理無淋巴轉移）呈現較強之放射活性攝取。(B)治療後 2 年影像。(C)治療後 3 年影像。(D)治療後 4 年影像。Figure2B–D 顯示右側頰癌及淋巴結均已去除，且右側唾液腺經手術切除後其放射活性消失，但左側腮腺於四年間逐漸增大，合併有中等程度放射活性升高並趨近穩定狀態（藍色箭號處）。(A)為手術及CCRT前之PET影像：左側腮腺(SUVmax:2.89,SUVpeak:2.59,metabolicvolume(MV):25.29c m^3,threshold:55%ofmaximum,totallesionglycolysis[TLG]:51.51g)；(B)治療後2年PET影像：左側腮腺(SUVmax:2.90,SUVpeak:2.59,MV:34.60c m^3,threshold:55%,TLG:70.24g)；(C)治療後3年PET影像:左側腮腺(SUVmax:3.64,SUVpeak:3.30,MV:35.95c m^3,threshold:55%,TLG:93.62g)；(D)治療後4年PET影像:左側腮腺(SUVmax:4.52,SUVpeak:3.94,MV:3 0 . 1 1 c m^3,threshold55%,TLG 97.45g)。

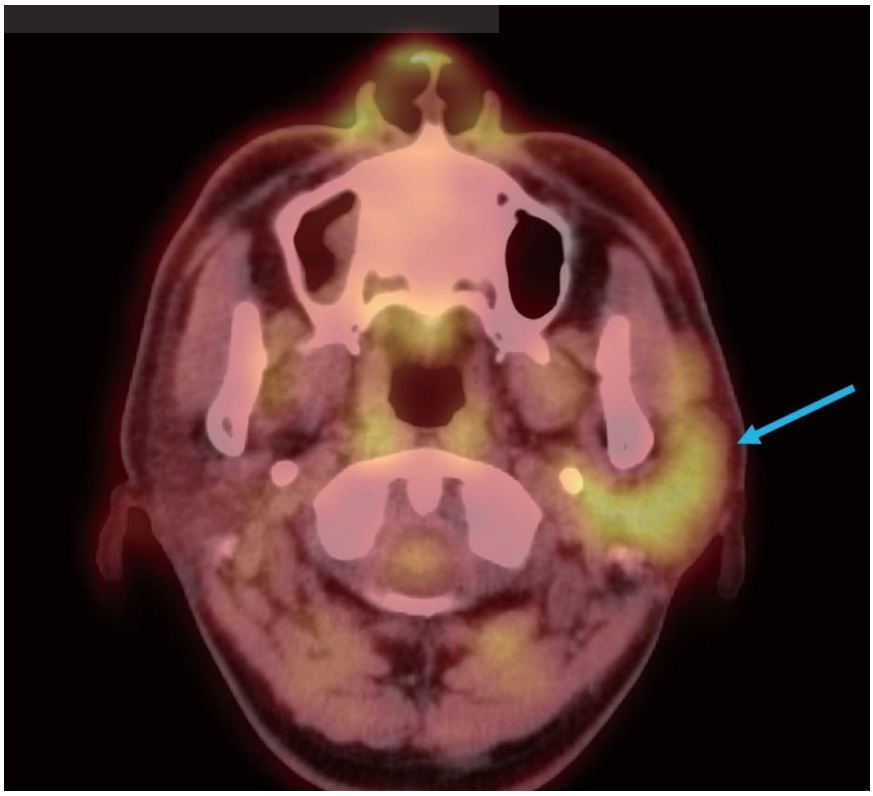

Figure3. 詳細對照Figure2D之F-18FDGPET/CT橫切面斷層影像。顯示前文藍色箭號所指示的放射活性位在左側廣泛增生之腮腺組織，並且無局部異常病灶。綜合病人的臨床表現以及比對手術前後歷年PET/CT影像(Figure2 和Figure3)的變化，可推論得知由於右側唾液腺功能缺失，左側腮腺代償性增生導致此種特殊的影像表現，而非真正的頭頸部腫瘤。病人於 Figure2D 往後的 7個月及12個月（手術後第五年）兩度再追蹤 F-18FDGPET/CT，左側腮腺亦均無病灶發生。

先天性唾液腺缺失的情況並不多見，而更常見於頭頸癌經手術或放射治療後的患者。單側唾液腺功能缺失可能造成同側或對側不同部位的唾液腺代償增生[1,2]。其機轉可能藉由咀嚼運動刺激細胞體積增大，隨著飲食習慣的改變也會對唾液腺的代償性增生造成影響，例如長期食用流質性食物可能就會減緩唾液腺代償性增生，但食用豐富膳食纖維的食物並伴隨大量咀嚼運動則會使唾液腺的代償性增生越加明顯[3]。除此之外可能的機制也會經由交感或副交感神經調節，當唾液腺僅由副交感神經支配時，會促使腺泡細胞數目增加，但不會導致細胞體積的增大，而交感神經則會同時參與腺泡細胞數目與體積的調控。因此，當唾液腺在交感神經與副交感神經的協同作用之下，則會產生最大的代償性增生反應[4]。

唾液腺增生症可能以疑似頭頸部腫瘤來呈現，透過謹慎的臨床觀察追蹤及仔細比對各種成像技術，包括 CT、MR 排除腫瘤可以達到鑑別診斷。目前文獻上仍缺少唾液腺增生在 FDGPET 疑似頸部腫瘤的影像報導，藉由此病例提醒吾人對此現象保持警覺，以避免對此種良性變化進行不必要的手術、切片、抑或侵入性檢查。

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唾液腺代償性增生於正子造影之表現

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摘要

氟18去氧葡萄糖正子斷層造影(F-18fluorodeoxyglucosepositronemission tomography，F-18 FDG PET)應用在頭頸癌患者，其影像分析往往是具挑戰性的。頭頸部複雜的解剖構造歷經手術及放射治療後，常呈現多變異的影像表現。本篇報告一位右側頰癌(buccalcancer)病例，在治療後數年期間，對側出現放射活性升高疑似腫瘤病灶。然而經由長期追蹤臨床及影像表現，得知為腮腺代償性增生。

關鍵詞：氟18去氧葡萄糖正子斷層造影、頭頸癌、唾液腺代償性增生

中部某區域教學醫院 Edoxaban 藥物使用評估

林湧達 [1]

林新醫療社團法人林新醫院 藥劑科 [1]

背景

Edoxaban 為一種口服直接凝血因子 Xa 抑制劑，臨床主要使用於非瓣膜性心房纖維顫動（Non-valvular Atrial Fibrillation， NVAF）以預防中風及系統性栓塞，亦用於治療深部靜脈血栓（Deep Vein Thrombosis，DVT）與肺栓塞（Pulmonary Embolism，PE）。根據仿單建議，應依患者年齡、腎功能、體重與是否合併 P-醣蛋白（P-glycoprotein，P-gp）抑制劑等因素調整劑量，以減少出血風險。特別是在老年族群中，需加強風險因子評估與個別化劑量調整〈表一〉。本研究旨在檢視 113 年度本院 Edoxaban 之實際使用狀況，評估適應症分布、每日使用劑量與患者年齡間的關聯性，以及實際劑量是否符合仿單建議。

表一：NVAF 與 VTE(DVT 與 PE)的 Edoxaban 劑量摘要

建議劑量		60mg QD
病患具有下列一種以上臨床因素時的建議劑量：		
腎功能不全	中度或重度(CrCL 15-50 ml/min)	30 mg QD
體重過輕	≤60kg	
P醣蛋白(P-gp)抑制劑	Cyclosporine、dronedarone、erythromycin、ketoconazole	
特殊老人族群（符合下列兩項標準，約80歲以上）		
至少具有一項出血因素	• 重要器官出血史，包括顱內出血、眼內出血和胃腸道出血 • 低體重 (≤45公斤) • 肌酸酐清除率[CrCl]≥15 ml/min且 <30 ml/min • 經常使用非類固醇抗發炎藥 • 抗血小板藥物的使用	15 mg QD
因有出血風險而無法接受常用劑量或其他核准劑量的口服抗凝血藥		

NVAF: Non-Valvular Atrial Fibrillation; VTE: Venous Thromboembolism; DVT: Deep Vein Thrombosis; PE: Pulmonary Embolism

方法

本研究為單一中心回溯性用藥評估分析，收集 113 年度所有門診與住院曾使用 Edoxaban 之個案資料。主要分析項目包括：(1) 各項適應症之使用比例；(2) NVAF 患者中每日劑量分布與年齡分析；(3) 每日使用劑量是否符合仿單建議。統計軟體使用 SPSS v18，連續變數以單因子變異數分析（ANOVA）進行三組比較，顯著水準設定為 $p<0.05$。

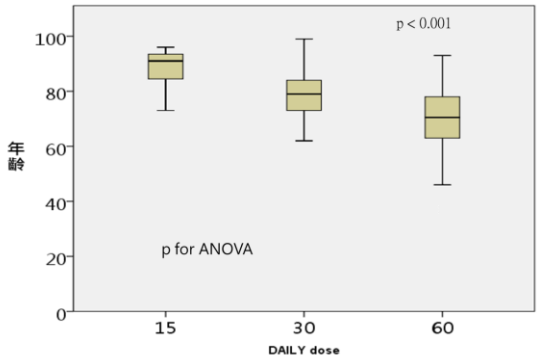
結果

共納入 284 位 Edoxaban 使用個案，使用適應症如下：NVAF 245 位（83.2%）、DVT 35 位（14.9%）、PE 4 位（1.95%）。分析 245 位 NVAF 病患中，男性 131 位（53.47%）〈表二〉。

表二：Edoxaban 適應症分析

適應症	N (人數)	%
NVAF	245	83.17%
Female	114	46.53%
Male	131	53.47%
DVT	35	14.88%
Female	21	60.00%
Male	14	40.00%
PE	4	1.95%
Female	2	50.00%
Male	2	50.00%
TOTAL	284	100.00%

NVAF: Non-Valvular Atrial Fibrillation; DVT: Deep Vein Thrombosis; PE: Pulmonary Embolism



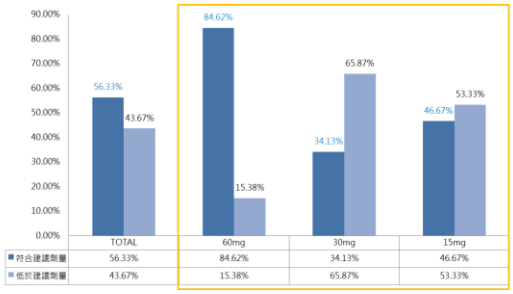
圖一：NVAF 每日劑量與年齡盒型圖

每日劑量分布為 60mg、30mg 及 15mg ，其對應年齡分別為 69.66±11.57、78.73±7.47 與 88.33±6.34 歲，三組間年齡差異具統計顯著性（$p<0.001$）〈圖一、表三〉。各劑

量組符合仿單建議比例為：60mg（84.62%）、30mg（34.13%）、15mg（46.67%）；其中 30mg 與 15mg 組合併後之符合率為 35.46%。整體符合仿單建議劑量比例為 56.33% 〈圖二〉。所有個案均未發現超量使用情形。

表三：NVAF 每日劑量分析

Daily dose	N	Age(mean±SD)	95% confidence interval	p for ANOVA
15mg	15	88.33±6.57	84.7 ~ 91.97	<0.001
30mg	126	78.73±7.50	77.41 ~ 80.05	
60mg	104	69.66±11.63	67.4 ~ 71.92	
TOTAL	245			



圖二：符合仿單建議劑量之比例

結論

本研究顯示 Edoxaban 主要應用於 NVAF 病患，其每日劑量與年齡間呈現顯著統計相關，反映年齡越高者使用劑量越低，與仿單建議相符。在 60mg 劑量組中符合率高達八成五，顯示劑量調整良好，惟 30mg 與 15mg 組合併後僅有 35.46%符合建議，整體正確率為 56.33%。顯示部分劑量低於仿單建議，可能因臨床考量患者出血風險所致。建議未來進一步探討低劑量使用對療效與安全性之影響，以提供更精準之用藥指引。

中部某區域教學醫院藥局藥品儲位標示改善計畫

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林新醫療社團法人林新醫院 藥劑科[1]

背景

醫院藥事作業流程中，藥品的庫存管理與調劑效率，直接影響整體用藥安全與臨床服務品質。原本藥品存放區僅有標籤，無系統性儲位標示，導致新進人員熟悉調劑台可順利找藥的時間延長、調劑錯誤的風險升高、庫存空間管理混亂、盤點耗時等問題，對工作效率與病人安全構成潛在威脅。為解決上述問題，本院藥劑科推動「藥品儲位標示改善計畫」，期望提升藥師調劑效率、降低錯誤率、優化供補與盤點作業流程。

方法

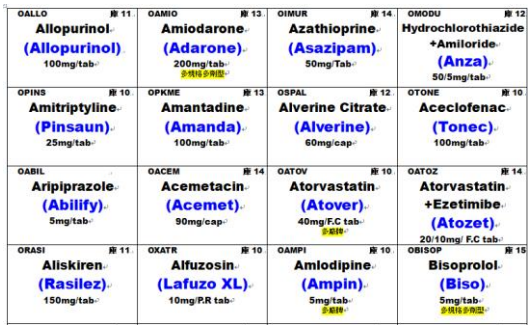
內以標準化、系統化的方式，分區進行藥品標籤更新，除了處置代碼、商品名、成份名、規格，增加庫存區儲位、盤點分類標示及『多劑量多劑型』之提醒，並利用藥袋資訊欄位顯示儲位。供補表增加儲位對照，方便助理快速備藥。

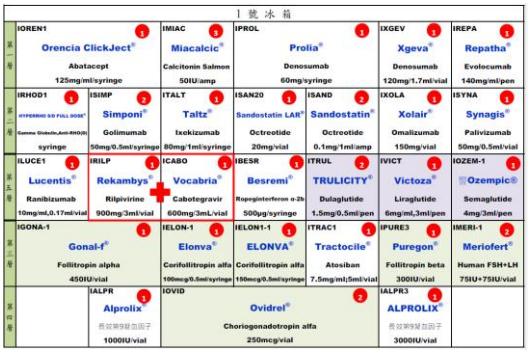
此計畫實施一年後，評估藥師調劑新進藥品找藥時間、新人調劑錯誤件數、線上補藥時間及助理備藥時間，並以問卷調查實施後的滿意度。

結果

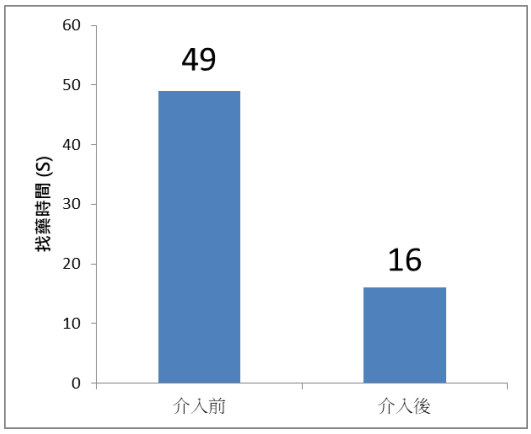
新進藥品首次找藥時間由每項平均 49±8.6 秒降至 16±5.8 秒；新人調劑錯誤件數由每月平均 10~20 筆減少至每月平均 3-5 筆；線上藥師至庫存區補藥所需時間由每項平均 30±12 秒降至 15±5 秒，藥品標籤增加庫存區儲位標示之提案，亦在本院 112 年第四季品管競賽中榮獲優等；助理準備供補所需時間由 105±15 分鐘縮短至 80±15 分鐘。滿意度問卷調查結果:儲位動線順暢度有 82%的同仁表示滿意，藥袋標示儲位縮短調劑時找藥時間有 96%滿意，儲位標籤加註庫存儲位縮短補藥時間有 93%滿意，增加『多劑量多劑型』提醒減少調劑錯誤有 79%為滿意，供補表顯示儲位對照縮短備藥時間則有 60%為滿意。

圖一 更新後之藥品標籤

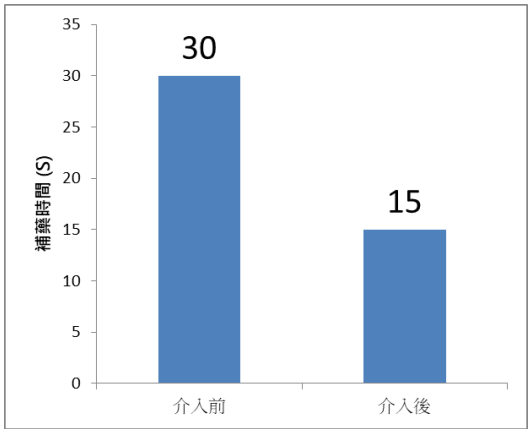




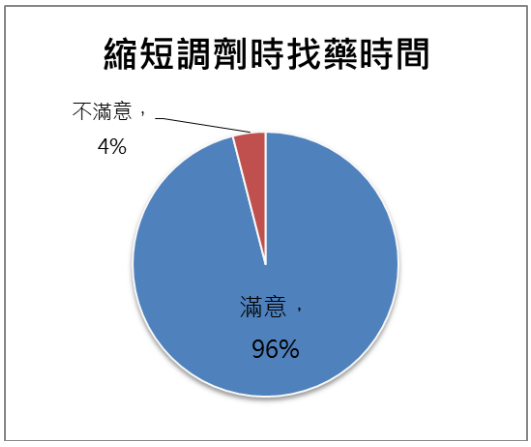
圖二 介入前後找藥時間比較



圖三介入前後補藥時間比較



圖四同仁滿意度調查



結論

友善的儲位標示提升新進人員訓練效率，縮短熟悉儲藥環境所需的時間，減少錯誤；尤其現今藥品更替頻繁，透過藥袋標示儲位，即使不熟悉，也可以很快找到，任何人隨時都能進入狀況，增加人力調度的彈性。未來希望繼續優化動線，加強調劑錯誤防呆措施，提升供補效能，以期更進一步提升用藥安全與藥事服務品質。

中部某區域教學醫院藥物諮詢服務成果分析

陳玫臻、林湧達
林新醫療社團法人林新醫院 藥劑科

背景

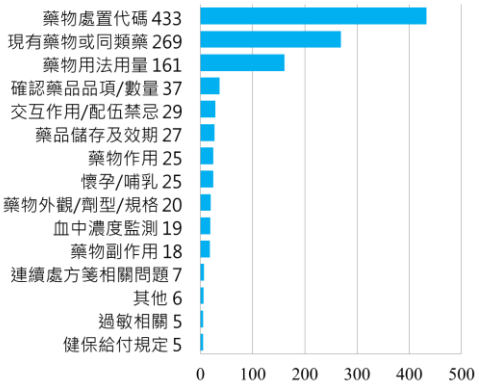
藥師是運用藥學專業，確保病人用藥安全的醫療專業人員。有效的用藥指導亦是搭建醫病關係間信任的橋樑。本研究藉由分析中部某區域教學醫院藥師提供之藥物諮詢服務紀錄，了解諮詢者的問題，進一步釐清藥物諮詢服務的需求面向，以作為提升藥師價值及服務品質之依據。

方法

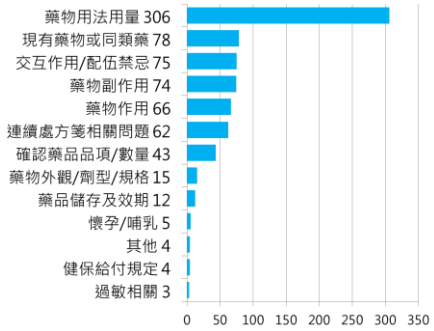
本研究主要收集某區域教學醫院藥劑科於 113 年 01 月至 113 年 12 月期間藥師登錄於 google 表單之諮詢紀錄。並依據諮詢對象、諮詢方式及問題類型加以探討並分析。

結果

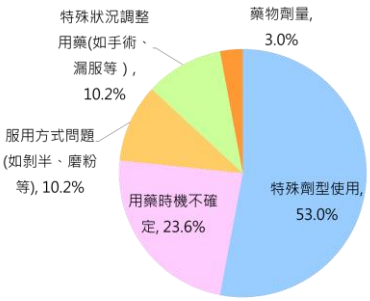
統計期間諮詢件數共有 1833 件。醫療人員占 59.2%，病人或家屬占 40.8%。醫療人員透過電話與當面詢問的比例分別為 92.0%與 8.0%，病人或家屬則為 59.6%和 40.4%。醫療人員最常問的問題類型依序為藥物處置代碼（39.9%）、現有藥物或同類藥（24.8%）、藥物用法用量（14.8%）、確認藥物品項或數量（3.4%）和交互作用及配伍禁忌（2.7%）（圖一）；病人或家屬則以藥物用法用量為主（41.0%），其次為現有藥物或同類藥（10.4%）、交互作用或配伍禁忌（10.0%）藥物副作用（9.9%）和藥物作用（8.8%）（圖二）。進一步分析顯示，病人或家屬在藥物用法用量的問題上多集中於特殊劑型使用（53.0%）與用藥時機不確定（23.6%）（圖三）。



圖一、醫療人員諮詢類別



圖二、病人/家屬諮詢類別



圖三、病人/家屬在藥物用法用量問題分析

結論

自新冠疫情後藥物供應不穩，缺藥頻繁，醫院藥物替換率高，可能導

致醫療人員對於院內藥物品項不甚熟悉，進而增加查詢需求，儘管院內設有電子藥品系統，醫療人員仍偏好直接諮詢藥師以節省時間。病人方面，雖可於藥袋或衛教單張獲得資訊，仍傾向由藥師直接進行劑型使用的指導、或在用藥產生問題時尋求藥師意見，顯示藥師在病人心中具高度信賴，也於用藥教育上扮演重要角色。未來藥師應持續不斷精進，也可透過結合數位工具與多元衛教資源，提供給病人更專業的服務，彰顯藥師核心價值。

中部某區域教學醫院藥局運用 Excel VBA 巨集改善盤點效率

黃則維[1,2]、蕭玟沁[1,2]、林湧達[1,2]

林新醫療社團法人林新醫院 藥劑科[1]

背景

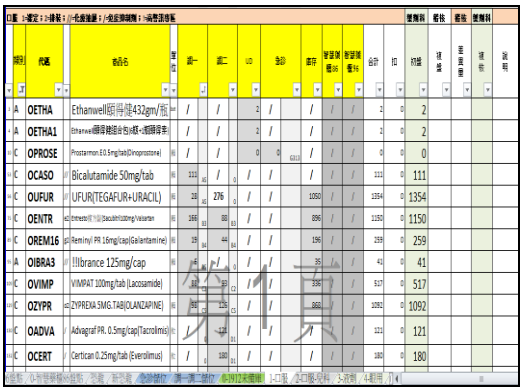
藥品盤點為醫院藥局維持庫存準確性及有效財務管理之重要作業，本院藥局原先以人工方式填寫紙本或 Excel 表單執行。然而近年藥品更迭快速，連帶儲位異動頻繁，人工維護易造成遺漏或錯誤。此外，複盤及查核流程耗費大量人力與時間，影響作業效率及資料準確性。有鑑於此，本研究透過 Excel VBA 巨集的功能來改善藥品盤點流程。

方法

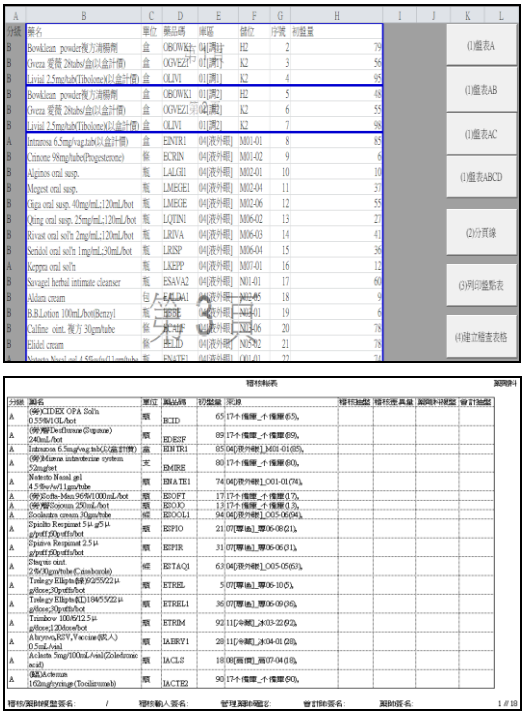
本研究針對舊有的盤點流程進行問題分析，發現舊有盤點表結構死板，需逐一人工輸入，各項資料異動時更需手動修正多處欄位，造成維護不易使數據頻出錯誤，因此重新設計盤點表結構，包含：(1)將所有藥品基本資料、分區及儲位資訊統一個別整合於單一分頁，當藥品異動時僅須於此二分頁集中調整，大幅降低維護時間；(2)撰寫 VBA 巨集程式，各區域初盤表由巨集一鍵產生，免除傳統張貼紙條及人工編輯表格流程，顯著縮短事前準備時間並使初盤表內容與實際儲位一致性提高；(3)各區初盤結果可藉巨集自動匯總於稽核報表，可快速查找藥品位置及數量，降低稽核複盤所耗費的人力與時間。此外，本研究另進行同仁滿意度調查，評估導入 Excel VBA 巨集後的主觀成效。

結果

透過 Excel VBA 巨集系統化盤點流程後，顯著改善以下指標：(1)盤點表維護時數由每月平均 20.25 小時降至 8.53 小時；(2)盤點事前準備時間由每次平均 4.4 小時降至 1.1 小時；(3)稽核複盤所花費的處理時數從 4.65 小時降為 3.1 小時;(4)根據滿意度問卷結果顯示，在 28 份調查中，多數同仁對盤點表清晰度、查核便利性、及整體滿意度等面向均表達正面回饋。



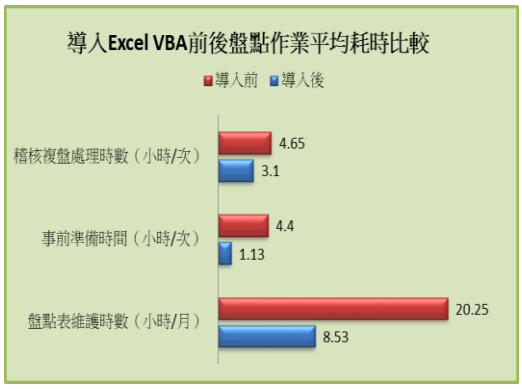
圖一 舊版盤點表



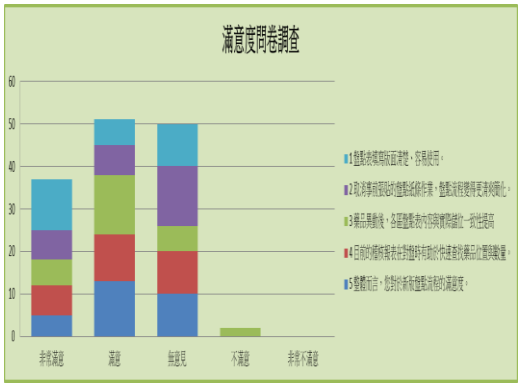
圖二 透過 VBA 巨集一鍵建立盤點表(上)、稽核表(下)

結論

導入 Excel VBA 巨集後，顯著改善盤點資料的維護及異動困難，提升盤點效率並減少人為疏失。問卷調查結果證實多數藥事人員肯定本次流程改善，有助提升作業準確性與藥品管理安全。期望後續可持續優化功能並延伸至其他庫存管理流程，以提升藥事服務品質及確保藥品管理效能。



圖三 導入 VBA 巨集後作業耗時之差異



圖四 滿意度調查

中部某區域醫院 Pre-ESRD 藥事照護概況分析

葉俊隆[1、2]、林湧達[1、2]
[1]林新醫療社團法人林新醫院藥劑科 、[2]社團法人臺中市大臺中藥師公會

背景

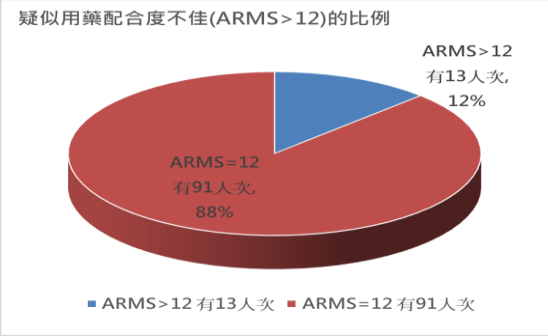
對慢性腎臟病之高危險群進行個案管理，以期早期發現，積極治療與介入，以有效延緩進入透析治療之時機與併發症之發生，藥師於 109 年 12 月加入慢性腎臟病照護醫療團隊，建立以病人為中心之慢性腎臟病整體照護模式以降低晚期腎臟病發生率，提升我國慢性腎臟病整體之醫療照護品質。本研究目的了解某區域醫院 Pre-ESRD 藥事照護概況分析。

方法

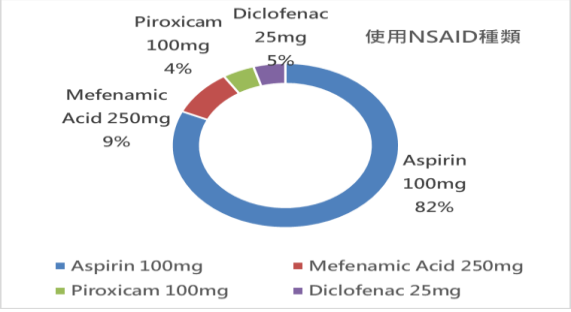
本研究為回溯研究某區域醫院進行描述性統計分析，病人用藥配合度統計、CKD 外之二項以上共病統計、衛教使用 NSAIDs 種類與比例、衛教使用抗排斥藥物 CNI 人數、使用保健食品、中藥統計分析、用藥整合及照會醫師。

結果

統計數據自 113 年 1 月~114 年 4 月 Pre-ESRD 藥事照護有兩次以上衛教共 50 位病患 104 人次分析如下 (1)在研究期間用藥配合度(ARMS)>12 有 13 人次與用藥配合度(ARMS) =12 有 91 人次，疑似用藥配合度不佳(ARMS)>12 (12%)。(2)50 位病患中有 49 位病患具有 CKD 外之二項以上共病，高血壓 38 人、高血脂 27 人、糖尿病 17 人、痛風 16 人、其他共病 25 人。(3)在研究期間因心血管共病使用 Aspirin 100mg 有 18 位患者、其他因關節疼痛、肌肉痠痛等使用其他 NSAID。(4)在衛教 50 位病患中有 4 人近期使用 Aspirin 100mg 以外的 NSAIDs(8%)，定期衛教追蹤後減為 1 人(2%)。(5)在衛教 50 位病患中有 5 人使用抗排斥藥物 CNI :Cyclosporine 25mg 及 Mycophenolate Mofetil 250mg 。(6)50 位病患中同時使用保健食品、中藥、草藥 2 位病患(4%)，只使用保健食品 16 位病患(32%)，只使用中藥、草藥 12 位病患(24%)，沒有使用保健食品、中藥 20 位病患(40%)。(7)用藥整合及照會醫師，有 3 件醫師接受建議，1 件醫師不接受建議。



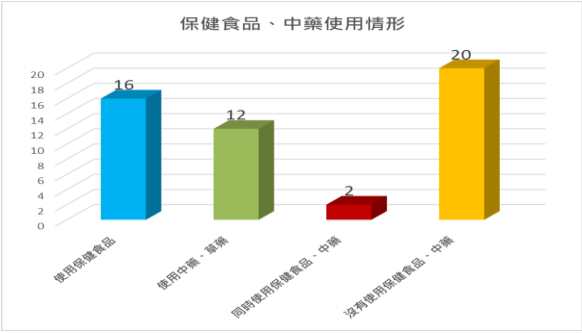
圖一在研究期間用藥配合度(ARMS)大於 12 有 13 人次與用藥配合度(ARMS) =12 有 91 人次。用藥配合度不佳(ARMS)>12 (12%)。



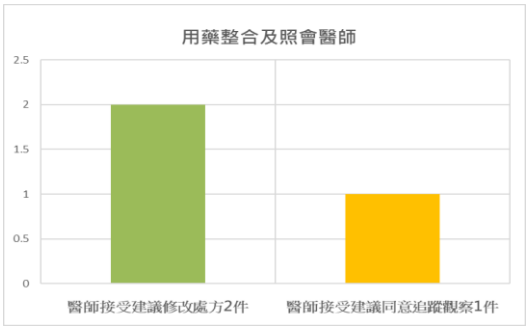
圖二在研究期間衛教使用 NSAIDs 種類與比例。

結果

統計數據自 113 年 1 月~114 年 4 月 Pre-ESRD 藥事照護有兩次以上衛教共 50 位病患 104 人次分析如下 (1)在研究期間用藥配合度(ARMS)>12 有 13 人次與用藥配合度(ARMS) =12 有 91 人次，疑似用藥配合度不佳(ARMS)>12 (12%)。(2)50 位病患中有 49 位病患具有 CKD 外之二項以上共病，高血壓 38 人、高血脂 27 人、糖尿病 17 人、痛風 16 人、其他共病 25 人。(3)在研究期間因心血管共病使用 Aspirin 100mg 有 18 位患者、其他因關節疼痛、肌肉痠痛等使用其他 NSAID。(4)在衛教 50 位病患中有 4 人近期使用 Aspirin 100mg 以外的 NSAIDs(8%)，定期衛教追蹤後減為 1 人(2%)。(5)在衛教 50 位病患中有 5 人使用抗排斥藥物 CNI :Cyclosporine 25mg 及 Mycophenolate Mofetil 250mg 。(6)50 位病患中同時使用保健食品、中藥、草藥 2 位病患(4%)，只使用保健食品 16 位病患(32%)，只使用中藥、草藥 12 位病患(24%)，沒有使用保健食品、中藥 20 位病患(40%)。(7)用藥整合及照會醫師，有 3 件醫師接受建議，1 件醫師不接受建議。



圖三同時使用保健食品、中藥、草藥 2 位病患(4%)，只使用保健食品 16 位病患(32%)，只使用中藥、草藥 12 位病患(24%)，沒有使用保健食品、中藥 20 位病患(40%)。



圖四用藥整合及照會醫師

結論

PreESRD 藥事照護之藥師可依個別病人用藥現況跨各專科領域溝通介入及評估，也從中瞭解到現在病患對疾病及用藥基本認識，更應建立以病人為中心之慢性腎臟病整體照護模式，提升慢性腎臟病整體照護品質。

Topiramate 引起感覺異常之不良反應案例報告

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林新醫療社團法人林新醫院 藥劑科[1]

背景

Topiramate 為一種抗癲癇藥，作用機轉尚未確定，但推測可能與阻斷神經元電壓依賴性鈉離子通道，增加 GABA(A)活性，拮抗 AMPA/kainate glutamate receptors，還有弱效抑制碳酸酐酶有關。Topiramate 目前被使用於局部癲癇發作的第二線單一藥物治療、與其他抗癲癇藥物合併使用輔助治療，還有對於符合國際偏頭痛學會偏頭痛診斷標準並符合特定條件的病人用於預防偏頭痛。Topiramate 會引起神經系統相關的不良反應，常見的有頭暈、疲勞、嗜睡、記憶力受損、注意力不集中、還有感覺異常等。

案例

病人為 26 歲女性，過去病史有心搏過速、中耳炎，無藥物食物過敏史。本身長期服用 Clonazepam 0.5mg/tab、Triazolam 0.25mg/tab、 Alprazolam 0.5mg/tab、 Propranolol 10mg/tab。病人從 01/30 開始出現右側頭痛自行服用 Tramadol 37.5mg + Acetaminophen 325mg 複方錠劑止痛，至 02/18 仍未緩解故至神經內科就診。醫師診斷：無預兆性偏頭痛，並開立 Propranolol 40mg/tab 1 顆 QD、Dihydroergotamine 5mg/cap 1 顆 QD、Flunarizine 5mg/cap 1 顆 HS 與 Topiramate 50mg/tab 1 顆 HS 給病人使用。02/18 看診後病人白天服用 Propranolol 和 Dihydroergotamine 各一顆，20:00 服用 Flunarizine 和 Topiramate 各一顆。02/19 從 10:00 到 16:00 於手部腳部間歇性出現麻木感後，病人即自行停藥。

結果

02/21 詢問病人不良反應之詳細狀況時病人表示希望找到不良反應的主因故嘗試再投予，當晚睡前單獨服用 Flunarizine 一顆。02/22 無出現不良反應，22:00 單獨服用 Topiramate 一顆。02/23 手腳麻木感再次出現，22:00 單獨服用 Dihydroergotamine 一顆。02/24 無出現不良反應。本案例中 Topiramate 之 Naranjo Score 評分為 8 分，為 Topiramate 造成的藥物不良反應相關性屬於極可能。

	2月18日	2月19日	2月20日	2月21日	2月22日	2月23日	2月24日
發生感覺異常	無	早上發生	無			晚上發生	無
Propranolol 40mg/tab	白天一顆	無服藥	無服藥				未再服藥
Dihydroergotamine 5mg/cap	白天一顆					睡前一顆	
Flunarizine 5mg/cap	睡前一顆			睡前一顆			
Topiramate 50mg/tab	睡前一顆				睡前一顆		

表一 病人 2/18~2/24 期間藥物使用情況

評估日期：	2025/02/25	病人姓名：	江○○	病歷號：	955298
懷疑藥物1：	Topamax 50mg/tab				
不良反應類型：	Type A--為藥物正常藥理作用過度反應所致(Pharmacological)				
Naranjo Score			是/否/不知道	分數	
1.是否有文獻報告確定此項不良反應			是	1	
2.不良反應是否發生於給藥之後			是	2	
3.當停藥或給予解藥，症狀是否改善			是	1	
4.停藥一段時間後再重新使用該藥，同樣症狀再度發生			是	2	
5.是否有其他因素(此藥以外)可能造成此項不良反應			否	2	
6.當給予安慰劑，不良反應是否再度發生			不知道	0	
7.藥物的血中濃度是否達到中毒範圍			不知道	0	
8.藥物劑量與不良反應的程度是否成正向關係			不知道	0	
9.病人過去對同樣或類似藥是否也有同樣的不良反應			否	0	
10.此項不良反應是否有客觀的證據			否	0	
總分				8	
不良反應之可能性：極可能(5-8分)					

表二 Naranjo Score

結論

Topiramate 用於預防偏頭痛時，在 UpToDate1 中有提及 Topiramate 會對中樞神經系統的多種受體作用，這些機轉因而可能影響神經傳導，導致病人可能出現手腳麻木刺痛等感覺異常的狀況，此為常見的不良反應。Topiramate 在肝腎功能改變時應注意監測療效甚至調整劑量 1，當病人出現肝腎功能下降，或是使用有藥物交互作用的藥品 3 導致 Topiramate 之中樞神經抑制作用被增強時，不良反應也會更容易出現。曾有文獻 2 指出，比起預防癲癇時 Topiramate 用於預防偏頭痛時感覺異常的發生率較高，女性比起男性較容易出現感覺異常，而感覺異常一般在停藥後便會在數天內消退。本案例病人為女性從 02/18 開始使用 Topiramate 後 02/19 即出現感覺異常，在停藥後無再出現不良反應。在交付藥品時應衛教病人服用 Topiramate 有引起感覺異常的可能性，若有出現不良反應不需過於驚慌。對於需要控制癲癇的病人，若病人對於感覺異常或其他副作用感到困擾不已，可建議病人與醫師討論是否調整用藥。若有出現嚴重不良反應如心跳異常、呼吸異常、昏厥、肝臟問題、眼睛問題、或是嚴重皮膚反應時，應請病人立即就醫。

The Impact of Midodrine on the Time to Discontinue Intravenous Vasopressor Use in ICU Patients

黃亭瑜[1、2]、林湧達[1、2]

[1]林新醫療社團法人林新醫院藥劑科 、[2]社團法人臺中市大臺中藥師公會

背景

Maintaining hemodynamic stability is an important therapeutic goal for patients in the intensive care unit (ICU). Intravenous vasopressors are the primary choice for controlling blood pressure. Persistent hypotension in patients who have otherwise been successfully resuscitated can delay their discharge from the ICU.

The administration of oral vasopressors, such as midodrine, may offer a potential strategy to decrease the duration of intravenous vasopressor use and shorten ICU length of stay (LOS). Midodrine is a peripherally acting α-receptor agonist. It causes modest increases in supine and standing blood pressure in a dose-dependent manner. However, the evidence regarding its effectiveness in shortening the duration of intravenous vasopressor requirement remains conflicting.

方法

The retrospective observational study used data drawn from a single hospital. We performed an analysis of patients receiving stable or decreasing doses of intravenous vasopressors in the ICU. The study period was defined as the time between January 1, 2024, to December 31, 2024.

We sequentially excluded individuals with severe organic heart disease, liver failure, pregnancy, midodrine as pre-admission medication, any known allergies to midodrine, ongoing clinical evidence of inadequate tissue oxygenation, and no enteral route available. Eligible patients were divided into two groups based on addition of midodrine. Primary outcome is the time to vasopressor discontinuation, defined as being vasopressor-free for 24 hours. Secondary outcome is length of stay in ICU and 30-day mortality.

結果

Among 246 potentially eligible adults who were admitted to ICU with intravenous vasopressors support during the study period, 186 met the inclusion criteria (mean age 72 years [SD 11]; 102 [55%] male). Among 186 included patients, 19 received IV vasopressor with midodrine and 167 received only IV vasopressor. The baseline characteristics of the two groups only showed a significant difference in initial mean arterial pressure (mean, 62 vs 67.5 mmHg; $p<0.05$).

The median time to discontinuation of intravenous vasopressors was 79.5 (IQR, 62.0–92.5) hours in the midodrine group and 82.6 (IQR, 61.0–95.2) hours in the other group, with no significant difference between groups (difference,

3.1 hour; 95% CI, −10.4 to 12.3 hours; p=0.82) (Fig.1). In addition, there were no significant differences between the two groups in terms of ICU length of stay and 30-day.

Table 1: Baseline Characteristics

	No Midodrine (N=167)	Midodrine (N=19)	p-value
Male (%)	90 (53.9)	12 (63.1)	0.13
Age, mean (SD)	67.8 (11.5)	76.7 (10.2)	0.06
Initial MAP, mean (SD)	62 (10.5)	67.5 (10.1)	p<0.05
Scr, mean (SD)	1.32 (0.68)	1.47 (0.77)	0.32
ALT, mean (SD)	46.3 (36.2)	45.9 (35.1)	0.27
AST, mean (SD)	47.2 (34.7)	48.9 (35.0)	0.53

結論

Although the analysis of the current results indicates that the use of midodrine does not affect the time to discontinuation of intravenous vasopressors, several common limitations inherent to retrospective studies may have influenced the findings. Additionally, the total sample size of the study population did not meet the required number for statistical analysis. Future studies could consider conducting prospective trials or larger-scale retrospective studies.

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埔基醫療財團法人埔里基督教醫院放射科 4, 埔基醫療財團法人埔里基督教醫院醫務部 5

Purpose:

Myxoinflammatory Fibroblastic Sarcoma is a low-grade fibroblastic sarcoma predilects to superficial distal extremity soft tissue. It is composed of plump spindled and epithelioid cells, inflammatory infiltrates, and mucin deposits in a fibrosclerotic stroma.

Myxoinflammatory fibroblastic sarcoma (MIFS) is a slow-growing, low-grade tumor reported as a soft tissue tumor affecting the distal extremities. It was first described in 1998 by Meis-Kindblom and Kindblom1 and Montgomery et al. We reported a case of Acral Myxoinflammatory Fibroblastic Sarcoma treated with surgery followed by adjuvant radiation therapy.

Methods:

A 74-year-old man with no family history of malignancy, with past histories of hypertension, type 2 DM, cholecystectomy, and CAD s/p stent. He noted a reddish tumor over right low leg, 7 cm in size for several months. After discussed with plastic surgeon, he received tumor excision of right lower leg on 2024/03/12. The pathological report demonstrated that Myxoinflammatory fibroblastic sarcoma, tumor size 4.8x2.2x1.0 cm. The tumor invaded the subcutaneous layer, and the pathological stage was defined as pT1.

The patient was referred to the Department of Radiation Oncology for post-operative radiotherapy. Radiotherapy delivered in simultaneous integrated boost(SIB) with 66Gy/33 fractions to right lower leg tumor bed(**Fig.1**),and 50.4Gy/28fractions to subclinical area.

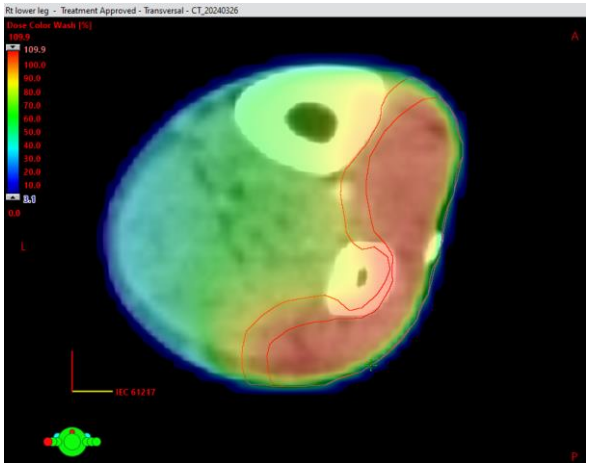

Figure 1. Dose distribution of post-operative adjuvant radiotherapy with SIB

Result:

The patient completed radiotherapy from 2024/04/02 to 2024/05/22. After completion of adjuvant radiotherapy with curative intention, the initial response is stable. The patient would follow-up lower limb MRI (**Fig. 2&3**), and chest X-ray tri-monthly. So far, the local control of the right lower leg is stable. Postoperative radiotherapy improved the local control of patients with Myxoinflammatory fibroblastic sarcoma.

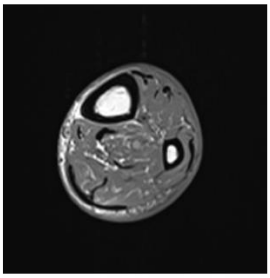

Figure 2.MRI T1 tes image on 2025/01/21 after radiotherapy

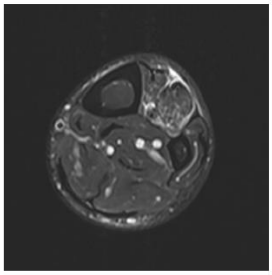

Figure 2.MRI T1 tes image on 2025/01/21 after adiotherapy

Conclusion

Myxoinflammatory fibroblastic sarcoma (MIFS) differentiation of the soft tissue sarcoma is rare. Wide local excision is the treatment of choice. Metastases are documented in approximately 2% of conventional MIFS, usually after local recurrence. Metastatic sites are most commonly regional lymph nodes and lungs. We suggested a follow-up schedule at least 5 years to evaluate the local control condition.

Given the nature of myxoinflammatory fibroblastic sarcoma, radiotherapy may improve the local control for these patients. However, further investigation is necessary to confirm the long-term effectiveness of the treatment and to identify potential risks.

骨盆底肌訓練需要多久才能有效改善機器手臂攝護腺根除手術後病人的尿失禁問題

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Yi-Kuan Lin [1] Shu- Hui Wang[1,*]

研究目的

攝護腺癌是西方世界中男性第二常見的癌症，在台灣攝護腺癌發生率與死亡率雖不如西方國家高，根據衛福部最近的111年度台灣癌症登記報告顯示，攝護腺癌已是10大癌症裡男性發生率第5名，死亡率也上升到第5名。目前最新外科手術的主流是以達文西機器手臂進行手術，研究文獻顯示骨盆底肌訓練可以有效降低手術後尿失禁的機會，但要訓練多久能夠擺脫尿失禁，想必是每一位病患心裡都想要問醫生的事。因此本篇利用系統性回顧來探討患者在接受機器手臂攝護腺根除手術後需要耗費多少時間進行骨盆底肌訓練才能有效擺脫尿失禁，回歸正常生活，並提供作為臨床骨盆底肌肉訓練參考。

研究材料與方法

設定納入條件：(1)接受機器手臂攝護腺根除手術，(2)術後使用骨盆底肌肉訓練。排除條件：(1)包含其他型態手術者，(2)研究追蹤未達3個月者。利用關鍵字機器手臂攝護腺根除手術(robotic prostatectomy)、骨盆底肌肉訓練(pelvic floor muscle training)，從PubMed搜尋相關文章。。

研究結果

最後篩選5篇符合條件之研究，包含2篇隨機對照試驗、1篇前實驗研究設計試驗及2篇前瞻性研究。在接受機器手臂攝護腺根除手術後，早期介入骨盆底肌肉訓練3個月可以有效改善尿失禁情況。運動介入頻率20下/次，每下維持10秒，1天做3至4次。其中3篇研究顯示72.2至84%的人擺脫尿失禁(包含有使用尿布，但可以自行控制排尿者)，另外2篇研究表示有62.5至67.5%的人完全擺脫尿失禁(不須使用尿布)。訓練6個月後有1篇研究表示100%的人擺脫尿失禁(包含有使用尿布，但可以自行控制排尿者)，另外1篇研究表示有83.3%的人完全擺脫尿失禁(不須使用尿布)。

研究結論

目前對於機器手臂攝護腺根除術病人，術後接受骨盆底肌訓練是臨床上標準作業流程，本篇藉由文獻回顧來探討骨盆底肌訓練對大部分病患來說需耗時3個月左右能改善尿失禁情況，訓練6個月後則可以完全擺脫尿失禁。

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以隨機試驗模式探討電腦化認知遊戲對注意力不足過動症兒童之持續注意力成效

陳羿伶

背景與目的

注意力不足/過動症(ADHD)是一種常見的神經發展障礙，影響兒童的專注力、衝動控制與執行功能。這些兒童在學習、社交與日常活動中面臨重大挑戰，並且未經治療可能導致學業表現低落、人際關係困難及心理健康問題。

過往傳統治療 ADHD 兒童的方法主要包括三種，第一種為藥物治療，如中樞神經興奮劑，派醋甲酯(Methylphenidate)，可幫助改善專注力，但可能造成食欲下降、睡眠困難或情緒變化等副作用。還有行為治療，主要是透過行為改變策略來改善 ADHD 兒童的自我調節能力，但成效會因個體而異，且需要長時間訓練。第三種則是環境的調整，在學校提供個別化教育計畫（IEP）但這些方式對 ADHD 兒童的長期改善仍有限。

近期研究顯示，電腦遊戲訓練可作為一種更科技化且便利的輔助治療，也可以根據每個孩童的能力去做難易度調整。故本研究主要在探討電腦遊戲治療是否能對 ADHD 兒童作為一個有效的訓練工具。

方法

本研究對象為為 80 名 6 到 12 歲之間的 ADHD 兒童，智力分數皆大於 80 分，並以隨機分為（n=40）實驗組電腦遊戲訓練，與（n=40）對照組傳統治療，像是職能、物理和語言治療。

實驗組的介入為一周五次，每次 30 分鐘，持續 8 週。電腦遊戲訓練內容包括專注力訓練關卡，旨在給予需要持續專注的任務，例如目標辨識及快速反應。還有包括計畫、決策與解決問題的遊戲，提高執行功能。

另外還有反應控制測試，在遊戲中加入「停止信號測試」機制，幫助兒童抑制衝動行為。除此之外，遊戲會根據兒童的表現，動態調整難度，確保最佳訓練效果。

結果

實驗組經過 8 週的介入後，使用 BRIEF-A 評估執行功能，在計畫能力、工作記憶與衝動控制這三大項上都有顯著改善($p < 0.05$)。另外在使用 SNAP-IV 評分後，注意力不足的症狀表現也顯著改善($p < 0.05$)。

結論

根據以上文獻表明，電腦化遊戲治療是可以做為一個非藥物治療外的輔助治療，去有效改善孩童的持續注意力、執行功能和計畫能力。

此外，除了單純進行遊戲訓練外，也建議家長可以與孩童一起制定時間表、討論遊戲內容及獎勵機制，提高孩童的參與度，以達到長期的效果。

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以感覺統合導向之職能治療介入對於唐氏症兒童感覺及神經動作表現之成效:案例分享

陳怡安

背景與目的

唐氏症 (Down syndrome)是一種染色體不分離 現象，由第 21 對染色體多一條所致。根據美國 唐氏症協會，唐氏症是最常見的染色體異常疾病。

唐氏症常見症狀為 (1)全身性肌肉張力低下 (2)韌帶鬆弛 (3)關節活動度過大，同時也可能經歷 主動肌-拮抗肌發生共同收縮。由於運動能力不足 ，他們在進行預期性姿勢調整時有困難，依照運動 任務需求和環境變化進行調整時也可能會遇到挑戰。 因此在介入計畫中使用增加姿勢反應刺激的治療方案是非常重要的。唐氏症兒童可能需運用策略以消 除不必要的感官輸入，治療應著重於產生協同姿勢及感官整合。

文獻建議在設計唐氏症兒童之復建計畫時，根據兒童需求並採用多種相互支持的治療方法。本研究目的為支持職能治療之感覺統合介入，並檢視感覺 統合職業治療介入對唐氏症嬰兒的感覺功能和神經運動表現的影響。

方法

本研究採納一名 14 個月大的唐氏症男嬰。家人稱個案是在懷孕 36+6 週時剖腹產出生的，且醫生在懷孕 期間沒有發現 DS 的存在。個案的發育記錄顯示運動 能力(爬行、坐和走路)和感覺能力(本體感受、前庭、觸覺和視覺)均呈現遲緩。 個案從 1 歲起便在復健與特殊教育中心接受語言治療 及特殊教育。家屬尋求職能治療以改善個案感覺 -動作的發展遲緩。

研究過程使用神經感覺動作發展評估 (NSMDA)檢視 個案神經動作的表現，以及嬰兒感覺功能測驗 (TSFI)以評估感覺功能。 進行前測後，個案在感覺統合中心參與一次 45 分鐘的職能治療介入，一周一次，為期 12 周。 感覺統合中心提供安全的環境，並給予適合個案年齡和性別的玩具以進行感覺運動遊戲。家長參加前兩次課程確保個案安全。此外還包含家庭計劃，包括可以在家進行的活動，以透過遊戲來改善個案的感覺及神經運動功能。

課程以寶寶喜歡的遊戲開始，以增加他們遊玩的自信。 12 週後，感覺和運動技能得到積極改善，因此決定繼續進行治療。介入強調適當挑戰，以發展對日常生活能力 不可或缺的感覺和運動因素。職能治療課程著重於促進個案粗大及精細動作。12 堂課程包含以下內容 :

(1)依據 12-18 個月之動作發展指標

設計
(2)培養寶寶的感官技能（例如 :物體質地、形狀和重量 ）
(3)透過本體覺、前庭、視覺和觸覺活動以培養感覺處理技能
(4)使用多種材料（例如 :治療刷、海綿、彩色紙、緞帶、 不同質地和顏色的織物、報紙、鏡子、搖鈴和鈴鐺 ）
(5)使用威爾巴格治療方案(Wilbargerprotocol)，並教導家人在家中繼續實施（例如 :輕刷、重壓及關節對壓 ）。

結果

於 NMSDA 及 TSFI 後測皆顯示兒童於神經動作及感覺功能皆有進步。NSMDA 分數由 17(嚴重動作失能)降為 12（輕微動作問題)；TSFI 分數則由 29(異常)升為 42(臨界邊緣)。

結論

研究發現，感覺統合之職能治療介入可改善唐氏症嬰兒之神經動作及感覺表現。此外，根據唐氏症兒童的個人需求 以制定個別化職能治療介入計畫是很重要的。

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提升照顧者執行鼻胃管灌食照顧技巧之正確率

Improving Caregivers' Accuracy in Performing Nasogastric Tube Feeding Techniques

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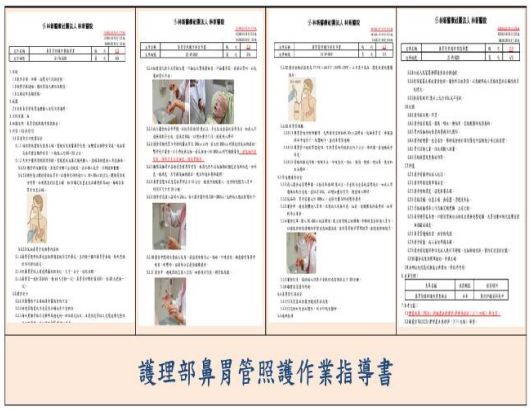
研究目的

鼻胃管對於意識不清、吞嚥困難、易嗆咳的病人是長期重要的營養支持管道，具備安全且感染率低是重要的，但根據 2015 年文獻指出鼻胃管灌食併發症導致的死亡率佔 4.3%，其中以護理人員衛教內容不一致及照顧者認知不足為主因，若醫護人員能正確辨別照顧者需求，並協助照顧者及早學會鼻胃管灌食之照顧技巧，運用統一標準化的衛教工具，可強化照顧者面對鼻胃管照護的認知不足。

研究方法

依「照護者鼻胃管路照護作業查檢表」 於 113 年 3 月 1 日~113 年 5 月 31 日，由 4 個內科病房護理長或組長稽核有放置鼻胃管病人之家屬、看護或外籍看護其實作灌食技巧是否正確，收集數據之時間於每週一至週日早上 08:00-17:30(白班)。



圖一 護理部鼻胃管照護作業指導書

項　　目	通過	不通過	不適用
1.灌食用物設備準備妥當。			
2.灌食食物濃度、溫度與量正確。			
3.管路流暢、位置正確、無受壓、滑脫及牽扯。			
4.管路有按標準工作流程定期更換管路，並有記錄。			
5.按時給予病人口腔護理，口腔無舌苔、奶塊、異味及分泌物。			
6.鼻管插管處鼻腔、口腔清潔無分泌物及皮膚無受壓受損，或胃造瘻口附近皮膚清潔無過敏或破皮。			
7.鼻胃管通暢清潔，無食物殘渣。			
8.灌食前後，病人姿位準備正確。			
9.灌食前的腹部評估或病人表示不舒服、反抽物的性狀、量均有清楚的記載。			
10.灌食中隨時注意病人反應，若出現咳嗽不止、嘔吐、呼吸變化、臉色發紫等異常現象，則暫停，由醫師決定是否繼續灌食。			
11.灌食高度及標準技術、步驟正確。			
12.能正確判斷病人的反抽物及量是否正常，並有能力觀察病人的反應及身體評估。			
總　　計			
通 過 率	%		

註：通過率= $\frac{\text{通過}}{\text{通過}+\text{不通過}} \times 100\,\%$

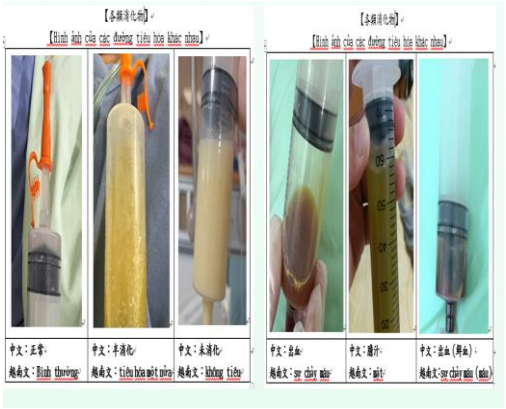
圖二 照護者鼻胃管路照護作業查檢表

研究結果

(1)降低因鼻胃管灌食併發症的住院天數，改善前為平均 50 天，改善後為：28 天，降低天數為：22 天(2)降低護理人員因鼻胃管灌食導致併發症，額外增加之護理照護時數，改善前為：490 小時，改善後為：196 小時，降低額外照護時間為：294 小時(3)降低因鼻胃管導致併發症護理人力之照護成本，改善前為：79520 元，改善後為：31808 元，降低護理人力成本為：47712 元。(4)內科病房住院病人鼻胃管灌食技巧不正確率為 50.85%，予以擬定對策實施後，內科病房住院病人鼻胃管灌食技巧不正確率為 4.62%。

護理應用

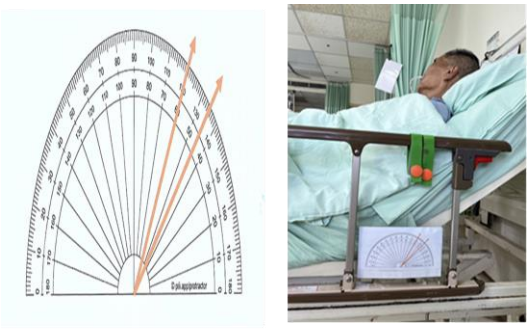
(1)製作各種異常消化物代表圖卡/灌食時間圖卡



圖三 各種異常消化物代表圖卡

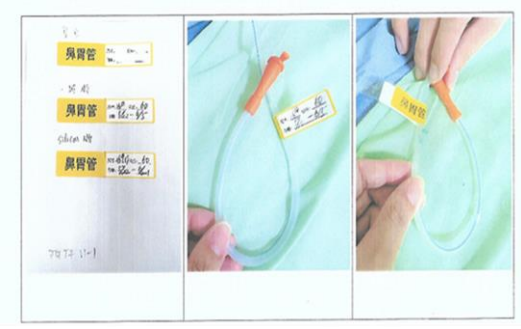
圖四 灌食時間圖卡

(2)增設床頭角度儀-將床頭搖至正確高度，於灌食後維持半坐臥姿勢大於 30 分鐘，以免有嗆咳導致溢奶。



圖五 增設床頭角度儀

(3)給予明確鼻胃管深度固定標示-照顧者可於每次灌食前確認鼻胃管固定深度。



圖六 鼻胃管深度固定標示

運用客觀結構式臨床測驗(OSCE)於護理人員臨床輸血技能之成效

Effectiveness of Using Objective Structured Clinical Examination (OSCE) To Assess Nurses' Clinical Transfusion Skills

黃穎溱[1]、曹慈翠[2]、賴婉甄[3]

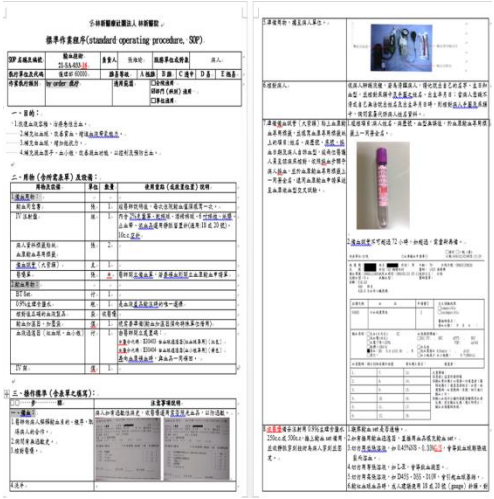
林新醫療社團法人林新醫院護理部護理長[1]、林新醫療社團法人林新醫院護理部督導[2]、林新醫療社團法人林新醫院護理部護理長[3]

背景與目的

臨床教育在護理人員培育中佔有極重要之一環，除了須具備豐富的專業知識，還需將這些知識應用於臨床照顧情境中。然而將學理及技能正確運用在護理照護，能瞭解周全性全人評估技巧及目的，在照護的過程提供全人照護、敏銳的觀察力和專業能力。因此，將臨床情境與標準流程結合，適時督導、修正及檢討執行過程中之不妥或不完全可直接影響臨床護理照護品質及成效。

研究方法

護理部品質管理小組為持續提升護理照護品質，113 年依「護理技術標準作業」之內容為稽核標準(圖一)，結合臨床異常狀況，以模擬情境方式及依「操作技能直接觀察評估表」進行考核，來評量護理人員「是否會正確的做/表現能力（shows how）」，以及在真正照顧病人時的「實際行為/臨床表現（does）」。評值工具以「操作技能直接觀察評估表」實際操作(圖二)，稽核頻率每月一次，目標值依各項護理技術訂定為 5.4-6 分，被評核者於考核後填寫臨床技術稽核滿意度問卷，由此來提昇臨床護理人員素質及知能。



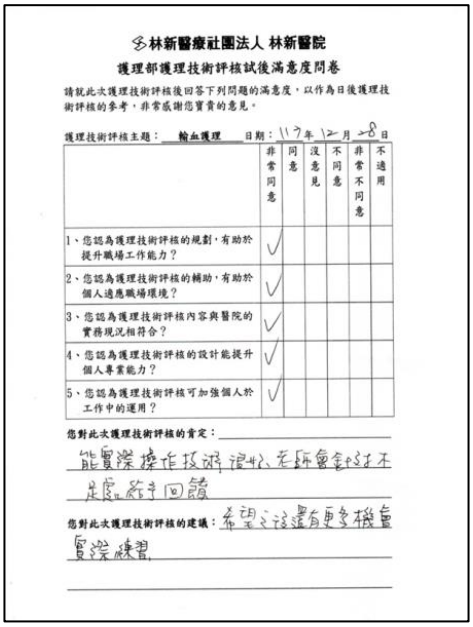
（圖一）護理部技術稽核辦法及輸血技術標準作業

（圖二)操作技能直接觀察評估表

(圖三)輸血技術的模擬工具

研究結果

品質管理小組針對異常最多的部分進行改善，主要為輸血的完整性，將異常部分做原因分析並融合在模擬情境中，依「操作技能直接觀察評估表」評核(圖三）。在技術考核過程中，我們深刻感受到護理人員於臨床多變情境中，應充分熟悉流程及具有應變的能力，再加上覆核機制的守望相助提醒，可有效減少臨床輸血的不完整性事件發生。經由此客觀結構式臨床測驗方式，同仁非常肯定此種考試模式，且經由臨床技術稽核滿意度問卷結果(圖四），護理人員很滿意考核方式，皆表示依臨床實務有條理的操作很實際，以真實病人、真實情境操作，不用死背，道具逼真，能提升工作能力，增進臨場反應。



林新醫療社團法人 林新醫院

護理部護理技術評核試後滿意度問卷

請就此次護理技術評核後回答下列問題的滿意度，以作為日後護理技術評核的參考，非常感謝您寶貴的意見。

護理技術評核主題：輸血護理　日期：112年12月28日

	非常同意	同意	沒意見	不同意	非常不同意	不適用
1、您認為護理技術評核的規劃，有助於提升職場工作能力？	✓					
2、您認為護理技術評核的輔助，有助於個人適應職場環境？	✓					
3、您認為護理技術評核內容與醫院的實務現況相符合？	✓					
4、您認為護理技術評核的設計能提升個人專業能力？	✓					
5、您認為護理技術評核可加強個人於工作中的運用？	✓					

您對此次護理技術評核的肯定：

能實際操作技術很好，老師會給予不足處給予回饋

您對此次護理技術評核的建議：希望可以還有更多機會實際練習

林新醫療社團法人 林新醫院

護理部　護理品安委員會

113年度12月份技術評核滿意度統計表

一.調查日期：113.12.28-113.12.29

二.調查對象：護理技術被評核者

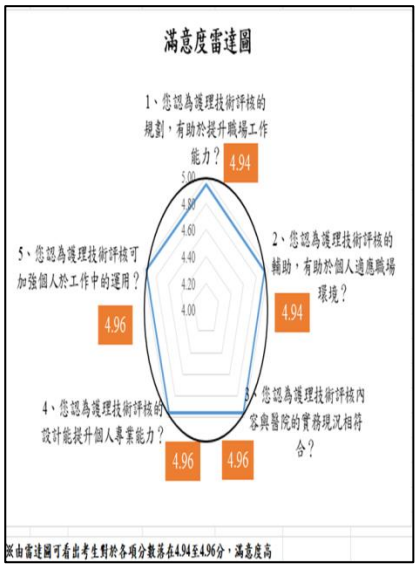
三.調查方式：使用五點量表進行調查，分別為非常同意(5分)、同意(4分)、沒意見(3分)、不同意(2分)、非常不同意(1分)

四.技術名稱：輸血技術

五.問卷填答率：技術評核共計48人，問卷回收48份，填答率100%(48/48)。

六.技術評核滿意度

項目 / 人數 / 滿意度	1、您認為護理技術評核的規劃，有助於提升職場工作能力？	2、您認為護理技術評核的輔助，有助於個人適應職場環境？	3、您認為護理技術評核內容與醫院的實務現況相符合？	4、您認為護理技術評核的設計能提升個人專業能力？	5、您認為護理技術評核可加強個人於工作中的運用？
非常同意	45	45	46	46	46
同意	3	3	2	2	2
沒意見	0	0	0	0	0
不同意	0	0	0	0	0
非常不同意	0	0	0	0	0
合計	48	48	48	48	48
平均分數	4.94	4.94	4.96	4.96	4.96



（圖四）護理技術稽核滿意度問卷及滿意度統計表

護理上的應用

臨床是一個種動態、雙向之互動過程。護理人員於考核過程中，除加強自我專業學識外；在品質管理中有效利用情境模擬，使臨床情境與管理目標互相配合，減少臨床異常事件的發生；在技術考核能幫助護理人員加強學識，並協助運用在臨床上；在專業素養能以誠懇、關懷及客觀的態度去對待病人，對工作具責任感；臨床護理人員也可透過彼此教學達到教學相長的目的。透過客觀結構式臨床測驗最大的收穫是有效地提昇人員之專業學識及教學能力，也減少異常事件發生，提昇護理人員之滿意度。

參考資料

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Nursing Experience in Caring for A Patient with Right-Eye Proptosis Caused by Ocular Adnexal Lymphoma

Ying-Jhen Huang[1]、Tzu-Tsui Tsao[2]

Lin Shin Hospital Head Nurse[1]、Lin Shin Hospital Supervisor [2]

Research Background

According to the most recent national statistics, malignant tumor/neoplasm is the leading cause of death in Taiwan. One such neoplasm, non-Hodgkin's lymphoma, is the ninth most common cause of cancer-related mortality in both men and women in Taiwan; it has a standardized mortality rate of 2.4%–4.0% (Health Promotion Administration, Ministry of Health and Welfare, 2023). Although ocular adnexal lymphoma (OAL) ac-counts for only 1% of all non-Hodgkin's lymphoma cases, it is one of the most commonly occurring malignant tumors of the ocular adnexa, representing approximately 55% of all orbital malignancies. Patients with OAL who receive radiotherapy, chemotherapy, or immunotherapy often have a 5-year survival rate between 50% and 94%, with the majority retaining favorable physiological functioning [1]. Although these clinical outcomes are favorable, individuals with OAL often experience periorbital pain, cancer-related anxiety, and visible disfigurement caused by tumor-induced proptosis. These challenges may adversely affect patients' quality of life and satisfaction with medical care [1-3]. Therefore, in addition to managing physical pain and psychological distress, clinical nurses should focus on facilitating positive adaptation to changes in physical appearance.

The current study describes the case of a patient given a diagnosis of lymphoma presenting with right-eye proptosis. He was initially hospitalized for diagnostic evaluation, underwent partial tumor resection, and subsequently received chemotherapy. During the course of hospitalization, he experienced persistent orbital pain and facial disfigurement, both of which were difficult for the patient to accept. In addition, he was the primary financial provider in his family, and consequently, he expressed feeling profound anxiety regarding the potential for a poor prognosis or death. These clinical observations motivated the author to document the case and the individualized and continual physical and mental care strategies implemented to comprehensively address the patient's needs. This care experience may provide a reference for clinical nurses managing patients with similar conditions in future practice.

OAL primarily involves the conjunctiva, lacrimal gland, orbital fat, lacrimal sac, and eyelids. Because it does not have prominent symptoms or lead to visible changes in the early stages of the

disease, OAL is often difficult to differentiate from other orbital diseases. As it advances, patients may present with proptosis, palpable masses, periorbital swelling, ptosis, restricted ocular motility, globe displacement, and diplopia [1]. Achieving an ac-curate diagnosis of OAL requires the use of both imaging modalities and histopathological analyses, and treatment strategies for the disease commonly include radiotherapy, chemotherapy, or immunotherapy to achieve tumor reduction, with surgical resection considered on the basis of the patient's clinical condition and response to initial therapy [1], [4].

OAL may cause pain due to tumor compression in the orbital region. For patients who undergo surgery as part of treatment, postoperative wound pain may compound this discomfort, leading to such patients experiencing greater pain. Therefore, effective pain control is critical to improving the quality of life of such patients [1-2]. To achieve effective pain control, nurses should administer analgesics as prescribed, encourage patients to describe their pain experiences, and conduct thorough assessment to determine pain location, characteristics, severity, duration, and precipitating factors as well as to quantify pain using the Numerical Rating Scale (NRS, 0-10). Patients should also be provided with nutrition education, with an emphasis on consuming a high-protein diet and adequate vitamin C, which can support wound healing. Non-pharmacological strategies are as crucial as pharmacological strategies are in pain management, and nurses should implement strategies such as guided deep breathing and adjustment of positioning to minimize traction-induced pain [5]. In addition, research indicates that complementary therapies, such as music therapy and acupressure, can be effective in alleviating cancer-related and postoperative pain [6].

OAL often leads to proptosis, resulting in visible changes to facial appearance. These changes can trigger psychological responses such as depression, diminished self-esteem, and social withdrawal, ultimately undermining a patient's sense of identity and self-worth. Facilitating positive coping in patients can help alleviate negative emotions and foster stronger emotional connections with others [1], [7]. Nurses play a critical role in this process because they can help patients articulate their perceptions of and emotional responses to changes in their appearance through active listening, being present, engaging in empathetic communication, and initiating guided conversations. Developing an individualized care plan is also essential in addressing the psychosocial needs of patients with OAL. Such care plans may include sharing examples of successful adaptation, teaching strategies for concealing visible changes—such as using clothing, accessories, or subtle makeup to cover up changes prior to

tumor reduction, and encouraging family and friends to provide consistent emotional support throughout the care process. The Body Image Visual Analogue Scale (BIVAS) may be employed to evaluate a patient's satisfaction with their body image following appearance changes; on the scale, 0 mm indicates extreme dissatisfaction, and 100 mm indicates complete satisfaction [2]. Research also indicates that expressive writing interventions, such as those involving reflections on aspects of one's body that one is grateful for or statements emphasizing perceived control, are effective in promoting acceptance of physical changes [7].

Patients who have been diagnosed with cancer commonly experience anxiety stemming from uncertainty regarding prognosis and the potential for mortality [3]. In addition, studies indicate that approximately 60% of patients' experience varying degrees of anxiety prior to surgery. When effectively managed, anxiety can be reduced, which can lead to improved treatment adherence, accelerated wound healing, and reduced length of hospital stay [8]. In evaluating anxiety severity, nurses generally use assessment tools such as the Beck Anxiety Inventory (BAI), which categorizes anxiety levels as follows: 0 to 7, nor-mal; 8 to 15, mild; 16 to 25, moderate; and 26 to 63, severe. Furthermore, establishing a trusting nurse-patient relationship is essential; it can be achieved through being present, empathetic communication, and active listening. Providing patients with clear information about the progression of their disease, treatment plans, and follow-up care and inviting patients to participate in decision-making can enhance their sense of control. Moreover, receiving emotional support from family members, friends, and religious re-sources can enhance psychological well-being. Furthermore, complementary therapies such as music therapy, acupressure, and aromatherapy have been demonstrated to effectively reduce anxiety [3], [8-9].

Nursing Assessment

The patient in this case study is named Mr. Chang. He is a 41-year-old man, a high school graduate, and believes in Taoism. He is a fruit farmer and is married. He lives in a multigenerational household with his wife (aged 38 years), son (aged 10 years), father (aged 78 years), and mother (aged 77 years). The family is close and supportive. During Mr. Chang's hospitalization, his wife was the primary caregiver.

2-1. Medical History and Current Hospitalization

Mr. Chang has no family history of cancer, no prior medical or surgical conditions, and no known allergies to

food or medications. In early October 2023, he noticed mild proptosis of the right eye. By mid-October, the condition had progressed, with this ac-companied by a sensation of orbital fullness and pain. On October 26, he sought medical attention at the reporting hospital. Computed tomography identified a 1 × 1.2 cm2 mass in the right orbit, a 1 × 0.8 cm2 mass in the right cervical region, and several subcentimeter lesions in the right axilla. Following clinical evaluation, surgical removal of the right cervical and axillary tumors was recommended. Chemotherapy was planned as the initial treatment for the orbital tumor, with ophthalmologic surgery to be considered thereafter. The patient was admitted on October 28. On October 29, he underwent surgical excision of the right cervical and axillary tumors with concurrent pathological sampling. A subclavian Port-A catheter was placed for subsequent chemotherapy administration. A whole-body positron emission tomography scan performed on November 1 identified multiple lymphatic lesions less than 0.3 cm in the right orbit, bilateral cervical regions, clavicular areas, and bilateral axillae. Pathological analyses confirmed a diagnosis of stage III malignant lymphoma. The patient was discharged on November 4 and subsequently continued outpatient follow-up and chemotherapy as scheduled.

2-2. Nursing Process

The patient received nursing care from October 28 to November 4, 2023. Data regarding this case were collected through observations, patient interviews, medical record re-views, physical assessment, and direct care. The information was organized using Gordon's Eleven Functional Health Patterns framework, as detailed in the following:

2.2.1. Health perception and health management patterns

The patient reported no history of smoking, alcohol consumption, or betel nut chew-ing. He considered himself to be in good health, maintained a regular lifestyle, and routinely took multivitamins to support his well-being. When he experienced minor illnesses such as a cold, he typically self-medicated with over-the-counter drugs and sought hospital care only if his symptoms did not improve. Following his diagnosis of OAL, he initially struggled to accept that he had the condition, particularly because of his young age and role as the family's primary financial provider. Nevertheless,

he exhibited a proactive attitude; he cooperated with surgical treatment and sought information regarding chemotherapy and ongoing care. He demonstrated adequate health perception and self-management; no problems related to this specific domain were noted.

2.2.2. Nutritional-metabolic patterns

The patient is 174.5 cm tall and weighs 71 kg, with a body mass index of 23.3 kg/m², which is within the normal range. Over the 3 months following the initiation of treatment, his weight remained stable, changing by less than 1%. He reported having a good appetite, no food aversions, and no specific dietary preferences. His typical meals consisted of 1 bowl of rice with vegetables and meat, and his daily fluid intake was approximately 1800 to 2000 mL. Laboratory data collected on October 28 revealed a hemoglobin level of 12 g/dL, sodium level of 137 meq/L, potassium level of 4.5 meq/L, albumin level of 4.0 g/dL, and white blood cell count of 8450/μL—all of which are within normal reference ranges. On October 29, the patient underwent surgical excision of tumors in the right cervical and axillary regions, with incisions approximately 3 cm in length made at each site. A subclavian Port-A catheter was also inserted for subsequent chemotherapy administration. Throughout the postoperative period, sterile dressing changes were routinely performed. The patient maintained a good appetite and consistently finished his meals. Other than the wounds from surgery, his skin remained intact and elastic. His hair was black and glossy. The oral mucosa was healthy and intact, and his chewing and swallowing functions were normal. No nutritional or metabolic problems were identified.

2.2.3. Excretion patterns

During hospitalization, the patient exhibited regular excretion patterns. Bowel movements occurred every 1 to 2 days and consisted of soft, medium-volume, yellow-brown formed stools. His daily urinary frequency ranged from 6 to 8 times, with a total urine output of approximately 1500 to 1800 mL. The urine appeared pale yellow, clear, and free of sediment. No deviations from his usual bowel or urinary habits were noted. Abdominal assessment revealed slight distension. Auscultation detected 7 to 10 bowel sounds per minute. Percussion produced mild tympany, and palpation confirmed a soft, nontender abdomen without palpable masses. No edema was observed in the extremities. Laboratory

results obtained on October 28 revealed a blood urea nitrogen level of 6.1 mg/dL and a creatinine level of 0.62 mg/dL; both were within normal reference ranges. No excretion-related health problems were noted.

2.2.4. Activity and exercise patterns

Prior to hospitalization, the patient was fully independent in all activities of daily living. He regularly visited his orchard as part of his occupational routine and engaged in recreational physical activities such as family outings and hiking on weekends or during agricultural downtime. A chest X-ray conducted on October 28 revealed no notable abnormalities. During hospitalization, the patient scored 100 on the Activities of Daily Living scale, which indicated full functional independence. Muscle strength was graded 5/5 in all 4 limbs. The patient's vital signs remained stable throughout his hospitalization: his body temperature ranged from 36.4°C to 37.1°C, his pulse from 67 to 85 beats per minute, his respiratory rate from 16 to 20 breaths per minute, and his blood pressure from 121 to 133/62 to 76 mmHg. His respirations were smooth, with oxygen saturation maintained at 98% to 100%. The patient exhibited good peripheral circulation; his extremities and lips were pink. Respiratory auscultation revealed clear lung sounds without adventitious noises such as crackles or wheezes. Although the orbital tumor resulted in right-eye proptosis due to local compression, his visual acuity remained mostly unaffected. His gait was stable and coordinated, and no mobility problems were identified.

2.2.5. Sleep and rest patterns

The patient did not require regular use of sleep aids. His usual routine involved going to bed before 10:00 p.m. and waking at 6:00 a.m. to inspect the orchard; this provided him with approximately 8 hours of uninterrupted sleep per night. He did not take daytime naps and reported good overall sleep quality. However, on October 28, he experienced difficulty in falling asleep due to right orbital discomfort and preoperative anxiety. After consulting with the physician, he was given an analgesic and Xanax (0.5 mg), which enabled him to sleep through the night. Following surgery on October 29, the prescribed analgesics and anxiolytics were continued. Throughout his hospitalization, the patient remained energetic during the day, with no signs of fatigue, excessive yawning, or dark circles under his eyes. He consistently

reported achieving 8 hours of restful sleep each night. No sleep or rest problems were identified.

2.2.6. Cognitive-perceptual patterns

The patient had normal eyesight and was alert and fully oriented to person, place, and time. His cognitive functions, including his judgment, orientation, memory, and thought processing, were intact. His sensory perception, including his responses to temperature and pain, remained within normal limits. He was also able to accurately verbalize discomfort. On October 28, he reported, "My right eye has become more swollen and painful over the past few days. Sometimes the pain radiates to the right side of my head. Pressing on the eye worsens the pain. It typically takes about 30 to 40 minutes after I take analgesics for the discomfort to subside." Physical assessment on the same day (October 28) revealed proptosis and swelling of the right eye caused by tumor compression. The patient exhibited signs of discomfort, including a furrowed brow, cold sweats, and frequent head rubbing. He rated his pain as 7 out of 10 on the NRS. On October 29, following surgery, the patient stated, "Now I feel pain on the right side of my neck, in my armpit, and in the area where the catheter was inserted. Moving causes discomfort in the areas where the wounds are. My right eye is also starting to hurt again. Can I have more pain medication?" Subsequent assessment revealed approximately 3-cm surgical wounds in both the right cervical and axillary regions, and a subclavian Port-A catheter was placed. The patient continued to furrow his brow, frequently pressed on his right eye with his left hand, and avoided movement because of wound discomfort. Assessment indicated the presence of acute pain.

2.2.7. Self-perception and self-concept pattern

The patient considered himself to be a mild-tempered, optimistic individual with a strong sense of responsibility toward his family. Prior to his cancer diagnosis, he maintained positive relationships with his family and friends and was generally perceived to be cheerful and outgoing. On October 28, he expressed, "I want to decline all visitors except my wife. With how I look now, I don't want others to see me." He further inquired, "Can I keep wearing a hat? When I leave the ward to get water or go to the convenience store, I feel like my eye is bulging. If it frightens even me myself—imagine how others must feel." During the same day, the patient was

observed wearing a hat at all times in an attempt to conceal the protrusion of his right eye. He declined visits from anyone other than his wife and consistently drew the bedside curtain while in the room. Even when receiving nursing care, he kept his head lowered to avoid exposing his right eye. On October 29, he asked the nurse: “Do you think my right eye looks ugly? Will I scare people if I go out? I really think I look worse every time I see myself.” He was seen repeatedly examining his right eye in the mirror and questioning the nurses about his appearance. He demonstrated signs of denial and dissatisfaction regarding his physical changes. Assessment conducted using the BIVAS yielded a score of 25 mm, indicating significant dissatisfaction with his body image. This assessment revealed a disturbance in body image.

2.2.8. Role and relationship pattern

The patient’s primary role is that of an adult male; his secondary roles include being a husband, son, father, and fruit farmer. His tertiary role is a patient with cancer. Within his household, the patient is both the main decision-maker and the main financial provider. The family has a stable financial status, with no outstanding loans, and the patient’s hospitalization expenses have been covered by insurance. On October 30, his wife shared, “Although we sometimes argue over minor daily matters, our family is close, and we genuinely care for one another. Earlier, my in-laws had a video call with us and our son to express their concern.” Throughout his hospitalization, the patient had positive interactions with his wife, who remained with him and provided consistent emotional support. During episodes of anxiety or pain, she exhibited empathy and offered comfort and encouragement. The patient also consistently had cooperative and respectful interactions with the health-care team. No health concerns were identified in this domain.

2.2.9. Sexuality and reproductive patterns

The patient married at age 30 and currently has 1 child. He reported maintaining a regular sexual relationship with his wife, typically engaging in sexual activity 1 to 2 times per week, using condoms for contraception. Over the past 2 weeks, the frequency had decreased to approximately once per week because of orbital pain; however, this change had not affected the couple’s emotional intimacy. During the patient’s hospitalization, physical assessment revealed no abnormalities in the genital

area and no unusual discharge. No health concerns were identified in this domain.

2.2.10 Coping and stress tolerance patterns

The patient stated that under normal circumstances, he copes with stress by spending time in the orchard, discussing problems with his wife, or socializing with his friends over tea. However, his cancer diagnosis posed a considerable emotional and physical burden. On October 28, he reported, “Since I’ve learned that I have cancer, I’ve been feeling low. I often feel agitated and constantly fear that it might be untreatable—that I might die.” He also shared, “The surgery is scheduled for tomorrow. Although I know it’s just a minor excision and biopsy, it’s my first surgery, so I feel nervous.” On the day of surgery, he appeared visibly anxious when discussing his diagnosis—furrowing his brow, lowering his head, and frequently sighing. He exhibited signs of emotional distress related to both the cancer diagnosis and the upcoming procedure. Assessment conducted using the BAI revealed a score of 28, indicating moderate anxiety. After the physician explained the pathological findings and positron emission tomography scan results to the patient on November 1, the patient was shocked, stating, “What? A malignant tumor? And there are more tumors in other areas? What am I supposed to do? I still have to support my family!” He further inquired, “Will chemotherapy completely cure this? Is there a high chance of recurrence?” He appeared visibly tense—clenching his fists, rubbing his hands, and repeatedly expressing concerns over the prognosis and effectiveness of chemotherapy. On the basis of these responses and behavior, the patient was determined to be experiencing clinically significant anxiety.

2.2.11 Values and belief patterns

The patient believes in Taoism and routinely engages in ancestral worship during the Chinese New Year and other major holidays. Prior to his admission, he and his wife visited a temple to pray for smooth surgery and treatment outcomes. On November 2, he ex-pressed, “I used to think that earning more money to provide for my family was my top priority, but now I realize that health is the foundation of everything—without it, I can’t work or support my family. I’m truly relying on you. I will fully cooperate with the treatment.” No health concerns were noted in this domain.

Problem Identification

According to the aforementioned assessment, the patient demonstrated the following health concerns: acute pain associated with tumor-induced compression of the right eye and postoperative surgical wounds; disrupted body image related to changes in physical appearance caused by proptosis of the right eye due to tumor compression; and anxiety resulting from the initial cancer diagnosis, upcoming surgical procedures, and uncertain-ty regarding prognosis and treatment outcomes.

IV. Discussion and Conclusions

This study presents a nursing care experience involving a patient with a new diagnosis of lymphoma, which had led to his right-eye proptosis. During hospitalization, the patient underwent a series of diagnostic evaluations, including a pathological biopsy, and was scheduled to receive outpatient chemotherapy following discharge. Throughout the course of care, 3 primary health concerns were identified: acute pain, body image disturbance, and anxiety. Pharmacological pain management was administered as prescribed by the attending physician. In parallel, non-pharmacological strategies—including music therapy, comfortable positioning, and acupressure—were introduced, and they effectively reduced the patient's perceived pain. To address the patient's psychological dis-tress related to his altered appearance, the care team encouraged him to openly express his emotions and discussed practical methods for concealing the visible effects of proptosis during his social interactions. Expressive writing was implemented as a structured intervention, with it used to help the patient gradually accept changes in his appearance. A trusting nurse-patient relationship was fostered through active listening, being present, and empathetic communication. An interdisciplinary team provided the patient with disease-specific education and reinforced the use of non-pharmacological anxiety-reduction techniques, including music therapy, acupressure, and aromatherapy. These interventions aligned with findings from the reviewed literature. Before discharge, follow-up outpatient appointments were arranged, and the patient was referred to an oncology case manager for continued support. A detailed handover of the

patient's medical and psychosocial needs was conducted. At that time, the patient's self-perceived body image—as measured using the BIVAS—was 60 mm. As part of the postdischarge care plan, the patient, his spouse, and the case manager agreed to continue the expressive writing intervention, with support in the form of regular telephone follow-ups by the case manager and outpatient visits. The patient reported in an outpatient follow-up on November 20 that he had consistently engaged in the daily expressive writing practice. His BIVAS score had risen to 75 mm, indicating a notable improvement in his self-image and a greater lev-el of acceptance toward the changes in his physical appearance.

Although the study hospital actively promotes evidence-based practice, it lacks a comprehensive framework for integrating various evidence-based interventions into clinical workflows. For example, in the current case, expressive writing was incorporated into care, and although the nursing staff were aware of its evidence-based rationale, their individual interpretations of and methods of implementing the intervention varied considerably. This inconsistency led to uneven patient education and implementation of the intervention. To address this problem in future cases, a dedicated evidence integration team can be established to develop standardized guidelines and protocols for each evidence-based intervention. Furthermore, offering online training courses would enhance nursing staff's knowledge of interventions and ensure consistent application across the care team. Such initiatives would facilitate individualized nursing care tailored to patient needs while ensuring consistency in the implementation of care practices.

Tables

Table 1. Acute pain associated with tumor-induced compression of the right eye and postoperative surgical wounds (October 28 to November 4)

Subjective and Objective Data	S1. On October 28, the patient reported, *"My right eye has become more swollen and painful over the past few days. Sometimes the pain radiates to the right side of my head. Pressing on the eye worsens the pain. It typically takes about 30 to 40 minutes after I take analgesics for the discomfort to subside."* S2. On October 29, the patient stated, *"Now I feel pain on the right side of my neck, in my armpit, and in the area where the catheter was inserted. Moving causes discomfort in the areas where the wounds are. My right eye is also starting to hurt again. Can I have more pain medication?"* O1. On October 28, the patient presented with right-eye proptosis and periorbital swelling due to tumor compression. He was observed to have a furrowed brow, co sweats, and repeated rubbing of his head. He rated his pain as 7 out of 10 on the NRS. O2. On October 29, after his surgery, 2 wounds approximately 3 cm in length were noted in the right cervical and axillary regions, and a Port-A catheter had been placed in the right subclavian area. The patient appeared to be in discomfort, as evidenced by a furrowed brow, repeated application of light pressure to his right e with his left hand, and apparent reluctance to move because of surgical pain on the right side.
Goals	1. By October 29, the patient will be able to accurately employ at least 2 nonpharmacological strategies for managing tumor-related pain. 2. By October 30, the patient will be able to discuss at least 2 nonpharmacological methods f relieving postoperative wound pain. 3. By November 1, the patient will report overall pain relief, with an NRS pain score of belov 3.
Nursing Interventions	1-1 On October 28, a handout for a personalized pain management plan was provided to the patient. Both the patient and his spouse were instructed on the following nonpharmacolog pain relief methods: (1) Deep breathing: The patient was instructed to inhale through th n for 5 seconds, hold his breath for 3 seconds, and exhale slowly through his mouth for 8 seconds and to repeat this process as necessary. (2) Comfortable positioning: The patient instructed to elevate the head of his bed by 30° to 45° or to adopt a left lateral position reduce blood accumulation in the right eye, which can worsen swelling. (3) Music therapy The patient was instructed to listen to music that he enjoyed, either by using an earbud in left ear or by placing a mobile device set to a low volume near his pillow. (4) Acupressu The patient was instructed to apply circular pressure to the Xuehai (SP10), Sanyinjiao (SI and Hegu (LI4) points; press each point for 5 seconds; relax for 1 second; and repeat this process for 2 to 5 minutes per session. 1-2 On October 28, after a consultation between the physician and the patient, Traceton 1# PO q6h—which was previously prescribed in the outpatient setting—was continued. Pain lev were reassessed 30 to 60 minutes postadministration and documented. 2-1 On October 29, after the surgery, the pain management handout was revisited, with postoperative wound pain management emphasized. The patient and his spouse were instructed in how to implement the following strategies: (1) Deep breathing, music thera and acupressure, with these applied as described for the previous day. (2) Comfortable positioning: The patient was instructed to elevate the head of the bed by 30° to 45°. He w told that when he was in the supine position, he should place a pil low under the right side the body to facilitate venous return toward the left and reduce swelling. (3) Nutrition: The patient was instructed to increase his intake of vitamin Grich food (eg, broccoli, bell pepp and the patient's homegrown guava) and high-protein items (eg, eggs, tofu, fish, and chick

Table 2. Acute pain associated with tumor-induced compression of the right eye and postoperative surgical wounds (October 28 to November 4)

Subjective and Objective Data	S1. On October 28, the patient stated, *"I want to decline all visitors except my wife. With how I look now, I don't want others to see me."* S2. On October 28, the patient asked, *"Can I keep wearing a hat? When I leave the ward to get water or go to the convenience store, I feel like my eye is bulging. If it frightens even me myself—imagine how others must feel."* S3. On October 29, the patient asked, *"Do you think my right eye looks ugly? Will I scare people if I go out? I really think I look worse every time I see myself."* O1. On October 28, the patient was observed to be wearing a hat at all times in an attempt to conceal the protrusion of the right eye. He declined all visitors except h wife and drew the bedside curtain during his hospital stay, even when he was receiving nursing care. He kept his head lowered to avoid revealing his right eye t others. O2. On October 29, the patient was observed repeatedly examining his right eye in a mirror, persistently asking nursing staff about his appearance, and expressing deni regarding his physical changes. The patient's body image was assessed using a visual analogue scale, and the score was 25 mm, indicating severe dissatisfaction with his appearance.
Goals	1. By October 30, the patient will be able to verbalize his true feelings regarding changes in his facial appearance. 2. By October 31, the patient will engage in a discussion with health -care professionals abo at least 2 coping strategies for managing his altered appearance. 3. By discharge, the patient will demonstrate at least 1 positive behavioral response to chan in his appearance (eg, participation in expressive writing and initiating open conversation with medical staff), and his body image visual scale score will increase to at least 60 mm.
Nursing Interventions	1-1. Throughout the care period, the nurse established a favorable nurse-patient relationship w the patient through active listening, being present, and empathetic communication. The patient was encouraged to express his thoughts regarding the changes in his fac appearance due to his right-eye protrusion, including his perceptions regarding the influe of these changes on his daily life and work. The care plan was adjusted on the basis of th patient's expressed concerns. 2-1. The patient's verbal and nonverbal indications of his views regarding his body image dur interactions and outings were continually monitored, with the observations used to asses his coping capacity and adaptation to his altered appearance. 2-2. On October 29, nurses and the patient collab orated to develop appearance -modify strategies that aligned with his usual clothing habits: (1) Wearing sunglasses: The patient typically wore sunglasses while inspecting the orchard to protect his eyes from strong sunlight. Incorporating this habit int o his daily routine was proposed as a strategy for concealing the protruding eye. (2) Wearing a hat: The patient typically wore a traditional bamboo hat while working. A strategy was proposed in which the patient wore a baseba cap with an extended brim to help conceal his eye in public. 3-1. The patient's wife was encouraged to remain present and actively involved in all aspects care. Video calls with other family members were also recommended to provide addition emotional support. 3-2. On October 29, the patient and his wife were presented with information regarding simil case experiences, with this including information regarding (1) the typical duration required for tumor size reduction, (2) common functional and psychological challenges faced before visible improvement occurs, and (3) potential difficulties encountered durin

Table 3. Anxiety resulting from the initial cancer diagnosis, upcoming surgical procedures, and uncertainty regarding prognosis and treatment outcomes (October 28 to November 4)

Subjective and Objective Data	S1. On October 28, the patient stated, *"Since I've learned that I have cancer, I've been feel low. I often feel agitated and constantly fear that it might be untreatable—that I might die."* S2. On October 28, the patient reported, *"The surgery is scheduled for tomorrow. Althoug know it's just a minor excision and biopsy, it's my first surgery, so I feel nervous."* S3. On November 1, upon learning about his diagnosis, the patient exclaimed, *"What? malignant tumor? And there are more tumors in other areas? What am I supposed to do? I s have to support my family!"* S4. On November 1, the patient asked, *"Will chemotherapy completely cure this? Is ther high chance of recurrence?"* O1. On October 28, when discussing his cancer diagnosis, the patient had a furrowed brow a tense facial expression; he frequently sighed and lowered his head. The patient expres anxiety related to the diagnosis and upcoming first surgery. His BAI score was 28. O2. On November 1, upon receiving the pathology report indicating malignant lymphoma a the presence of multiple tumors, the patient exhibited signs of emotional distress, includin tense expression, mild hand clenching and rubbing, and repeated verbalization of anxiety ab the diagnosis and questions regarding the efficacy of chemotherapy.
Goals	1. By October 29, the patient will be able to correctly implement at least 3 nonpharmacologi anxiety-reduction techniques. 2. Prior to discharge, the patient will report a noticeable reduction in anxiety, as evidenced b BAI score lower than 14.
Nursing Interventions	1-1. On October 28, the patient and his spouse were provided with education on anxie reduction strategies, including the following: (1) Music therapy: The patient was encouraged listen to calming music, such as that including nature sounds and no lyrics. (2) Acupressu The patient was instructed to apply circular pressure to the Neiguan (PC6), Laogong (PC Taichong (LR3), and Yongquan (KI1) points, with each point being pressed for 5 seconds a released for 1 second and with sessions lasting 2 to 5 minutes. (3) Aromatherapy: Because patient had no prior experience with using essential oils, lavender oil was recommended to hi He was instructed that it could be applied topically during acupressure or dripped onto a pi of gauze and placed near his pillow to promote relaxation through scent. (4) Religious practi As a follower of Taoism, the patient was encouraged to pray to deities for surgical success a recovery and to use this as an outlet for expressing his internal fear and anxiety. 1-2. On October 29, nurses participated in a multidisciplinary consultation with the physici patient, and spouse to explain the postoperative evaluations that would be required a treatment plans. The patient's wife was encouraged to participate actively in the patient's c to enhance the patient's sense of control. 1-3. On November 2, the nurses collaborated with the physician to explain the anticipa treatment course to the patient and his spouse, including the need for regular chemothera sessions (approximately half- to full-day visits) and scheduled follow-up appointments monitor treatment outcomes. 2-1. Throughout the care period, a trusting nurse-patient relationship was established by nurses consistently being present and engaging in empathetic communication and act listening. The BAI was administered periodically to assess changes in the patient's anxi levels.
Outcome Evaluation	1. On October 29, the patient stated that the anxiety-reduction strategies were similar to th used for pain management, noting that they included listening to music and perform

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流感併發重症引起急性呼吸窘迫症候群使用肺保護性通氣策略之呼吸照護經驗

Respiratory Care Experience of Influenza Severe Case caused Acute Respiratory Distress Syndrome using Lung Protective Ventilation Strategies

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目的

流感是一種高度傳染性的呼吸道病毒性疾病，嚴重程度各不相同但重症病例常導致肺炎、急性呼吸窘迫症候群和多重器官衰竭，尤其是 65 歲以上的老年人面臨更高的免疫老化、慢性合併症和疫苗效力下降的風險，全球每年有數百萬人感染流感，其中老年族群的感染率與死亡率明顯較高。本文分享一名 67 歲女性雖已接種流感疫苗仍確診流感併發重症引起急性呼吸窘迫症候群使用肺保護性通氣策略的呼吸照護經驗。

呼吸治療評估

病患為 67 歲女性，無過去病史，今年 1/14 施打流感疫苗後開始咳嗽，1/19 因頭暈、臉色蒼白且全身無力入急診求治，由於呼吸喘及低血氧予以插氣管內管並使用呼吸器，診斷為流感併發重症轉入加護病房，1/24 胸部 X 光雙側嚴重浸潤，呼吸器設定為 PEEP10cmH_2O、$FiO_2$70%，氧合指數(PaO_2/FiO_2 ratio)為 81mmHg，診斷為重度急性呼吸窘迫症候群(ARDS)。

問題確立

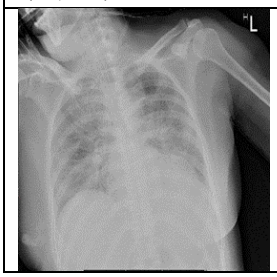
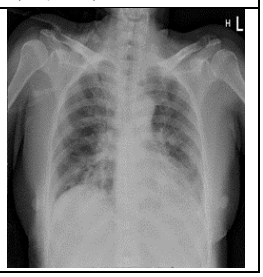
1.第一型呼吸衰竭，因灌流通氣失衡(V/Q mismatch)導致。
2.呼吸道清除功能失效，與插管及鎮靜藥物使用有關。
3.呼吸肌無力，因長期臥床導致。

呼吸置措施

1.呼吸器採用肺保護性通氣策略:潮氣容積 300ml(預測體重 PBW50kg、潮氣容積 6ml/kg)、PEEP10-14cmH_2O、Pplt<30cmH_2O，並給予鎮靜藥物。
2.每 2 小時及必要時翻身拍背使用密閉式抽痰管抽痰。
3.定期追蹤胸部 X 光、氧合指數(PaO_2/FiO_2 ratio)、呼吸器脫離指標(weaning profile)。
4.每週 2 次，每次 30-50 分鐘的肺部復原治療。

結果評值

1/24 胸部 X 光雙側嚴重浸潤(圖一),氧合指數(PaO_2/FiO_2 ratio)為 81mmHg,確診為重度 ARDS,呼吸器設定調整至肺保護性通氣策略以提高氧合及避免肺損傷,給予類固醇抑制肺部發炎,給予鎮靜藥物讓病患與呼吸器同步,氧合指數(PaO_2/FiO_2 ratio)由 81 增加至 179mmHg,顯示氧合顯著改善;1/28 胸部 X 光雙側浸潤改善(圖二),停用鎮靜藥物開始下調呼吸器設定至 Synchronized Intermittent Mandatory Ventilation(SIMV)模式並衛教病患執行肺復原計畫,病患由需協助抬舉上肢進步至可自行舉起 600c.c.寶特瓶,顯示肌力顯著恢復,3/3 呼吸器脫離指標為淺快呼吸指數(RSBI):32.5、最大吸氣壓力(MIP):-26、最大吐氣壓力(MEP):+40,3/12 以 T-Piece 訓練病患脫離呼吸器自主呼吸,3/20 拔管後使用 Aerosol mask 病患 SpO_2達 97%。

1/24 胸部 X 光雙側嚴重浸潤 (圖一)	1/28 胸部 X 光雙側浸潤改善 (圖二)
	

結果與討論

病患因第一型呼吸衰竭在急性期給予肺保護性通氣策略能顯著改善氧合並減少肺損傷,急性期過後執行肺復原計畫協助病患恢復呼吸肌肌力及耐受力可提升呼吸器脫離率,透過 SIMV 模式與 T-Piece 訓練脫離呼吸器,恢復自主呼吸功能,提升身體活動機能與恢復日常生活品質。

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