2024 Annual Report of the Thailand Renal Replacement Therapy (TRT) Registry – Executive Summary

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Abstract

The 2024 Thailand Renal Replacement Therapy (TRT) Registry Annual Report examines national trends in incidence, prevalence, practice patterns, and outcomes to inform health policy and system planning. In 2024, the incidence of renal replacement therapy (RRT) reached a historic high of 515 per million population (33,976 new cases), largely reflecting the expansion of hemodialysis (HD) following the implementation of the 2022 "free-choice" dialysis policy. Peritoneal dialysis (PD) initiation declined markedly, while kidney transplantation remained limited. RRT prevalence more than doubled from 2016 to 2024, exceeding 2,600 per million population, with HD accounting for most of the increase. Diabetes (32.7%) and hypertension (32.2%) were the leading causes of end-stage kidney disease. The dialysis population was predominantly older (mean age 62.6 years) and had relatively low educational attainment. Important care gaps were identified, including high catheter use at HD initiation, frequent twice-weekly dialysis, suboptimal anemia control, prevalent mineral and bone disorders, and insufficient preventive care. Between 2017 and 2024, cumulative mortality reached 39.2% (9.5 deaths per 100 patient-years), with higher mortality in PD than HD patients. Cardiovascular disease and infections were the leading causes of death. One-year survival was 95.4%, declining to 61.9% over five years. Despite expanded RRT access under universal coverage, improving long-term outcomes and system sustainability will require strengthened chronic kidney disease prevention, optimized dialysis quality, equitable financing, expanded transplantation, and continued investment in high-quality registry data.

Keywords: renal transplantation; KT; renal failure; kidney failure; ASEAN; ESKD; ESRD; CKD

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บทสรุปรายงานประจำปี 2567 การลงทะเบียนการบำบัดทดแทนไตแห่งประเทศไทย

บัญชา สถิระพจน์, พิชญ ตันติยวรงค์, อนันต์ เชื้อสุวรรณ, อดิสรณ์ ลำเพาพงศ์, กวี ลิ่มบุตร, ไกรวิพร เกียรติสุนทร, คณิน ธรรมาวรานุคุปต์, ณัฏฐา ล้ำเลิศกุล, ปรมัตถ์ ธิมาไชย, พรพิมล เรียนถาวร, วัทธิกร พิชิตพร, วิจิตรา โชติมงคล, สุขฤทัย เลขยานนท์, สุวิกรานต์ วงศ์ประไพโรจน์, ชญาภา วรพิทยาภรณ์, นฤนาถ คีรีวรรณ์, นันทนา ชปิลเลส, นิภา อัยยสานนท์, ปวีณา สิงห์ทิศ, ปิยาภรณ์ โทวันนัง, มณภิญญา ฉัตรทอง หอมจัน, สร้อยสะอาง สร้างสมวงษ์, สุนทรี เพิ่มพูลสวัสดิ์, อรอุมา เพ่งพินิจ, เถลิงศักดิ์ กาญจนบุษย์, วุฒิเดช โอภาศเจริญสุข

คณะอนุกรรมการการลงทะเบียนบำบัดทดแทนไต สมาคมโรคไตแห่งประเทศไทย

บทคัดย่อ

ภาระโรคไตเรื้อรังระยะสุดท้ายในประเทศไทยเพิ่มสูงขึ้นอย่างมีนัยสำคัญ อันเป็นผลจากความชุกที่เพิ่มขึ้นของโรคเบาหวานและความดันโลหิตสูง รายงานประจำปี พ.ศ. 2567 ของการลงทะเบียนบำบัดทดแทนทางไตของสมาคมโรคไตวิเคราะห์แนวโน้มระดับประเทศด้านอุบัติการณ์ ความชุก รูปแบบการรักษา และผลลัพธ์ทางคลินิก เพื่อสนับสนุนการกำหนดนโยบายและการวางแผนระบบบริการสุขภาพ ในปี 2567 อุบัติการณ์ของการบำบัดทดแทนไตสูงถึง 515 รายต่อล้านประชากร หรือผู้ป่วยใหม่ 33,976 ราย ซึ่งส่วนใหญ่สะท้อนการขยายตัวของการฟอกเลือดด้วยเครื่องไตเทียมภายหลังการดำเนินนโยบาย “การล้างไตอิสระ” ในปี 2565 ขณะที่การเริ่มต้นล้างไตทางช่องท้องลดลงอย่างชัดเจน และการปลูกถ่ายไตยังมีจำนวนจำกัด ความชุกของการบำบัดทดแทนไตเพิ่มขึ้นมากกว่าสองเท่าระหว่างปี 2559–2567 เกิน 2,600 รายต่อล้านประชากร โดยส่วนใหญ่เป็นการเพิ่มขึ้นของการฟอกเลือดด้วยเครื่องไตเทียม สาเหตุหลักของภาระโรคไตเรื้อรังระยะสุดท้ายคือ เบาหวานร้อยละ 32.7 และความดันโลหิตสูงร้อยละ 32.2 ผู้ป่วยส่วนใหญ่มีอายุค่อนข้างสูง อายุเฉลี่ย 62.6 ปี และมีระดับการศึกษาค่อนข้างต่ำ ยังพบช่องว่างสำคัญของการดูแลรักษา ได้แก่ การใช้สายสวนหลอดเลือดเป็นทางเข้าเส้นเลือดเริ่มต้นในการทำการฟอกเลือดด้วยเครื่องไตเทียมในสัดส่วนสูง การฟอกเลือดสัปดาห์ละ 2 ครั้งที่พบได้บ่อย การควบคุมภาวะโลหิตจางที่ยังไม่เหมาะสม ความผิดปกติของแร่ธาตุและกระดูกที่พบบ่อย และการดูแลเชิงป้องกันที่ยังไม่เพียงพอ ระหว่างปี 2560–2567 อัตราเสียชีวิตสะสมอยู่ที่ร้อยละ 39.2 (9.5 รายต่อ 100 รายต่อปี) โดยผู้ป่วยล้างไตทางช่องท้องมีอัตราเสียชีวิตสูงกว่าผู้ป่วยฟอกเลือดด้วยเครื่องไตเทียม โรคหัวใจและหลอดเลือดและการติดเชื้อเป็นสาเหตุการเสียชีวิตหลัก อัตราการรอดชีวิตที่ 1 ปีเท่ากับร้อยละ 95.4 และลดลงเหลือร้อยละ 61.9 ที่ 5 ปี โดยแตกต่างกันตามสาเหตุของโรคไตเรื้อรังระยะสุดท้าย ชนิดทางเข้าเส้นเลือด ขนาดการฟอกเลือดและสิทธิการรักษา แม้การเข้าถึงการบำบัดทดแทนไตจะขยายตัวภายใต้ระบบหลักประกันสุขภาพถ้วนหน้า แต่การปรับปรุงผลลัพธ์ระยะยาวและความยั่งยืนของระบบจำเป็นต้องเสริมสร้างการป้องกันโรคไตเรื้อรัง เพิ่มประสิทธิภาพคุณภาพการฟอกไต จัดสรรงบประมาณอย่างเป็นธรรม ขยายการปลูกถ่ายไต และพัฒนาฐานข้อมูลทะเบียนที่มีคุณภาพอย่างต่อเนื่อง

คำสำคัญ: โรคไตวายระยะสุดท้าย; การบำบัดทดแทนไต; การฟอกเลือดด้วยเครื่องไตเทียม; การล้างไตทางช่องท้อง; ประเทศไทย

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Introduction

Chronic kidney disease (CKD) has been shown to be independently associated with an increased risk of cardiovascular events and all-cause mortality among Thai individuals at high cardiovascular risk.[1] In addition, data from Thai cohorts with elevated atherosclerotic risk demonstrate that increased arterial stiffness is a significant predictor of progressive renal decline, including the development of end-stage kidney disease (ESKD) and the need for dialysis initiation.[2]

Globally, the burden of CKD and ESKD has risen markedly over the past three decades.[3, 4] By 2023, an estimated 4.6 million individuals worldwide were receiving renal replacement therapy (RRT), with type 2 diabetes mellitus and hypertension representing the leading underlying causes.[5, 6] CKD currently affects approximately one in nine adults worldwide, with Asia shouldering a disproportionate share of this burden due to its large, aging population and high prevalence of cardiometabolic risk factors.

Despite well-established recommendations from Kidney Disease: Improving Global Outcomes (KDIGO), which emphasize early detection, optimal blood pressure control, and the use of evidence-based therapies to slow disease progression and reduce cardiovascular risk, implementation remains inconsistent across regions.[7, 8] Variability in healthcare infrastructure, reimbursement policies, and access to novel therapies continues to contribute to gaps in CKD care and outcomes.

Thailand has experienced a continuous rise in ESKD incidence, with more than 20,000 new dialysis initiations annually.[9] Similar trends are observed across Southeast Asia, driven by population aging, increasing prevalence of diabetes and hypertension, and expanded access to RRT.[5, 6] This growing demand places significant pressure on healthcare infrastructure and financing systems.

From a health economics perspective, kidney transplantation remains the most cost-effective RRT modality, followed by peritoneal dialysis (PD), while hemodialysis (HD) is generally more resource-intensive. These findings have informed dialysis policies across Asia, including Thailand's long-standing PD-First strategy under the Universal Coverage Scheme (UCS), which successfully expanded nationwide access to home-based dialysis.[10, 11] In 2022, Thailand implemented a "free-choice" policy allowing patients to select either PD or HD as initial therapy through shared decision-making. Although this policy strengthened patient autonomy, it was associated with increased HD utilization, raising concerns regarding long-term financial sustainability and early mortality risks. Ongoing policy discussions have therefore focused on balancing patient-centered care with cost-effectiveness and system capacity.[12, 13]

The Thailand Renal Replacement Therapy (TRT) Registry provides essential national data to monitor trends, outcomes, and healthcare utilization. Between 2000 and 2023, the registry recorded over 150,000 patients receiving RRT, with cardiovascular disease and infection as leading causes of mortality.[14] Continuous expansion of dialysis facilities and workforce capacity has improved access; however, challenges in equitable distribution, modality selection, and long-term sustainability persist.

This 2024 TRT Annual Data Report analyzes current national trends, outcomes, and system challenges to inform evidence-based policy decisions and optimize RRT delivery in Thailand.

Incidence of Renal Replacement Therapy (RRT), 2000–2024

The incidence of RRT in Thailand has increased substantially over the past two decades, reflecting the growing burden of ESKD. A marked shift in modality distribution occurred after implementation of the national "free-choice" dialysis policy in 2022.

Between 2016 and 2019, incident RRT cases rose steadily from 16,071 (243.8 pmp) to 20,079 (301.7 pmp). During 2020–2021, overall incidence remained stable at approximately 300 pmp, with increasing PD initiation and modest declines in HD.

Following policy implementation in 2022, HD initiation increased sharply, exceeding 13,000 cases annually in 2022–2023, while PD initiation declined to fewer than 5,000 cases per year. In 2024, a dramatic surge was observed, with 33,976 new RRT cases

(515 pmp), driven predominantly by 27,136 incident HD patients. PD initiation totaled 5,851 cases, remaining well below pre-2022 levels. Kidney transplantation as initial therapy gradually increased to 989 cases but accounted for only a small proportion of total incident RRT **(Table 1)**.

Table 1 Incidence of Renal Replacement Therapy (RRT) in Thailand

Year	Hemodialysis	Peritoneal Dialysis	Kidney Transplantation	Total New RRT Patients	Population*	Incidence (per million population)
2016	8,175	7,260	636	16,071	65,931,550	244
2017	8,774	7,474	709	16,957	66,188,503	256
2018	10,096	8,008	670	18,774	66,413,979	283
2019	11,249	8,101	729	20,079	66,558,935	302
2020	10,201	8,917	714	19,832	66,186,727	300
2021	9,825	9,688	433	19,946	66,171,439	301
2022	13,004	4,993	710	18,707	66,090,475	283
2023	13,045	4,159	986	18,190	66,052,615	275
2024	27,136	5,851	989	33,976	65,951,210	515

**Population data are based on mid-year national population estimates. Incidence is expressed as the number of newly treated RRT patients per 1 million population (pmp). Data on peritoneal dialysis utilization were obtained from the National Health Security Office (NHSO) of Thailand. Data on kidney transplantation were obtained from the Transplantation Society of Thailand (TST).*

These findings indicate a transition from a PD-dominant era to HD predominance, with important implications for healthcare financing, infrastructure, and long-term sustainability.

Prevalence of Renal Replacement Therapy (RRT), 2000–2024

RRT prevalence has increased steadily, driven by rising incidence and improved patient survival. The total number of patients receiving RRT nearly doubled from 81,418 (1,235 pmp) in 2016 to 157,070 (2,381 pmp) in 2024 **(Table 2 and Figure 1)**.

Table 2 Prevalence of Renal Replacement Therapy (RRT) in Thailand

Year	Hemodialysis	Peritoneal Dialysis	Kidney Transplantation	Total	Population*	Prevalence (per million population)
2016	54,161	19,125	8,132	81,418	65,931,550	1,235
2017	61,170	20,450	5,360	86,980	66,188,503	1,314
2018	69,979	21,693	5,652	97,324	66,413,979	1,465
2019	77,778	22,235	6,212	106,225	66,558,935	1,596
2020	83,586	22,995	6,926	113,507	66,186,727	1,715
2021	85,114	23,843	6,495	115,452	66,171,439	1,745
2022	86,325	24,439	7,225	117,989	66,090,475	1,785
2023	129,113	23,714	7,555	160,382	66,052,615	2,428
2024	126,505	23,059	7,506	157,070	65,951,210	2,381

**Population data are based on mid-year national population estimates. Prevalence is expressed as the number of patients receiving RRT per million population (pmp). Data on peritoneal dialysis utilization were obtained from the National Health Security Office (NHSO) of Thailand. Data on kidney transplantation were obtained from the Transplantation Society of Thailand (TST).*

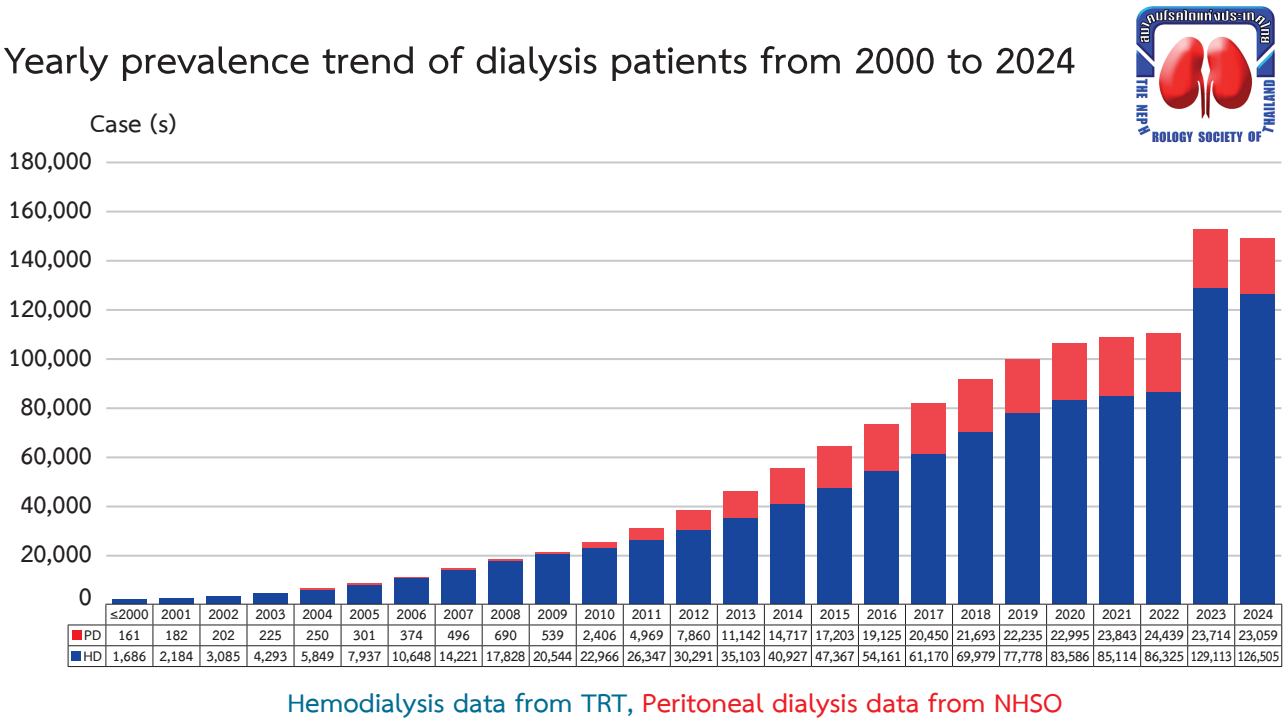


Figure 1 Annual prevalence trend of dialysis patients from 2000 to 2024

HD was the primary driver of this growth, increasing from 54,161 patients in 2016 to 126,505 in 2024, with a pronounced rise after 2022. PD prevalence increased gradually until 2022 (peak 24,439 patients) before declining modestly to 23,059 in 2024, consistent with reduced initiation rates. Kidney transplantation

prevalence remained relatively stable (approximately 5,000–8,000 patients), indicating persistent limitations in donor supply and transplant capacity.

Data Integrity and Limitations

All data were validated and deduplicated using the TRT Registry Program (version 3.3.1) to ensure reliability. Limitations include potential reporting delays from a small number of centers, possible policy-related shifts in administrative coding, and limited availability of detailed clinical and socioeconomic variables. Long-term modality-specific outcomes were not evaluated.

Overall, Thailand's RRT landscape is undergoing rapid transformation, characterized by expanding HD utilization, declining PD initiation, and gradual growth in transplantation. These shifts underscore the need for balanced modality planning, sustainable financing strategies, and strengthened CKD prevention efforts.

Underlying Causes of End-Stage Kidney Disease (ESKD)

Diabetic nephropathy (32.7%) and hypertension (32.2%) were the leading causes of ESKD, together accounting for more than 65% of dialysis cases, as shown in **Table 3**. Glomerulonephritis accounted for 3.2%, with lupus nephritis as the most common subtype. Chronic tubulointerstitial diseases accounted for 2.6%. Notably, 5.6% of cases had unidentified causes and 12.4% had missing data.

These findings confirm the dominant role of metabolic and vascular diseases in driving Thailand's ESKD burden and underscore the need for intensified prevention and early management of diabetes and hypertension.

Among 751 patients with biopsy-proven glomerulonephritis progressing to ESKD, IgA nephropathy was the leading cause, accounting for 28.9% of cases. This was followed by membranous nephropathy, focal segmental glomerulosclerosis (FSGS), and membranoproliferative glomerulonephritis (MPGN), as summarized in **Table 4**. A substantial proportion (38.9%) had unknown etiologies, highlighting limitations in diagnostic evaluation and late presentation.

Table 3 Underlying Causes of End-Stage Kidney Disease (ESKD)

Etiology	Total (N = 140,031)	Percentage (%)
Diabetic Nephropathy	45,785	32.7
Hypertensive Nephropathy	45,029	32.2
Glomerulonephritis	4,453	3.2
Chronic Tubulointerstitial Disease	3,596	2.6
Obstructive Nephropathy	1,549	1.1
Polycystic Kidney Disease	1,690	1.2
Others	12,883	9.2
Unknown	7,898	5.6
Missing Data	17,395	12.4

Table 4 Biopsy-Proven Glomerulonephritis Resulting in End-Stage Kidney Disease (ESKD)

Etiology	Total (N = 751)	Percentage (%)
IgA Nephropathy	217	28.9
Membranous Nephropathy	42	5.6
Focal Segmental Glomerulosclerosis (FSGS)	38	5.1
Membranoproliferative Glomerulonephritis (MPGN)	30	3.9
Crescentic Glomerulonephritis	16	2.1
Mesangial Proliferative Glomerulonephritis	9	1.2
Chronic Allograft Nephropathy	8	0.8
Amyloidosis	2	0.3
Others	95	12.7
Unknown	292	38.9

Demographic and Socioeconomic Characteristics

The mean age of dialysis patients was 62.6 ± 16.7 years, with a slight male predominance (52.5%). Age and sex distribution were similar across modalities. Educational attainment differed by modality: 39% of patients had primary education or lower, particularly among PD patients. In contrast, a substantially greater proportion of HD patients had attained a bachelor's degree or higher (14.5%) than PD patients (5.6%). These disparities suggest socioeconomic and health literacy factors may influence modality selection and outcomes.

Reimbursement Schemes

The UCS accounted for the largest proportion of patients, covering 48.3% of the total cohort, followed by the Civil Servant Medical Benefit Scheme (CSMBS) at 18.9% and the Social Security Scheme (SSS) at 16.0%. Notably, UCS insured 82.2% of PD patients, underscoring its central role in supporting home-based dialysis **(Table 5)**. In contrast, HD patients were more evenly distributed across UCS, CSMBS, and SSS. These differences in insurance coverage likely influence access to care, dialysis modality distribution, and clinical outcomes.

Table 5 Distribution of Dialysis Patients Across Reimbursement Schemes

Category, N (%)	Hemodialysis (N = 126,505)	Peritoneal Dialysis (N = 13,526)	Total (N = 140,031)
Universal Coverage Scheme (UCS)	56,535 (44.7)	11,116 (82.2)	67,651 (48.3)
Social Security Scheme (SSS)	21,908 (17.3)	512 (3.8)	22,420 (16.0)
Civil Servant Medical Benefit Scheme (CSMBS)	25,513 (20.2)	937 (6.9)	26,450 (18.9)
Self-payment	11,509 (9.1)	145 (1.1)	11,654 (8.3)
Others	11,040 (8.7)	816 (6.0)	11,856 (8.5)

Hemodialysis Practice Patterns

Among HD patients, arteriovenous fistula (AVF) was the most commonly used vascular access, accounting for 61.3% of cases. This was followed by permanent catheters (22.7%), double-lumen catheters (10.7%), and arteriovenous grafts (5.3%). The relatively high use of catheter-based access may reflect delayed referral, suboptimal pre-dialysis care, or inadequate vascular access planning.

Thrice-weekly HD was the predominant schedule (67.5%), while 30.8% received twice-weekly HD. Dialysis adequacy was assessed using spKt/V and urea reduction ratio (URR). Among twice-weekly patients, mean spKt/V was 1.73 ± 0.35, and URR was 75.0 ± 7.3%; however, 59.6% had spKt/V <1.8, indicating suboptimal adequacy by recommended targets. In contrast, thrice-weekly patients had a mean spKt/V of 1.68 ± 0.33 and URR of 74.1 ± 6.9%, with only 5.2% failing to achieve the target spKt/V of 1.2. The proportion of patients with URR <65% was low in both groups (8.8% in the twice-weekly HD group and 9.3% in the thrice-weekly HD group).

Nutritional assessment showed mean normalized protein catabolic rate (nPCR) values of 1.20 ± 0.25 g/kg/day in the twice-weekly HD group and 1.11 ± 0.21 g/kg/day in the thrice-weekly HD group. Despite acceptable averages, a substantial proportion of patients had nPCR <1.0 g/kg/day, particularly in the thrice-weekly group (31.0% vs. 21.5%), suggesting inadequate protein intake in a considerable subset of patients.

Mineral Bone Disorder, Nutrition, and Anemia

The mean serum calcium level was 9.0 ± 1.1 mg/dL, with 65.7% of patients within the normal range (8.6–10.3 mg/dL). However, hypocalcemia occurred in 30.5% and hypercalcemia in 3.8%, both of which are clinically relevant given their associations with bone fragility and vascular calcification.

The mean serum phosphate level was 4.6 ± 1.4 mg/dL. Hyperphosphatemia (>4.5 mg/dL) was present in 47.0% of patients, while 6.0% had hypophosphatemia (<2.7 mg/dL). Persistent phosphate imbalance remains a major concern due to its link with secondary hyperparathyroidism, vascular calcification, and increased mortality.

The mean intact parathyroid hormone (iPTH) level was 391.9 ± 356.3 pg/mL (median 301.8 pg/mL, IQR 168.6–499.4), with 63.1% within the recommended target range (135–585 pg/mL). Nevertheless, 18.4% had suppressed levels (<135 pg/mL), suggesting low bone turnover, and 18.6% had elevated levels (>585 pg/mL), consistent with secondary hyperparathyroidism.

The mean serum albumin level was 3.8 ± 0.5 g/dL (median 3.9 g/dL, IQR 3.6–4.1). Although 79.7% had albumin ≥3.5 g/dL, 20.3% exhibited hypoalbuminemia, indicating ongoing risks related to malnutrition and inflammation.

Overall, mineral metabolism abnormalities and nutritional impairment remain prevalent in this dialysis population, underscoring the need for continuous monitoring and individualized management to optimize CKD-MBD control and improve long-term outcomes.

Anemia remained suboptimally controlled, with a mean hemoglobin level of 9.7 g/dL and more than half of patients having levels <10 g/dL. Control varied across reimbursement schemes: 54.3% of patients under the CSMBS achieved target hemoglobin levels, compared with 38.9% under the SSS, 39.2% in the self-payment group, and only 28.6% under the UCS, highlighting disparities in access to anemia care.

The median transferrin saturation was 27.1% (IQR 21.1–34.5%), and the median ferritin level was 398.9 ng/mL (IQR 216.0–658.5 ng/mL). Iron deficiency was common, with 21.0% having transferrin saturation <20% and 22.7% ferritin <200 ng/mL. Conversely, elevated iron indices were also observed, with 14.5% having transferrin saturation >40% and 38.5% ferritin >500 ng/mL, suggesting potential iron overload in a substantial subset.

Most patients received erythropoiesis-stimulating agents (ESAs) intravenously (61.1%), while 11.9% were treated subcutaneously. Epoetin alfa accounted for 92.9% of prescriptions, with other ESAs used infrequently.
Overall, anemia control remains inadequate in a large proportion of dialysis patients, with significant variation across insurance schemes. Suboptimal iron balance and unequal access to ESA therapy likely contribute to these disparities, underscoring the need for more standardized and equitable anemia management.

Causes of Death in Dialysis Patients

Between 2017 and 2024, 83,344 deaths occurred among 212,612 registered dialysis patients, yielding a cumulative mortality proportion of 39.2%. Mortality was higher in PD than in HD patients (54.2% vs. 37.3%), with an overall mortality rate of 9.5 deaths per 100 patient-years (PD: 13.3; HD: 8.8) **(Table 6)**.

Cardiovascular disease was the leading cause of death (20.1%), followed by infectious diseases (12.7%) and cerebrovascular disease (4.6%). HD patients experienced a higher proportion of cardiovascular deaths (21.6%), whereas PD patients had more i nfection-related deaths (15.7%). Notably, 40.5% of deaths lacked cause-of-death data, underscoring the need to improve registry completeness. Cardiovascular and infectious diseases remain the principal drivers of mortality, with modality-specific risk patterns requiring targeted prevention strategies.

Overall Patient Survival

With a median follow-up of 2.48 years (interquartile range [IQR], 1.31-4.30), survival remained high in the first year (95.4%) but declined to 78.9% at 3 years and 61.9% at 5 years (Figure 2). While short-term outcomes are favorable, long-term survival declines substantially, emphasizing the importance of sustained cardiovascular risk reduction, infection prevention, and timely transplantation evaluation.

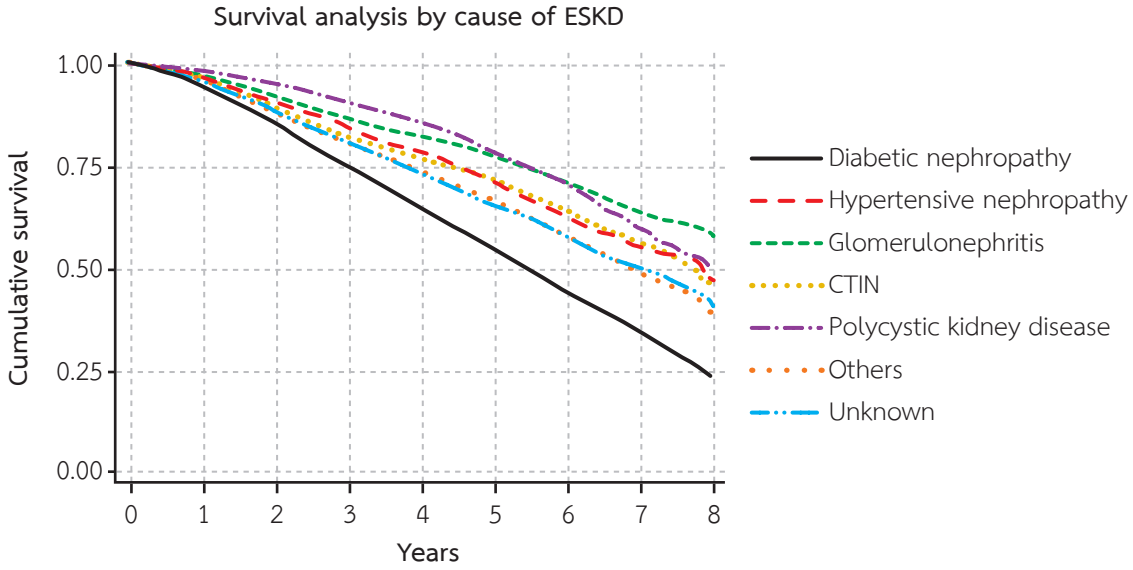
Table 6 Causes of Death in Dialysis Patients

Cause of Death	Total (N = 83,344) N (%)	Hemodialysis (N = 70,331) N (%)	Peritoneal Dialysis (N = 13,013) N (%)
Cardiac Disease	16,734 (20.1)	15,190 (21.6)	1,544 (11.9)
Infectious Disease	10,578 (12.7)	8,534 (12.1)	2,044 (15.7)
Uncertain	5,816 (7.0)	4,688 (6.7)	1,128 (8.7)
Cerebrovascular Disease	3,870 (4.6)	3,268 (4.7)	602 (4.6)
Malignancy	1,805 (2.2)	1,701 (2.4)	104 (0.8)
Kidney Disease	1,127 (1.4)	1,022 (1.5)	105 (0.8)
Accident	663 (0.8)	621 (0.9)	42 (0.3)
Liver Disease	603 (0.7)	568 (0.8)	35 (0.3)
Suicide	121 (0.1)	94 (0.1)	27 (0.2)
Other	8,276 (9.9)	8,255 (11.7)	8,138 (62.5)
Missing	33,751 (40.5)	28,790 (40.9)	4,961 (38.1)
Cumulative Mortality Proportion	**83,344 / 212,612 (39.2)**	**70,331 / 188,618 (37.3)**	**13,013 / 23,994 (54.2)**
Overall Mortality Rate	**9.5/100/year**	**8.8/100/year**	**13.3/100/year**

Time After initiation	Survival Rate (%)	95% Confidence Interval
1 Year	95.4	95.2 - 95.5
3 Years	78.9	78.5 - 79.2
5 Years	61.9	61.5 - 62.4

Figure 2 Overall Survival of Patients Receiving RRT in Thailand (2024)

Five-year survival differed significantly by underlying kidney disease. Patients with polycystic kidney disease (79.2%) and glomerulonephritis (77.7%) had the best outcomes, whereas diabetic nephropathy had the poorest survival (54.6%) **(Figure 3)**. Diabetic nephropathy is associated with markedly worse long-term survival, highlighting the need for intensified metabolic and cardiovascular management.



Cause of ESKD	5-Year Survival (%)	95% Confidence Interval
Diabetic nephropathy	54.6	53.9 - 55.4
Hypertensive nephropathy	72.0	68.8 - 74.9
Glomerulonephritis	77.7	75.4 - 79.8
Chronic tubulointerstitial nephritis (CTIN)	72.7	69.2 - 75.9
Polycystic kidney disease	79.2	76.1 - 81.9
Others	67.1	65.6 - 68.5
Unknown	66.2	64.5 - 67.9

Figure 3 Five-Year Survival of Hemodialysis Patients by Cause of ESKD in Thailand (2024)
Note: *Survival estimates were calculated using the Kaplan–Meier method. Group differences were assessed using the log-rank test ($p < 0.001$).*

Five-year survival was highest with arteriovenous fistula (70.2%), followed by arteriovenous graft (66.1%), and lowest among catheter users (58.4–61.8%). Early AV fistula creation and minimizing long-term catheter use are critical to improving survival outcomes.

Patients receiving twice-weekly HD had the lowest five-year survival (52.7%), compared with thrice-weekly (67.0%) and four-times-weekly dialysis (71.7%). Higher dialysis frequency is associated with better long-term survival, supporting adequate dialysis dosing and timely treatment escalation.

Five-year survival was highest among Social Security Scheme (SSS) beneficiaries (74.4%). Other schemes—including UCS, CSMBS, and self-paying patients—had lower and similar survival rates (55.3–57.6%). Significant disparities in survival exist across insurance schemes, suggesting socioeconomic and access-related influences on outcomes and reinforcing the need for equitable dialysis care nationwide.

The 2024 registry data demonstrate improving short-term survival but persistent long-term mortality driven primarily by cardiovascular and infectious

causes. Survival varies substantially by ESKD etiology, vascular access type, dialysis intensity, and insurance coverage, highlighting both clinical and socioeconomic determinants of outcomes. Strengthening preventive care, optimizing dialysis delivery, promoting early AV fistula placement, and ensuring equitable access across health systems remain key priorities for Thailand's national RRT program.

Summary: Dialysis Status in Thailand

Over the past two decades, Thailand has experienced rapid expansion of RRT, driven by a rising burden of ESKD. By 2024, RRT incidence reached a historic high of 515 per million population, and prevalence exceeded 2,600 per million more than doubling since 2016. Growth has been fueled mainly by HD, particularly after the 2022 "free choice" dialysis policy, which accelerated HD uptake.

HD is now the dominant modality, supported by expanded infrastructure and reimbursement systems, with over 1,200 dialysis centers nationwide largely operated by the private sector. In contrast, PD utilization declined after 2022 and remains below prior levels. Kidney transplantation has increased modestly but continues to represent a small proportion of RRT initiation due to limited donor availability and transplant capacity.

Diabetes and hypertension account for over two-thirds of ESKD cases, reflecting the growing impact of non-communicable diseases. The dialysis population is predominantly older adults with relatively low educational attainment, underscoring socioeconomic influences on outcomes. Access to transplantation remains limited, and disparities across insurance schemes are associated with differences in care access and survival.

Important practice gaps persist. Many patients initiate HD with central venous catheters, twice-weekly dialysis remains common, and complications such as malnutrition, anemia, and mineral bone disorders are highly prevalent. Preventive care is suboptimal, with incomplete infection screening and low vaccination coverage.

Between 2017 and 2024, cumulative mortality reached 39.2%, higher among PD patients. Cardiovascular disease and infections were the leading causes of death. Although one-year survival exceeded 95%, five-year survival declined to approximately 62%, with worse outcomes among patients with diabetic nephropathy, catheter use, lower dialysis frequency, and disadvantaged insurance coverage.

Overall, Thailand has made substantial progress in expanding RRT access under universal health coverage. However, improving long-term outcomes will require stronger CKD prevention and early detection, better pre-dialysis planning and vascular access creation, optimization of dialysis adequacy, revitalization of PD programs, expansion of transplantation capacity, strengthened preventive care, and continued investment in high-quality registry systems to ensure equitable and sustainable renal care.

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References

1. Aiumtrakul N, Kittithaworn A, Supasyndh O, Krittayaphong R, Phrommintikul A, Satirapoj B. Prediction of cardiovascular outcome by estimated glomerular filtration rate among high-risk patients: a Thai nationwide cohort study. Clin Exp Nephrol 2022;26(12):1180–93. doi: 10.1007/s10157-022-02262-5.
2. Aiumtrakul N, Supasyndh O, Krittayaphong R, Phrommintikul A, Satirapoj B. Cardio-ankle vascular index with renal progression and mortality in high atherosclerosis risk: a prospective cohort study in CORE-Thailand. Clin Exp Nephrol 2022;26(3):247–56. doi: 10.1007/s10157-021-02149-x.
3. Arriola-Montenegro J, Cheungpasitporn W, Thongprayoon C, Craici IM, Miao J. Public interest in chronic kidney disease

and dialysis: a 20-year data analysis. Ren Fail 2025;47(1): 2462253. doi: 10.1080/0886022X.2025.2462253.

4. Collaborators GBDKFwRT. Global, regional, and national prevalence of kidney failure with replacement therapy and associated aetiologies,1990-2023: a systematic analysis for the Global Burden of Disease Study 2023. Lancet Glob Health 2025;13(8):e1378–e95. doi: 10.1016/S2214-109X(25)00198-6.
5. Thurlow JS, Joshi M, Yan G, Norris KC, Agodoa LY, Yuan CM, et al. Global Epidemiology of End-Stage Kidney Disease and Disparities in Kidney Replacement Therapy. Am J Nephrol 2021;52(2):98–107. doi: 10.1159/000514550.
6. Premprasong A, Nata N, Tangwonglert T, Supasyndh O, Satirapoj B. Risk factors associated with mortality among patients on maintenance hemodialysis: The Thailand Renal Replacement Therapy registry. Ther Apher Dial 2024;28(6): 839–54. doi: 10.1111/1744-9987.14166.
7. Agarwal R, Nangaku M, Chen L, Wang AYM, Yanagita M, Bavanandan S, et al. Implementation of Established Global Guidelines in the Management of CKD in Patients with Type 2 Diabetes in Asia. Clin J Am Soc Nephrol 2025. doi: 10.2215/CJN.0000000909.
8. Makmun A, Satirapoj B, Tuyen DG, Foo MWY, Danguilan R, Gulati S, et al. The burden of chronic kidney disease in Asia region: a review of the evidence, current challenges, and future directions. Kidney Res Clin Pract 2025;44(3):411–33. doi: 10.23876/j.krcp.23.194.
9. Kanjanabuch T, Takkavatakarn K. Global Dialysis Perspective: Thailand. Kidney360 2020;1(7):671–5. doi: 10.34067/KID.0000762020.
10. Nyokabi P, Youngkong S, Bagepally BS, Okech T, Chaikledkaew U, McKay GJ, et al. A systematic review and quality assessment of economic evaluations of kidney replacement therapies in end-stage kidney disease. Sci Rep 2024;14(1):23018. doi: 10.1038/s41598-024-73735-8.
11. Assanatham M, Pattanaprateep O, Chuasuwan A, Vareesangthip K, Supasyndh O, Lumpaopong A, et al. Economic evaluation of peritoneal dialysis and hemodialysis in Thai population with End-stage Kidney Disease. BMC Health Serv Res 2022;22(1):1384. doi: 10.1186/s12913-022-08827-0.
12. Supaporn T. The Professor Emeritus Sa-nga Nilvarangkun, MD, Endowed Lectureship: National Policy & Sustainability on Thailand Dialysis Program. J Nephrol Soc Thail. 2025; 30(4): 241-7.
13. Morad Z, Choong HL, Tungsanga K, Suhardjono. Funding renal replacement therapy in southeast Asia: building public-private partnerships in Singapore, Malaysia, Thailand, and Indonesia. Am J Kidney Dis 2015;65(5):799–805. doi: 10.1053/j.ajkd.2014.09.031.
14. Satirapoj B, Tantiyavarong P, Thimachai P, Chuasuwan A, Lumpaopong A, Kanjanabuch T, et al. Thailand Renal Replacement Therapy Registry 2023: Epidemiological Insights Into Dialysis Trends and Challenges. Ther Apher Dial 2025;29(5):721–9. doi: 10.1111/1744-9987.70056.