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

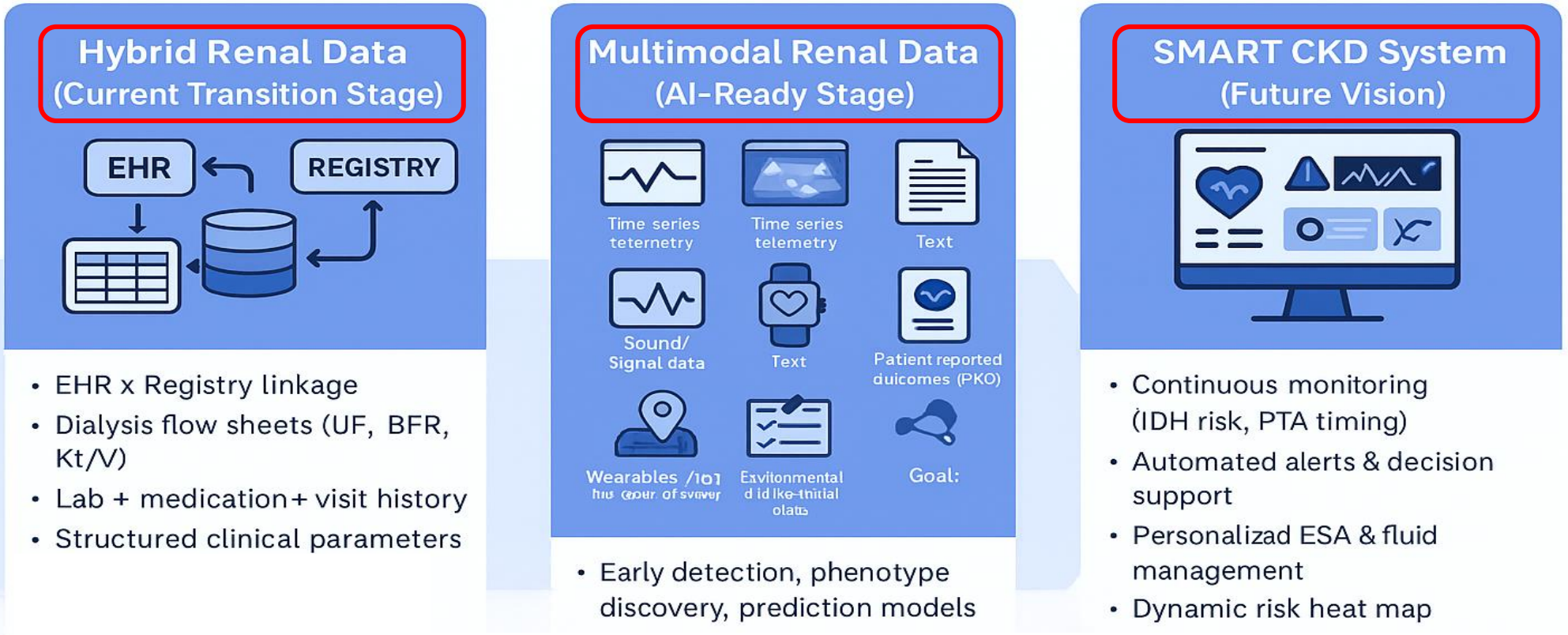
Registry / Prospective System

- 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

- Longer dialysis time
- Use of AV fistula
- Kt/V ≥1.2
- UF< 13ml/kg/hr
- Targeting Ca/P/iPTH
- Individualized ESA
- Patient–reported outcome

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

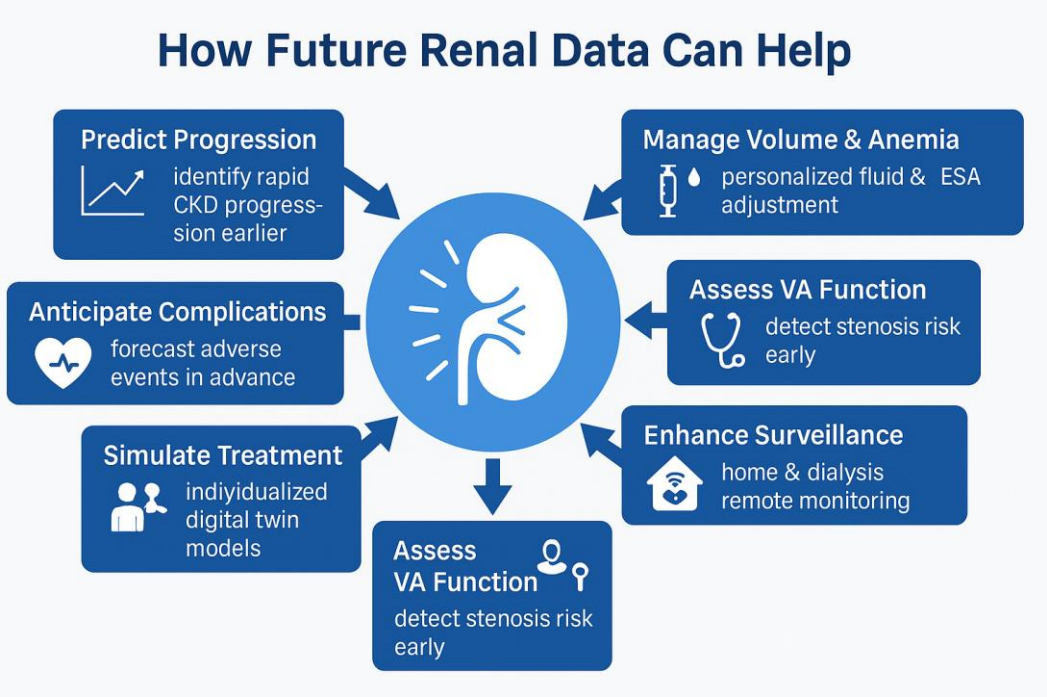
Bridging traditional datasets with digital clinical data → Multiple data types integrated into one pipeline → Real-time, predictive, personalized renal care ecosystem



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

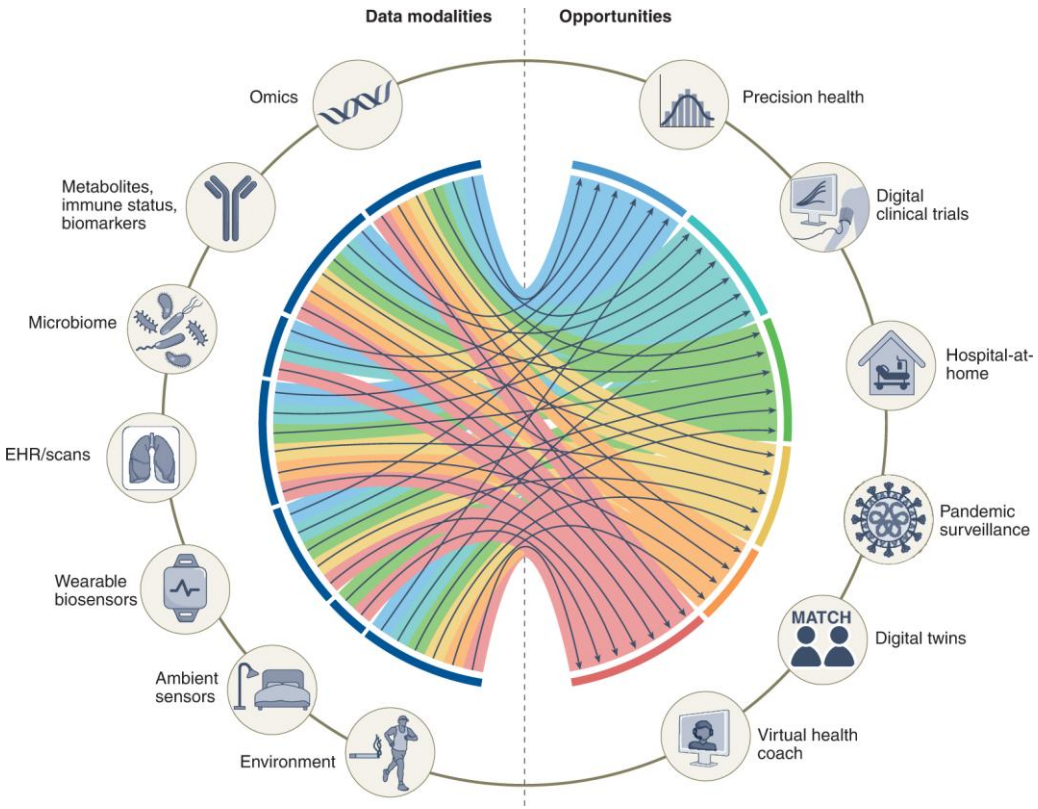
Future renal data transforms CKD care : from reactive to predictive

- 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



Multimodal biomedical AI
,Nature Medicine | VOL 28 | September 2022 | 1773–1784

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

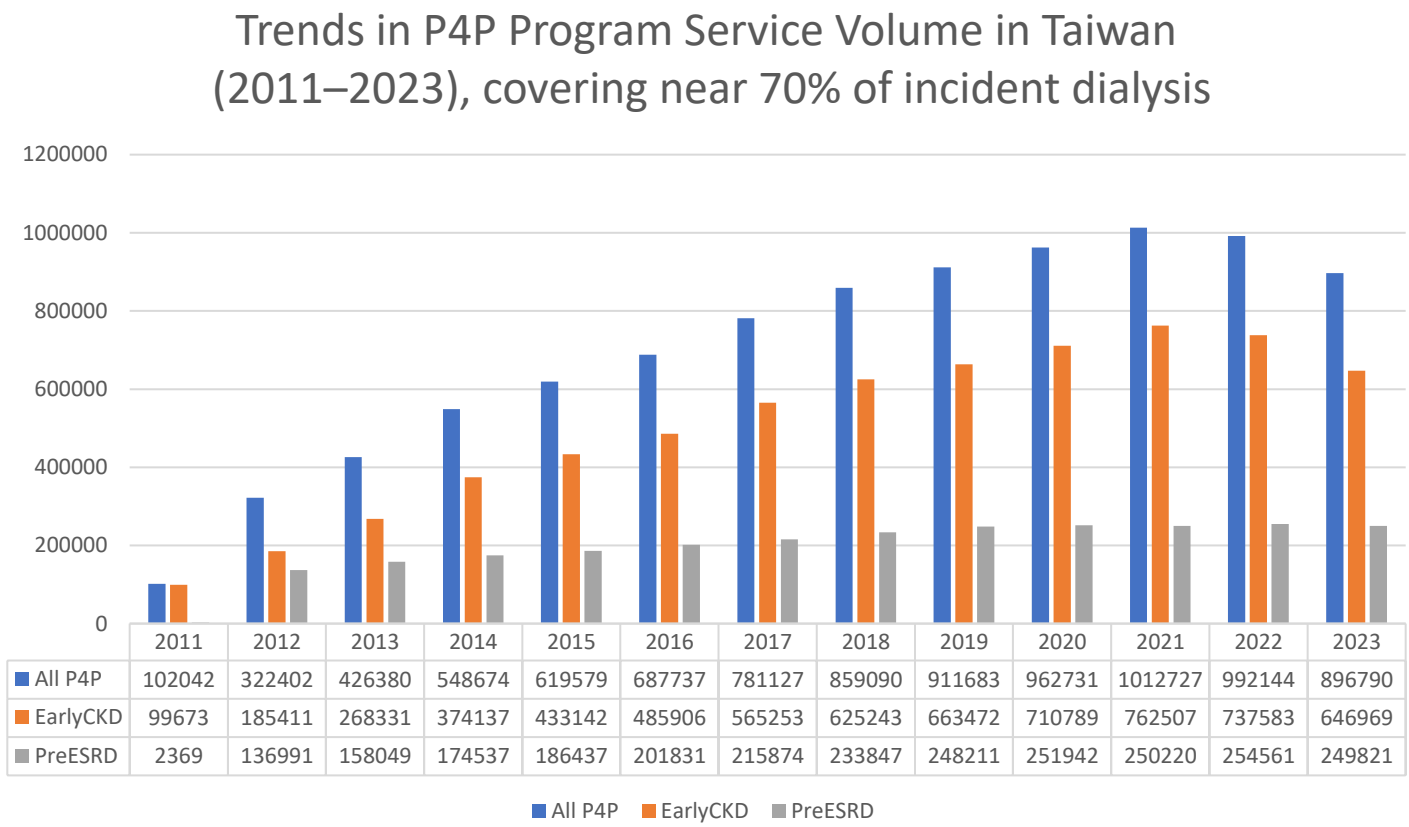
System	Initial Purpose	Data Type & Focus	Current Role
TWRDS (Taiwan Renal Registry Data System) (1987-) **ARKDT** (Annual Report on Kidney Disease in Taiwan, 2014–)	Audit dialysis quality, insurance accreditation	Monthly center reporting (clinical + lab) Insurance claim data	Full ESKD registry, >99% national coverage, 2-yr lag
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 lad
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%)	6,946 (56.9%)	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、住診主診斷欄位為判斷依據，且符合住院1次或門急診2次以上的定義。
糖尿病之 ICD-9-CM 與 ICD-10-CM 碼請參考方法學。
註3：%= 該年（各組別）人數 / 該年新發透析數 *100。



	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023
All P4P	102042	322402	426380	548674	619579	687737	781127	859090	911683	962731	1012727	992144	896790
EarlyCKD	99673	185411	268331	374137	433142	485906	565253	625243	663472	710789	762507	737583	646969
PreESRD	2369	136991	158049	174537	186437	201831	215874	233847	248211	251942	250220	254561	249821

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

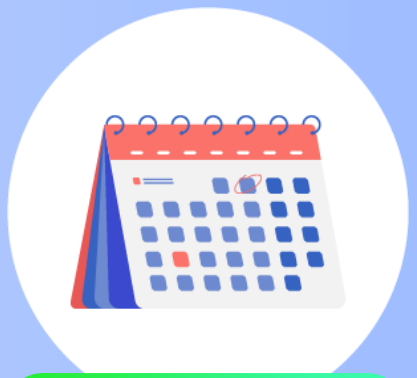
Case Management

- 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

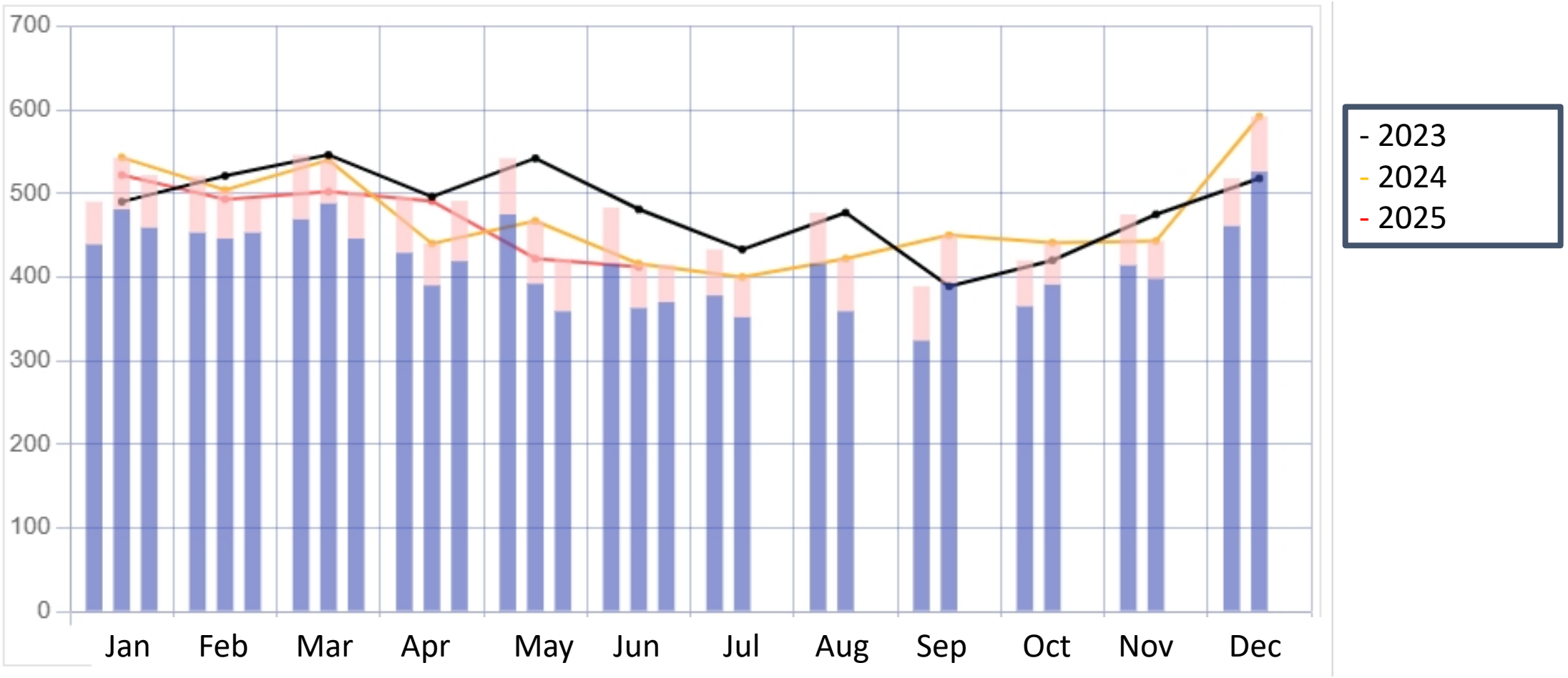
The system is designed based on Kidney disease pay-for-performance (P4P) programs

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O樺	F22****232	65	66.7	(70.9)	2		N	
2023-01-30	Early-CKD	224912	吳O花	M22****498	63	67.4	(72.3)	2		N	
2023-01-27	Early-CKD	238081	DM 李O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O姐	A27*****60	79	46.3	(46.6)	3a		N	
2022-07-04	Pre-ESRD	764242	DM 聶O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O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

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

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