

Renal Data System in Taiwan

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Outline

- The Future State: What Renal Data Can Achieve
- The Current State: What We Have in Taiwan Today
- The Gap & Next Steps: What We Must Build

Disclosure:

- The presenter has no financial or personal conflicts of interest to declare.

Two Systems, One Goal: Bridging Administrative and Registry Data in CKD Care

Administrative / Claims-Based System

- Origin: Insurance reimbursement & quality audit
- Focus: Coverage, cost, utilization, and outcomes
- Strengths: Nationwide scale, continuity, representativeness, cost saving
- Best for: Policy evaluation, quality improvement



The screenshot shows the homepage of the NIDDK USRDS 2024 Annual Data Report. The top navigation bar includes links for USRDS Home, Annual Data Report, Prior Data Reports, For Researchers, and ESRD Quarterly Update. The main content area features a search bar and a table of contents for the 2024 Annual Data Report, which includes sections on Introduction, Navigating the 2024 ADR, Chronic Kidney Disease, End Stage Renal Disease, Supplements: Healthcare Disparities, Healthy People 2030, Reference Tables, and Suggested Citation.

Registry / Prospective System

- Origin: Research or disease-specific enrollment
- Focus: Disease mechanisms, risk factors, prognosis
- Strengths: Clinical depth, precision, predefined structure
- Best for: Hypothesis testing, longitudinal cohort studies



The screenshot shows the homepage of the DOPPS (Disease Outcomes and Practice Patterns Study) website. The top navigation bar includes links for ABOUT US, OUR STUDIES, PUBLISHED RESEARCH, PARTNER WITH US, and DOPPS PRACTICE MONITOR. The main content area features a blue background with the text "Powerful data. Global insights." and "DOPPS helps shape practice and policy for better health across the world." Below this is a "LEARN MORE" button.



The screenshot shows three cards from the DOPPS website: "The DOPPS Practice Monitor" (describing data on contemporary trends in hemodialysis and peritoneal dialysis practices), "Partner with the DOPPS" (describing a collaborative or ancillary study), and "Our Published Research" (describing over 300 papers in peer-reviewed journals).

- Longer dialysis time
- Use of AV fistula
- $Kt/V \geq 1.2$
- $UF < 13\text{ml/kg/hr}$
- Targeting Ca/P/iPTH
- Individualized ESA
- Patient-reported outcome

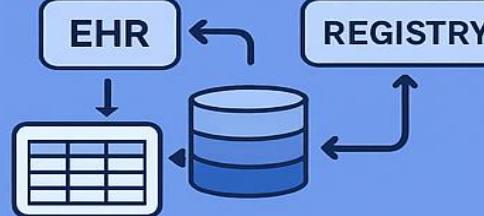
The Future Renal Dataset: From Hybrid Data to SMART CKD System

Bridging traditional datasets with digital clinical data

Multiple data types integrated into one pipeline

Real-time, predictive, personalized renal care ecosystem

Hybrid Renal Data (Current Transition Stage)



- EHR x Registry linkage
- Dialysis flow sheets (UF, BFR, Kt/V)
- Lab + medication+ visit history
- Structured clinical parameters

Multimodal Renal Data (AI-Ready Stage)



- Early detection, phenotype discovery, prediction models

SMART CKD System (Future Vision)



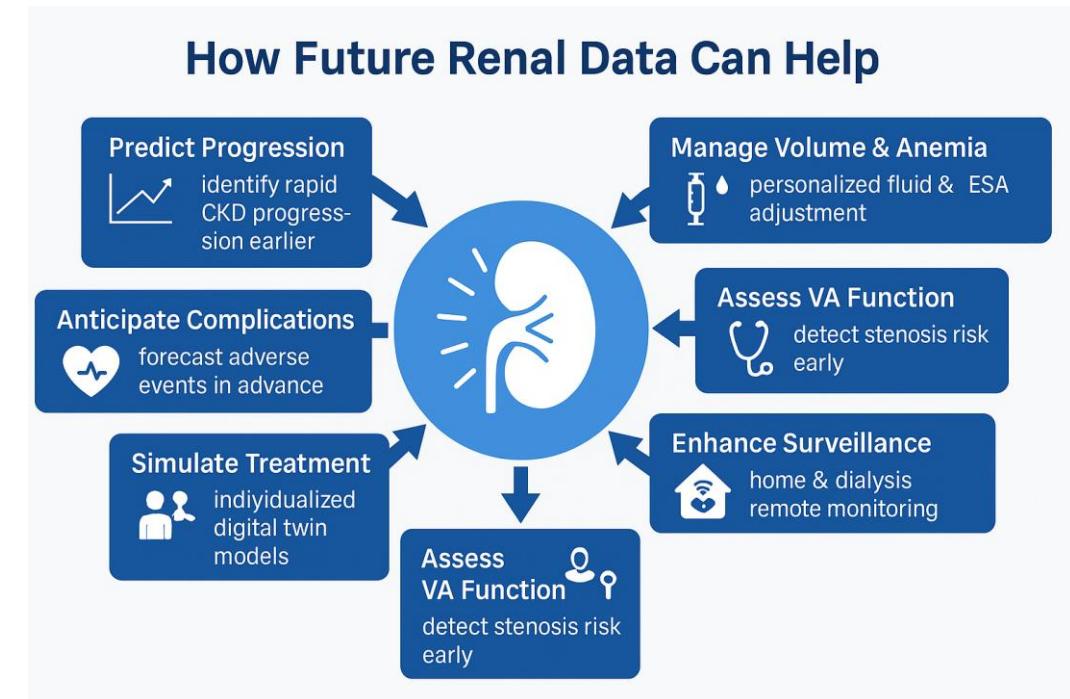
- Continuous monitoring (IDH risk, PTA timing)
- Automated alerts & decision support
- Personalized ESA & fluid management
- Dynamic risk heat map

The stages evolve in parallel rather than sequentially.

Within any stage, success proven in a smaller setting can be expanded and scaled to larger populations or institutions

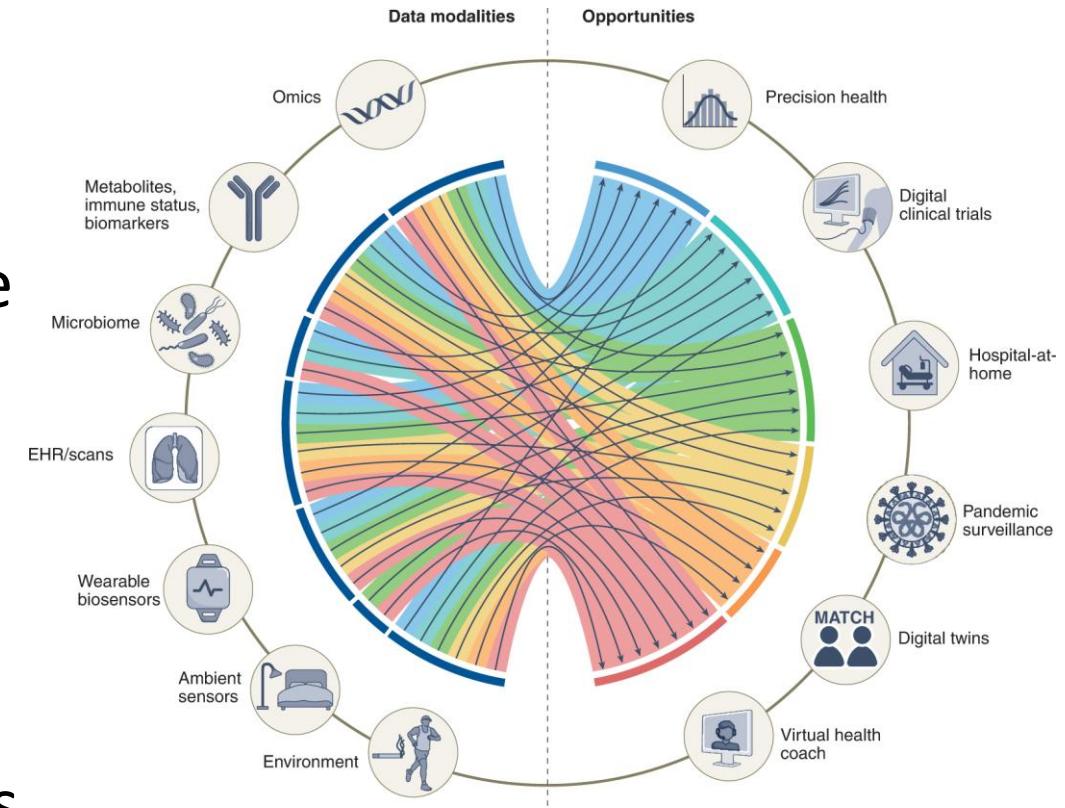
Future renal data transforms CKD care : from reactive to predictive

- Predict earlier
 - Ex. CKD progression/complications
- Intervene smarter
 - Ex. ESA, volume, VA stenosis
- Monitor continuously
 - Ex. home + dialysis
- Personalize precisely
 - Ex. digital twins, less trial and error
- Improve outcomes
 - Ex. fewer admissions, better kidney survival



What We Need to Build a Predictive CKD Data System

- Multimodal, longitudinal renal data
 - (EHR + dialysis + home + omics etc.)
- Integrated, interoperable infrastructure
 - (standardized, real-time, secure)
- Strong governance & trust
 - privacy, ethics, regulation
- Advanced analytics & AI
 - prediction, simulation, decision support
- Deep integration into clinical workflows
 - actionable, usable, evaluated



How far are we now?

From reactive to predictive, what kind of data do we need to collect?

The Current State: What We Have in Taiwan Today

Four Major Renal Data Systems in Taiwan

System	Initial Purpose	Data Type & Focus	Current Role
TWRDS (Taiwan Renal Registry Data System) (1987-)	Audit dialysis quality, insurance accreditation	Monthly center reporting (clinical + lab) Insurance claim data	Full ESKD registry, >99% national coverage, 2-yr lag
ARKDT (Annual Report on Kidney Disease in Taiwan, 2014–)			
Pre-ESRD P4P Program (2006–)	Standardize stage 3–5 CKD care	Structured clinical and lab uploads, quarterly visits	Longitudinal CKD cohort linked to NHI, 2-yr lag
Early CKD Care Program (2011–)	Promote early detection & community management	Screening, eGFR/ACR surveillance	Expanding coverage to stage 1–3a CKD, 2-yr lag
Renal Biopsy Registry (2014–)	Integrate pathology and clinical data	Pathology + diagnosis linkage	Foundation for precision medicine and research, 6-month lag

P4P Data in Taiwan: Strong Surveillance Value, Limited Frontline Utility



表2 2018-2022年新發透析患者人數					
年度	2018	2019	2020	2021	2022
總計	12,342	12,471	12,375	12,207	12,459
性別					
男性	6,902 (55.9%)	6,902 (55.3%)	7,001 (56.6%)	6,948 (56.0%)	7,146 (57.4%)
女性	5,440 (44.1%)	5,569 (44.7%)	5,374 (43.4%)	5,261 (43.1%)	5,313 (42.6%)
年齡別(歲)					
<40	466 (3.8%)	454 (3.6%)	493 (4.0%)	408 (3.3%)	441 (3.5%)
40-64	4,324 (35.0%)	4,341 (34.8%)	4,104 (33.2%)	4,074 (33.4%)	4,085 (32.8%)
65-74	3,315 (26.9%)	3,539 (28.4%)	3,675 (29.7%)	3,674 (30.1%)	3,731 (29.9%)
≥75	4,237 (34.3%)	4,137 (33.2%)	4,103 (33.2%)	4,051 (33.2%)	4,202 (33.7%)
透析模式別					
血液透析	11,177 (90.6%)	11,293 (90.6%)	11,168 (90.2%)	11,030 (90.4%)	11,277 (90.5%)
腹膜透析	1,165 (9.4%)	1,178 (9.4%)	1,207 (9.8%)	1,177 (9.6%)	1,182 (9.5%)
糖尿病	5,679 (46.0%)	5,946 (47.7%)	5,808 (46.9%)	5,823 (47.7%)	5,747 (46.1%)

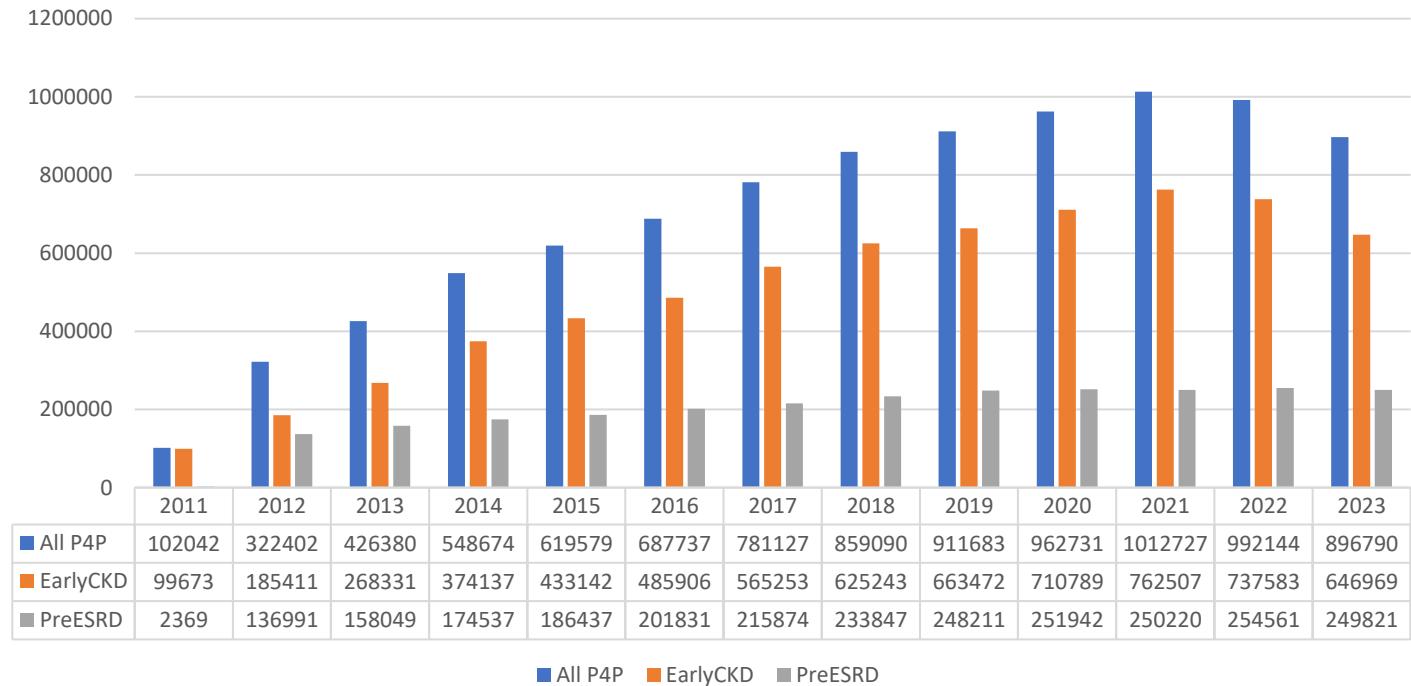
註 1：透析模式別 --- 開始連續門急診透析三個月內至少有使用一次腹膜透析者歸為腹膜透析，其餘則歸為血液透析。

註 2：糖尿病以開始透析前一年之門、住診主診斷碼位為判斷依據，且符合住院 1 次或門急診 2 次以上的定義。

註 3：P4P 資料來源：ICD-9-CM 與 ICD-10-CM 碼碼參考方法學。

註 4：% = 該年 (各組別) 人數 / 該年新發透析數 * 100 %

Trends in P4P Program Service Volume in Taiwan (2011–2023), covering near 70% of incident dialysis



Mapping Taiwan's Renal Data Systems Across the Three Stages of Data Evolution

	Hybrid Renal Data (Current Transition stage)	Multimodal Renal Data (AI-ready stage)	Smart CKD system (Future Vision)
Dialysis registry dataset (caring for dialysis patients)	National level, output as Annual Report on Kidney Disease in Taiwan (ARKDT)	Inter-tertiary hospital level, for model validation	A few Tertiary hospitals are working on specific projects separately
Pre ESKD program (caring for advanced CKD patients)	National level, reported recently and regularly	Tertiary hospital level, most for academic study	Pilot smart CKD projects exist, but are not yet integrated nationally.
Early CKD program (caring for early CKD patients)	National level, reported recently and regularly	Tertiary hospital level, most for academic study	Limited multimodal research; smart CKD applications remain fragmented.
Renal biopsy registry (caring for GN patients)	National level, reported recently	AI pathology initiatives exist at the tertiary hospital level	Not yet

Key Barriers Preventing the Transition to Smart CKD Data Systems

Data collection (Hybrid stage)

- It is not easy for the care team to collect or prepare the data.
- The care team has no incentive to collect the data.
 - **Incentives** include many forms beyond money.

Multimodal (AI-ready stage)

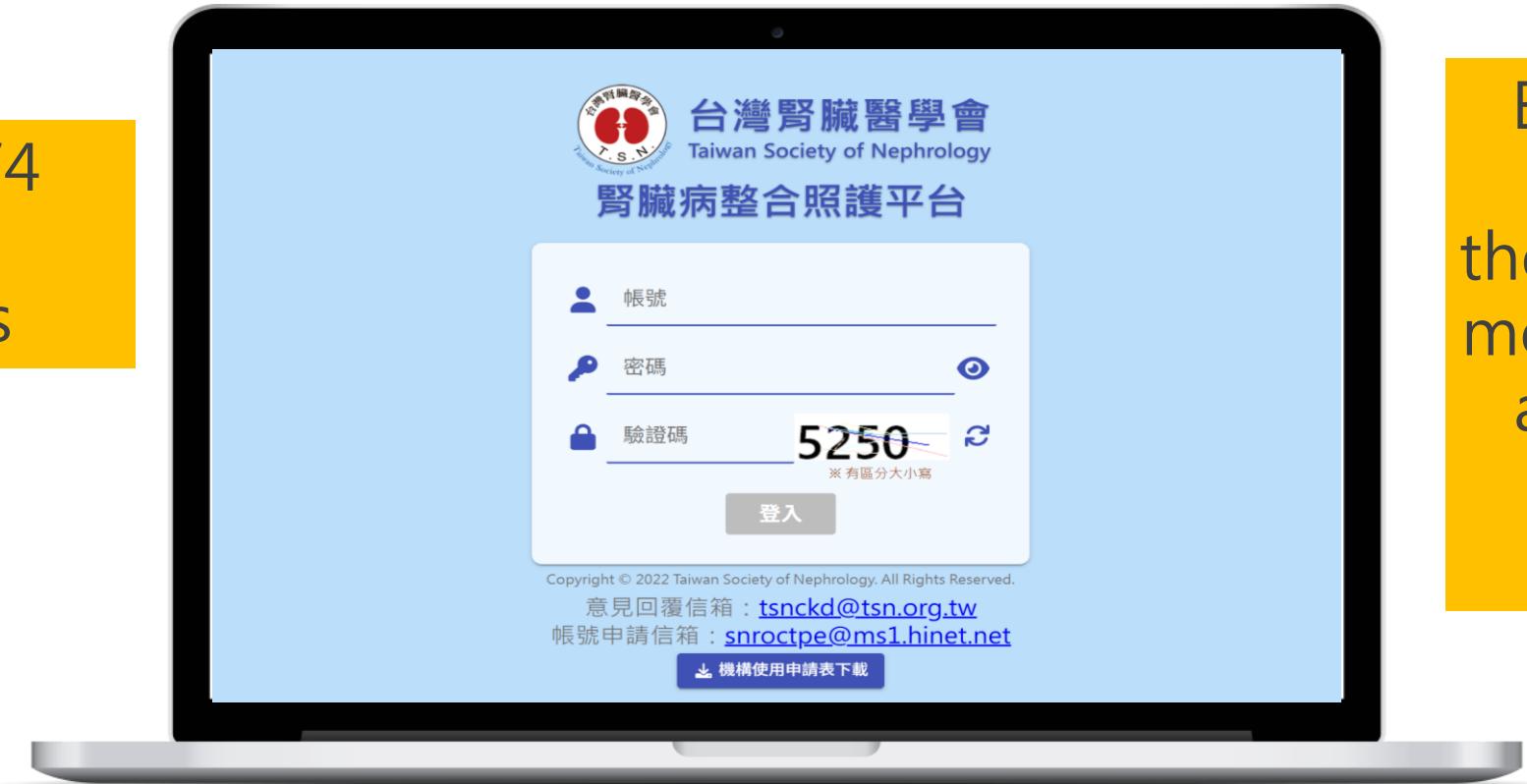
- IT support, both hardware and software, is not adequate etc.



腎臟病整合照護平台

TSN-CKD Integrated Care Platform

In use by 274
Medical
Institutions



Enrolling more
than 150
thousand patients,
most of whom are
advanced CKD
patients.

TSN-CKD Integrated Care Platform to help the care team with administrative issues



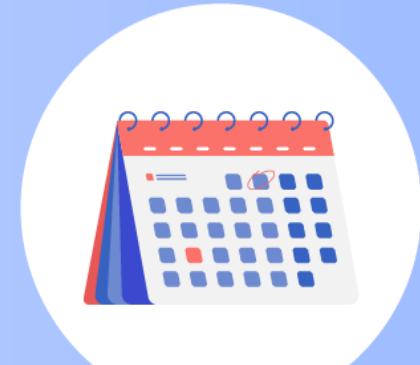
個案管理 Case Management

- Kidney function monitoring (eGFR slope)
- Lifestyle and health-behavior assessment
- Patient-clinician shared evaluation
- Personalized care-plan design
- Shared decision-making
- High-risk patient management



臨床稽核 Clinical Review

- CKD care quality monitoring
- Health-promotion program quality review
- Lab / medication utilization analysis
- Shared decision support effectiveness evaluation



申報管理 Reporting & Administrative Management

- Automated VPN-based data upload
- Batch report generation
- Auto-flagging cases meeting criteria
- Automated incentive program submission

The system is designed based on Kidney disease pay-for-performance (P4P) programs

腎臟病整合照護平台 v1.25.05.16

公告 個案清冊 快速搜尋 報表分析 申報管理 系統管理 醫創科技 測試用衛教... 登出

清除條件 檢查

+ 新增個案

衛教人數(照護中/總數) : AKD 2/3 Early-CKD 51/53 DKD 1/1 Pre-ESRD 2/4
藥師收案(照護中/總數) : AKD 1/1 Pre-ESRD 1/1
逾期一年個案 : AKD 2 Early-CKD 52 DKD 1 Pre-ESRD 1

匯出

清單類型 個案清單

收案日期 起日 至 迄日

收案類型 不分

病歷號/姓名
身分證號/編號

個案Stage 2, 3a, 3b, 4, 5

結案 全部

結案日期 起日 至 迄日

共9筆 8人 * 同一人收案兩次計兩筆數，算一人數

收案日期	收案類別	病歷號	姓名	身分證號	年齡	eGFR (MDRD)	eGFR (EPI)	Stage	藥師收案	結案	快捷
2023-03-13	Early-CKD	003438995C	DM 吳○樺	F22****232	65	66.7	(70.9)	2		N	
2023-01-30	Early-CKD	224912	吳○花	M22****498	63	67.4	(72.3)	2		N	
2023-01-27	Early-CKD	238081	DM 李○秀鑾	M20****024	75	74.3	(76.8)	2		N	
2022-12-21	Pre-ESRD	000556600	YOD	Y28*****58	59	53.5	(57.3)	3a	2025-02-26	N	
2022-11-30	AKD	00005566	黃○姐	A27*****60	79	46.3	(46.6)	3a		N	
2022-07-04	Pre-ESRD	764242	DM 聶○亮	A20****819	76	4.1	(3.8)	5		N	
2022-01-27	Pre-ESRD	1112232	FOG	Y14****073	60	31.3	(32.3)	3b		Y	
2021-11-25	Pre-ESRD	00001123	無○大	A10*****69	57	30.1	(31.3)	3b		Y	
2018-01-02	DKD	1112232	FOG	Y14****073	85	76.6	(76.6)	2		N	

Multidisciplinary care teams for CKD

腎臟病整合照護平台 v1.25.05.16

公告 個案清冊 快速搜尋 報表分析 申報管理 系統管理

編號/姓名/病歷/身分證號

基本資料 檢驗數據 **衛教指導** **營養表單** 醫病共享決策 藥事指導

聶O亮 Pre-ESRD
A20****819
女 76歲 編號 4697

病歷：764242
生日：1949-02-10
Stage : 5 DM
eGFR : 4.1
收案：2022-07-04

本院 2022-07-04收

衛教紀錄

衛教單張
用藥/住院
指導項目
趨勢圖

CKD nurse

腎臟病整合照護平台 v1.25.05.16

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營養紀錄

營養評估
營養診斷與飲食問題
衛教項目與評值
趨勢圖

Dietitian

腎臟病整合照護平台 v1.25.05.16

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藥事照護評估

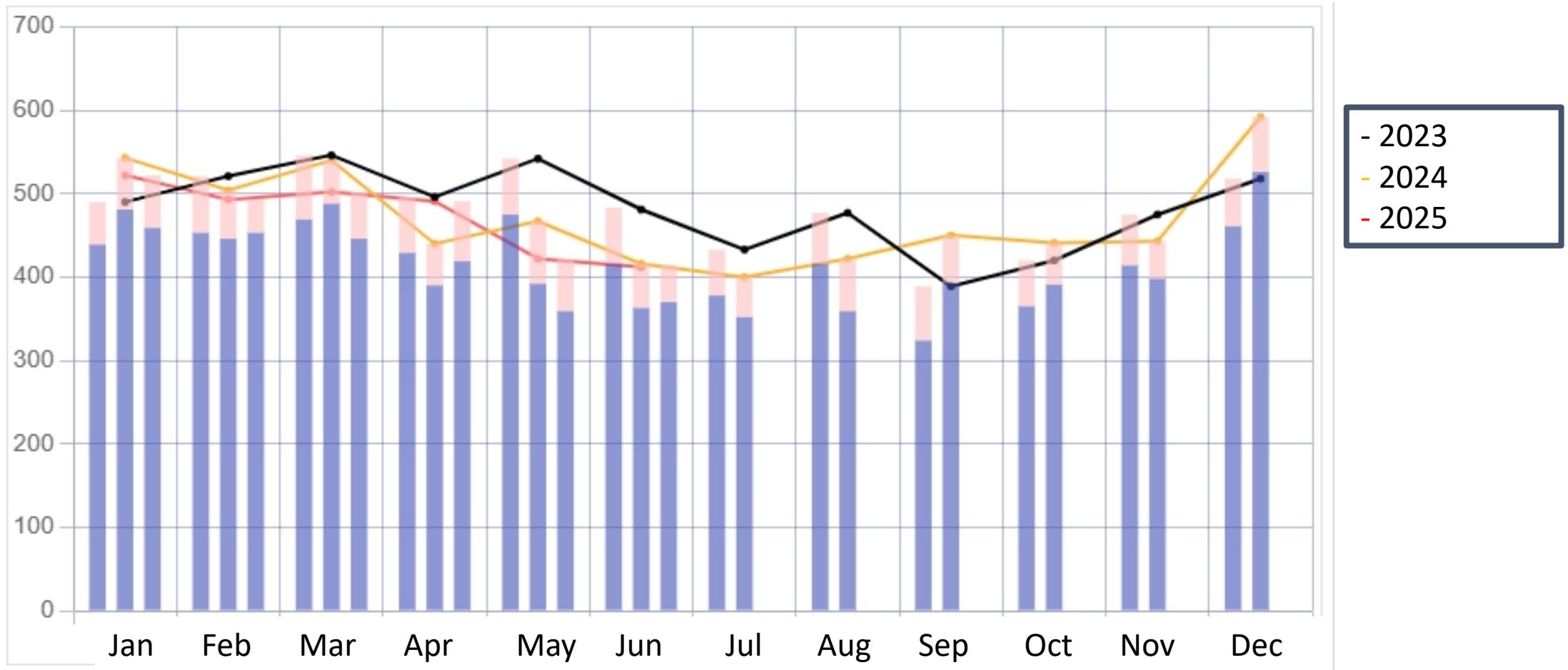
用藥配合度諮詢服務
用藥配合度評估
藥事指導/衛教項目
現狀用藥整合

Pharmacist

eGFR slope assessment



Cases Entering Long-term Dialysis in the Pre-ESRD Program



>90% of incident ESKD patients can be traced back through the TSN P4P platform.

Annual report on CKD analysis

QC index of planned initiation of HD

Pre-ESRD

收案成效

衛教照護品質

ESKD照護品質

每季有預先做好血管通路比例

每季首次透析沒有使用暫時性導管比例

每季經門診進入首次透析比例

健康促進品質

Early-CKD

收案成效

健康促進品質

DKD

收案成效

健康促進品質

ESKD照護品質

每季首次透析沒有使用暫時性導管比例



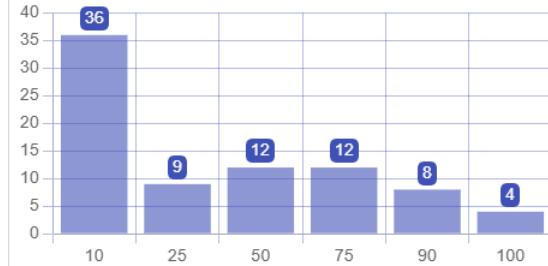
閾值

本機構前兩年平均 -2 SD

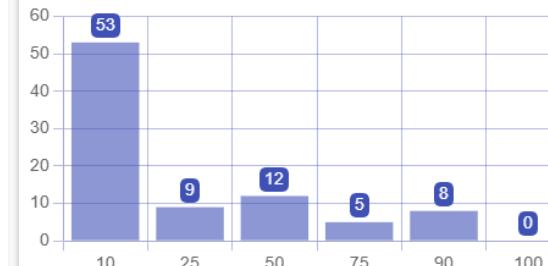
73.79

112Q4	$\frac{29}{35}$ (82.86%)
113Q1	$\frac{24}{32}$ (75%)
113Q2	$\frac{20}{24}$ (83.33%)
113Q3	$\frac{20}{24}$ (83.33%)
113Q4	$\frac{20}{24}$ (83.33%)
114Q1	$\frac{29}{40}$ (72.5%)
114Q2	$\frac{29}{38}$ (76.32%)

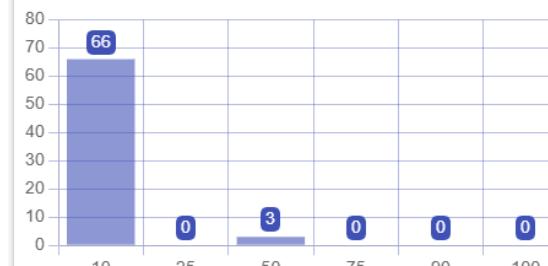
區域醫院 ▾ 平均百分位分布



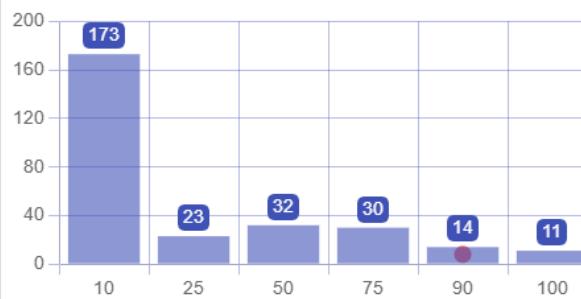
地區醫院 ▾ 平均百分位分布



基層診所 ▾ 平均百分位分布



全國平均百分位分布



醫學中心 平均百分位分布



Take-home Message

- Advancing hybrid, multimodal, and SMART CKD data systems in parallel enables a scalable path toward predictive, personalized kidney care.
- Transforming CKD care from reactive to predictive begins with collecting meaningful, multimodal data.
- With limited resources, we must adopt more practical, collaborative, and shared approaches to make data AI-ready.
- Barriers become easier to overcome when solutions are designed around the real needs of patients and care teams.

We collect renal data not for storage, but for prediction, prevention, and better care

Thank you for your attention