

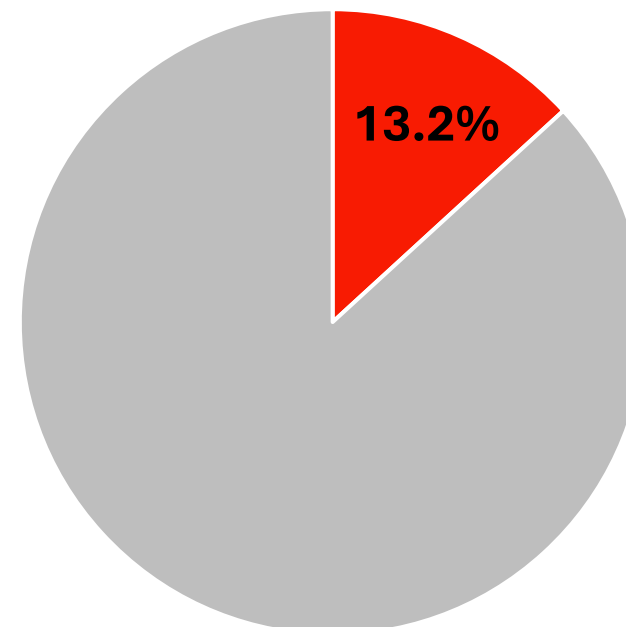
Modelli predittivi di risposta alle terapie in Nefrologia

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La malattia renale cronica è una condizione frequente nella popolazione generale

	Prevalence		
	Count (thousands), 2023	Age-standardised prevalence (%), 2023	Percentage change in age-standardised prevalence between 1990 and 2023 (%)
Global	788 000 (743 000 to 843 000)	14.2% (13.4 to 15.2)	3.5% (2.7 to 4.1)
Low SDI	111 000 (103 000 to 120 000)	15.2% (14.4 to 16.2)	-3.2% (-3.8 to -2.5)
Low-middle SDI	106 000 (99 000 to 114 000)	16.1% (15.2 to 17.3)	-6.5% (-7.1 to -5.8)
Middle SDI	96 800 (90 600 to 104 000)	16.3% (15.3 to 17.6)	4.3% (3.7 to 5.0)
High-middle SDI	185 000 (175 000 to 197 000)	15.1% (14.3 to 16.2)	3.0% (2.0 to 3.9)
High SDI	283 000 (267 000 to 303 000)	12.2% (11.5 to 13.1)	4.4% (3.4 to 5.3)

INCIPE (6,200 adulti pop. gen. Veneto)



GBD, Lancet 2025; Gambaro, Clin Am Soc Nephrol 2010

La malattia renale cronica è una importante causa di mortalità e outcome avversi

	All-age deaths, thousands			Age-standardised death rate per 100 000 population		
	2000	2023	Percentage change, 2000-23	2000	2023	Percentage change, 2000-23
Chronic kidney disease	796.0 (701.6 to 902.0)	1520.1 (1331.1 to 1696.5)	90.9% (66.1 to 123.2)*	16.9 (14.7 to 19.1)	17.2 (15.1 to 19.2)	1.9% (-10.7 to 18.3)

Leading causes 2022

1 Ischaemic heart disease
2 Stroke
3 COPD
4 Lower respiratory infections
5 COVID-19
6 Lung cancer
7 Alzheimer's disease
8 Neonatal disorders
9 Diabetes
10 Chronic kidney disease
11 Cirrhosis liver
12 Hypertensive heart disease
13 Road injuries
14 Tuberculosis
15 Diarrhoeal diseases
16 Colorectal cancer
17 Stomach cancer
18 Falls
19 Self-harm
20 Malaria

GBD, Lancet 2025

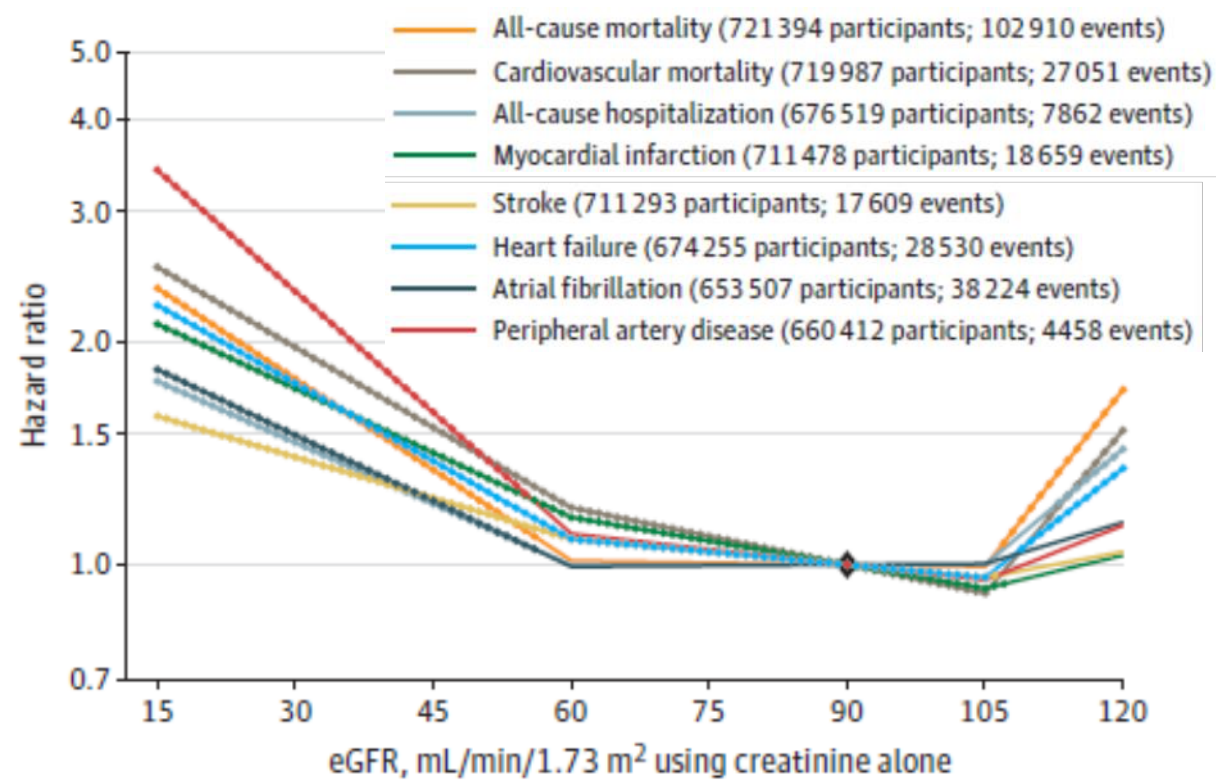
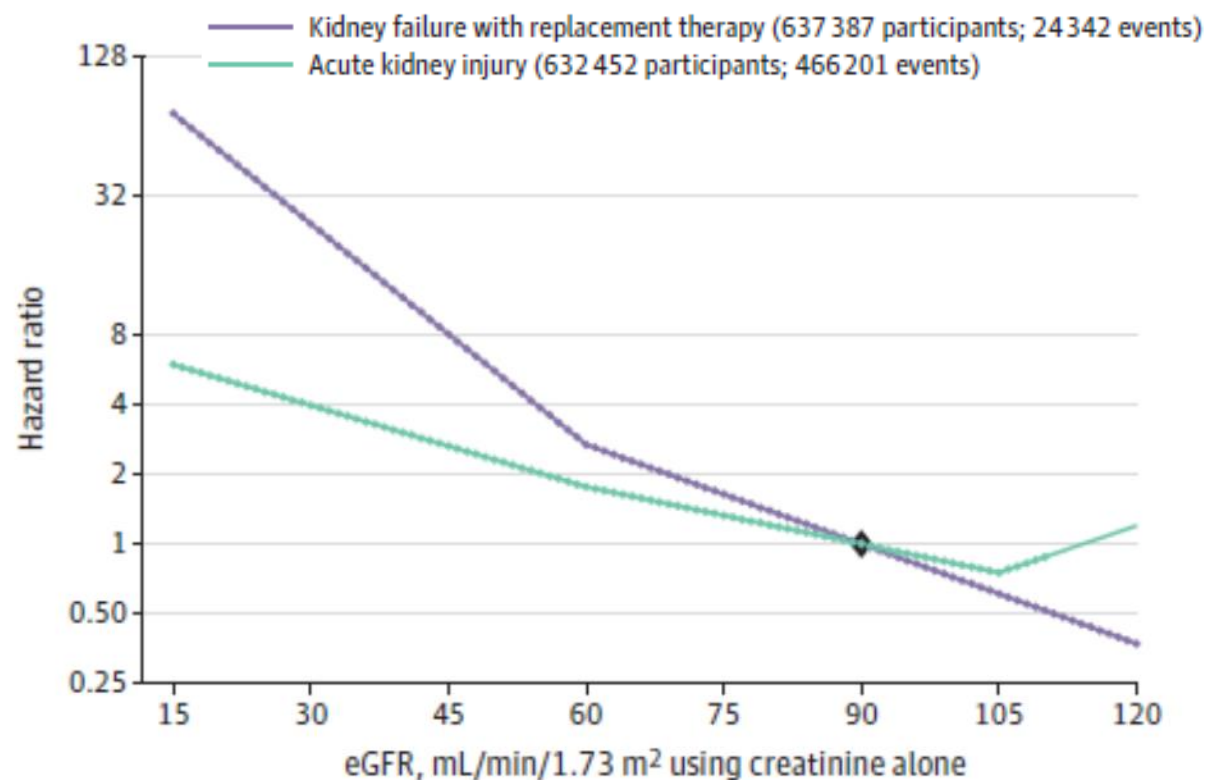
La malattia renale cronica è una importante causa di mortalità e outcome avversi

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Leading causes 2022	Leading causes 2050	Mean percentage change in age-standardised death rate
1 Ischaemic heart disease	1 Ischaemic heart disease	-44.8 (-64.3 to -15.4)
2 Stroke	2 Stroke	-41.3 (-53.4 to -25.9)
3 COPD	3 COPD	-13.7 (-34.3 to 15.6)
4 Lower respiratory infections	4 Alzheimer's disease	-3.48 (-5.38 to -1.07)
5 COVID-19	5 Chronic kidney disease	33.1 (-0.751 to 79)
6 Lung cancer	6 Lower respiratory infections	-26.6 (-36.8 to -13.3)
7 Alzheimer's disease	7 Hypertensive heart disease	17.1 (-16.5 to 61)
8 Neonatal disorders	8 Lung cancer	-17 (-31.9 to 0.776)
9 Diabetes	9 Diabetes	-13.9 (-33.8 to 14.9)
10 Chronic kidney disease	10 Cirrhosis liver	-9.06 (-20.9 to 6.14)
11 Cirrhosis liver	11 Colorectal cancer	-3.02 (-24.8 to 23.1)
12 Hypertensive heart disease	12 Falls	-5.34 (-10.6 to -0.215)
13 Road injuries	13 Diarrhoeal diseases	-34 (-54.1 to 0.13)
14 Tuberculosis	14 Road injuries	-18.1 (-46.7 to 28.6)
15 Diarrhoeal diseases	15 Pancreatic cancer	18.1 (-6.89 to 46.9)
16 Colorectal cancer	16 Breast cancer	1.42 (-18.9 to 24.8)
17 Stomach cancer	17 Stomach cancer	-38.1 (-41.6 to -34.4)
18 Falls	18 Atrial fibrillation	17.3 (11.9 to 22.5)
19 Self-harm	19 Urinary diseases	33.5 (11.4 to 60)
20 Malaria	20 Prostate cancer	5.51 (-8.93 to 23)

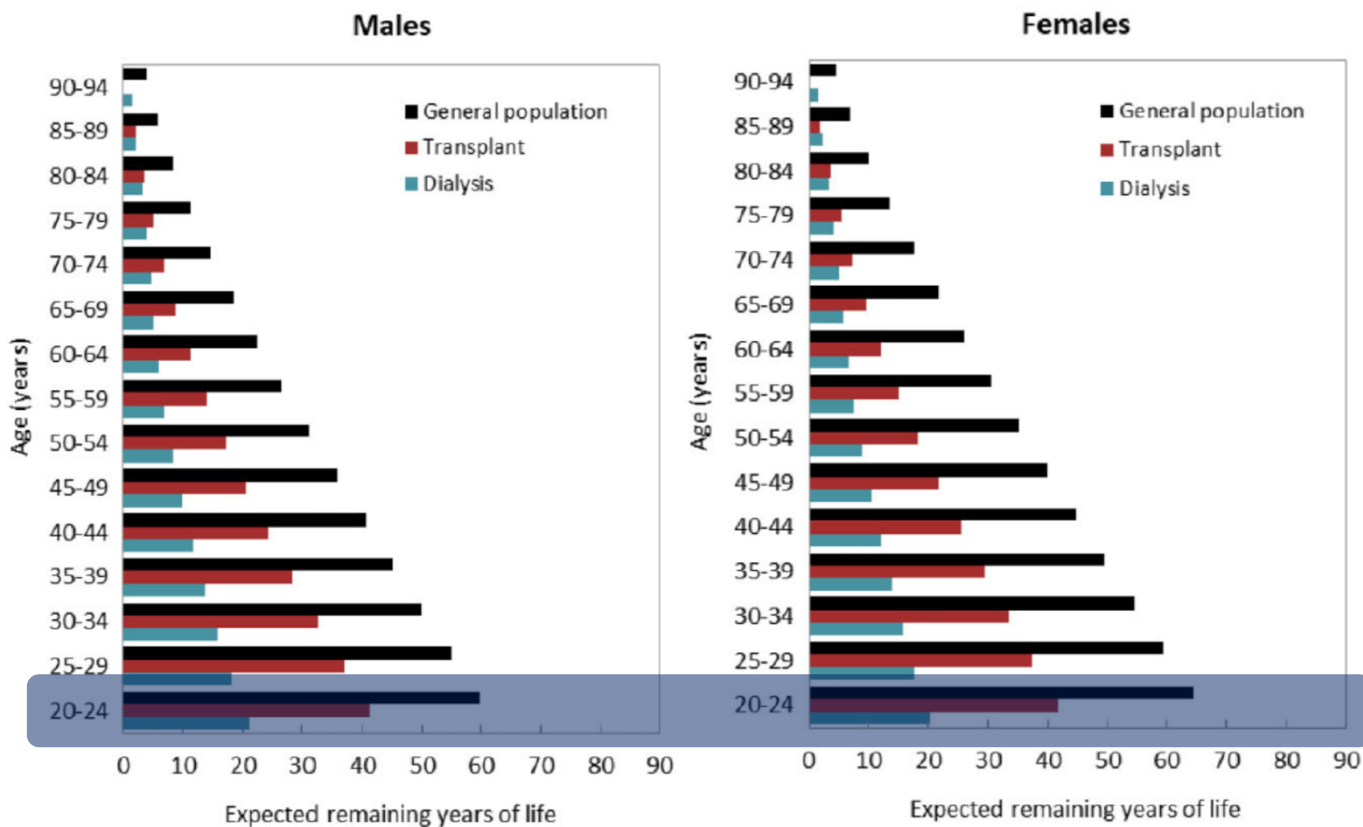
GBD, Lancet 2025

La malattia renale cronica è una importante causa di mortalità e outcome avversi

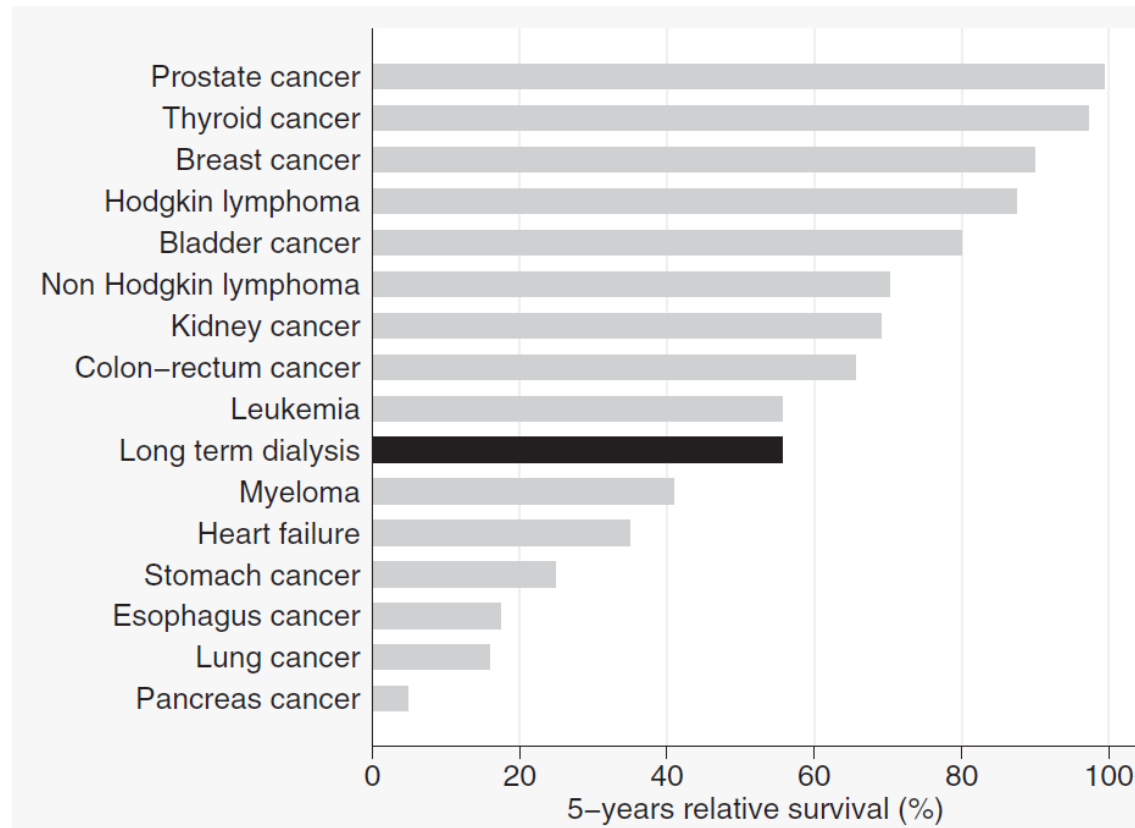


Grams, JAMA 2023

Riduzione dell'aspettativa di vita nelle persone sottoposte a dialisi



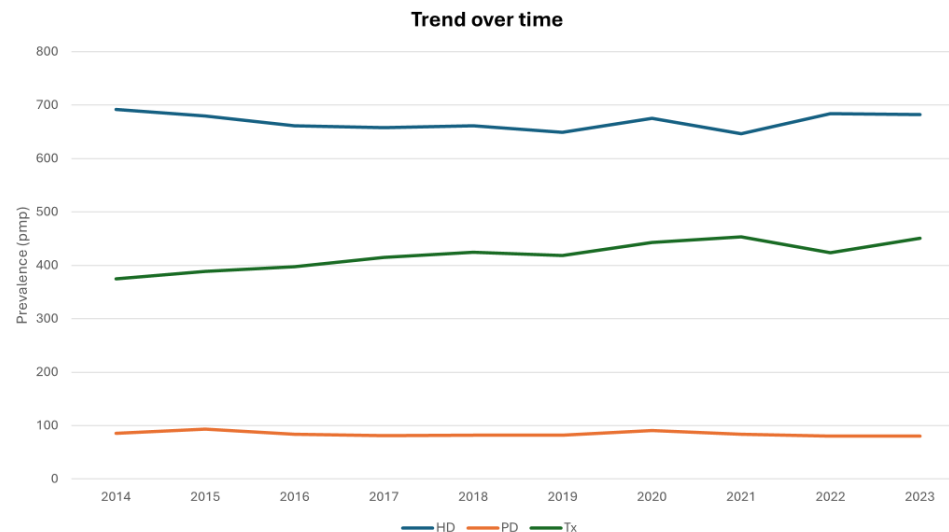
~40 anni in meno rispetto alla PG



Boenink, Clin Kidney J 2025; Nordio, Am J Kidney Dis 2012

Trend temporali di prevalenza in trattamento sostitutivo – Registro SIN 2023

Misura epidemiologica	Attributo	Denominatore
Prevalenza	Anno	Popolazione generale
	Metodica	



Regioni incluse: Alto Adige, Calabria, Emilia-Romagna, Friuli-Venezia Giulia, Liguria, Lombardia, Marche, Molise, Piemonte-Valle D'Aosta, Puglia, Sicilia, Trentino, Umbria, Veneto (HD, PD, Tx); Basilicata (PD, Tx); Abruzzo, Lazio, Toscana (HD, PD)

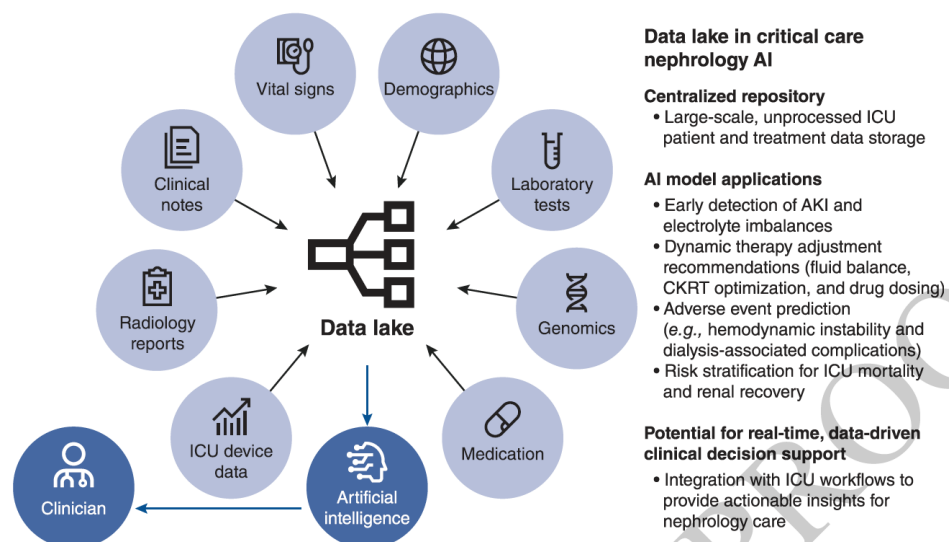
Possibile ruolo dell'intelligenza artificiale in Nefrologia

Responsible Use of Artificial Intelligence to Improve Kidney Care

A Statement from the American Society of Nephrology

Navdeep Tangri,¹ Wisit Cheungpasitporn², Stanley D. Crittenden,³ Alessia Fornoni⁴, Carmen A. Peralta⁵, Karandeep Singh⁶, Len A. Usvyat⁷, and Amy D. Waterman⁸, on behalf of the American Society of Nephrology (ASN) Artificial Intelligence (AI) Workgroup*

Published Online Ahead of Print: November 7, 2025



Malattia renale cronica

- Screening
- Predizione di progressione

Danno renale acuto

- Timing ottimale di inizio CRRT

Trattamento dialitico

- Predizione di complicanze intra-HD
- Ottimizzazione dose dialitica

Trapianto di rene

- Ottimizzazione matching/allocazione
- Predizione di rigetto

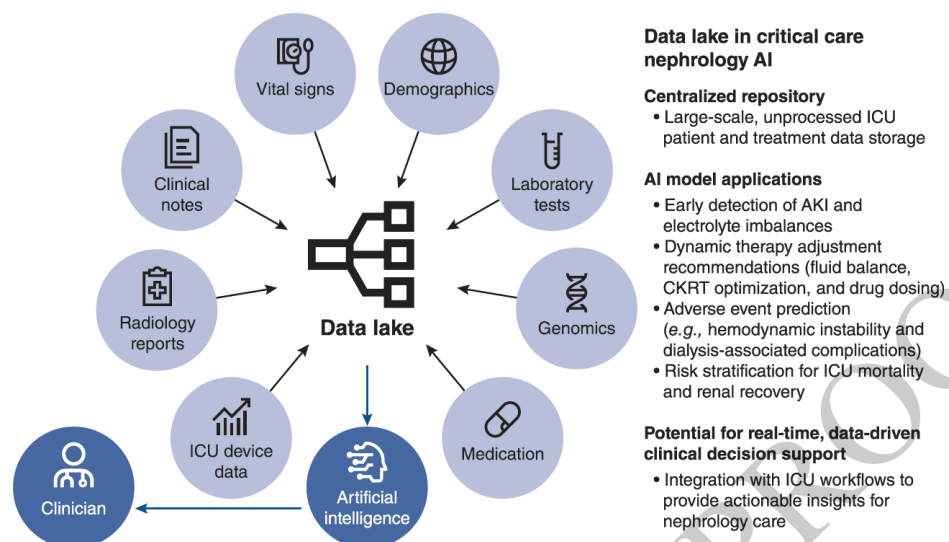
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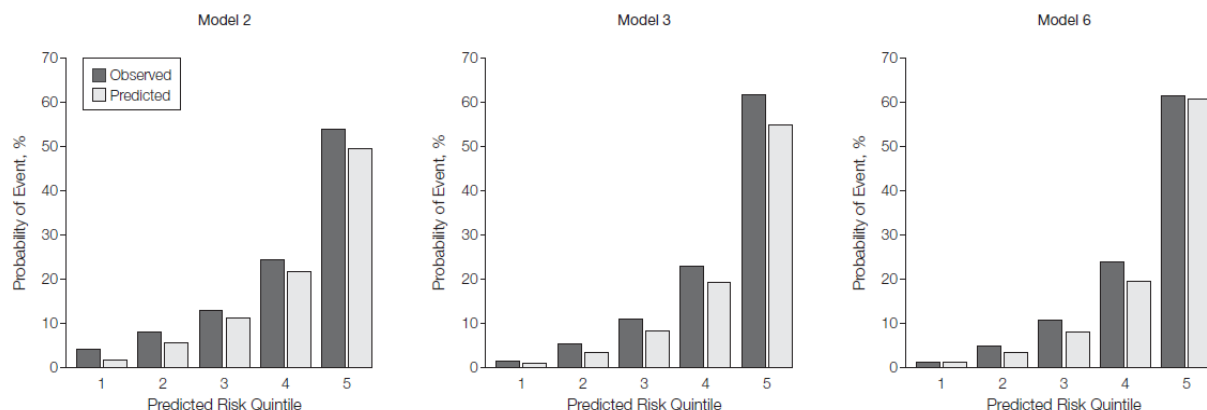
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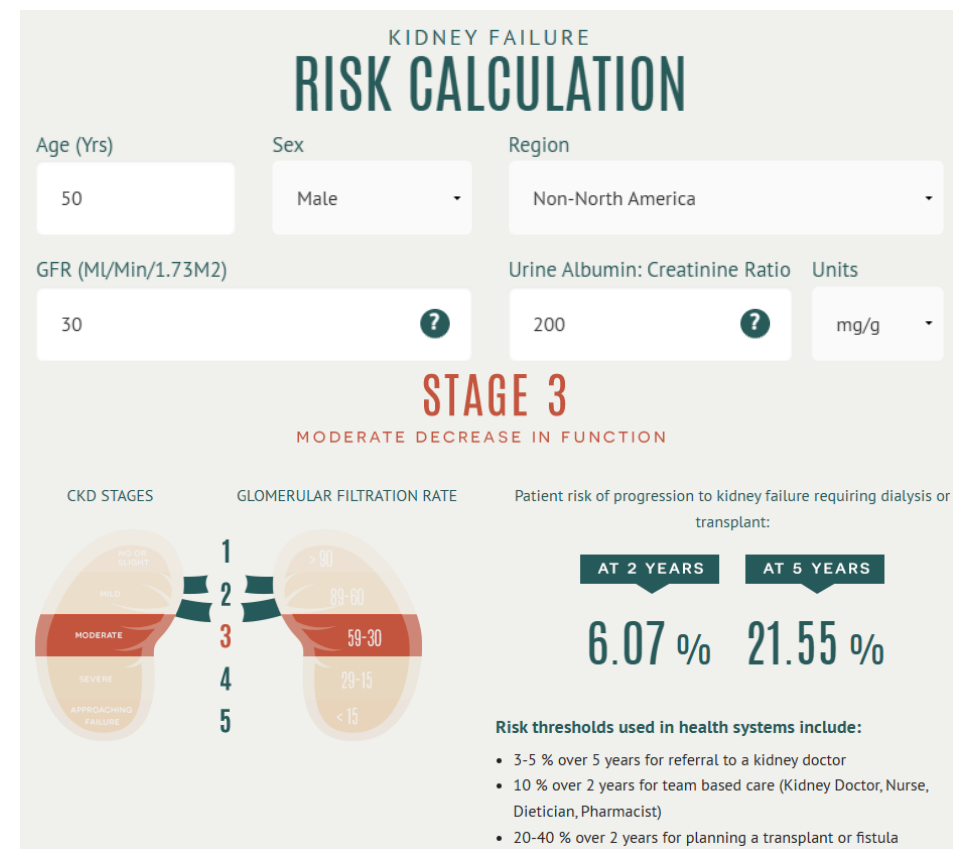
Approcci AI di stratificazione rischio

Approcci AI di risposta terapeutica

Modelli predittivi di rischio di progressione – KFRE



Probability of Kidney Failure, %		
Model	Patient A (70-year-old male, with estimated GFR of 30 mL/min/1.73 m ² and urine ACR of 200 mg/g) ^b	Patient B (50-year-old male, with estimated GFR of 30 mL/min/1.73 m ² and urine ACR of 50 mg/g) ^c
2	19.8	32.7
3	16.3	13.6
6	26.0	10.7



Tangri, JAMA 2011

Modelli predittivi di rischio di progressione – KDpredict

Select Model Type ⓘ

4 variables 6 variables

Age in years *

50

Sex at birth *

Male

CKD-EPI eGFR formula

2009 2021

eGFR (mL/min/1.73m2) * ⓘ

30

Measure of proteinuria ⓘ

ACR PCR Dipstick

Units

mg/g mg/mmol

ACR (mg/g) *

200

Clear Update risk

Risk predictions over time

Years 1 to 5 from the diagnosis of moderate or severe CKD

Each diamond represents the values of the risk of death (y axis) and kidney failure (x axis) at years 1 to 5. Note that people with kidney failure may die within the prediction timeframe.

5 year risks from the time of diagnosis

Move the slider to the desired prediction horizon

1 5

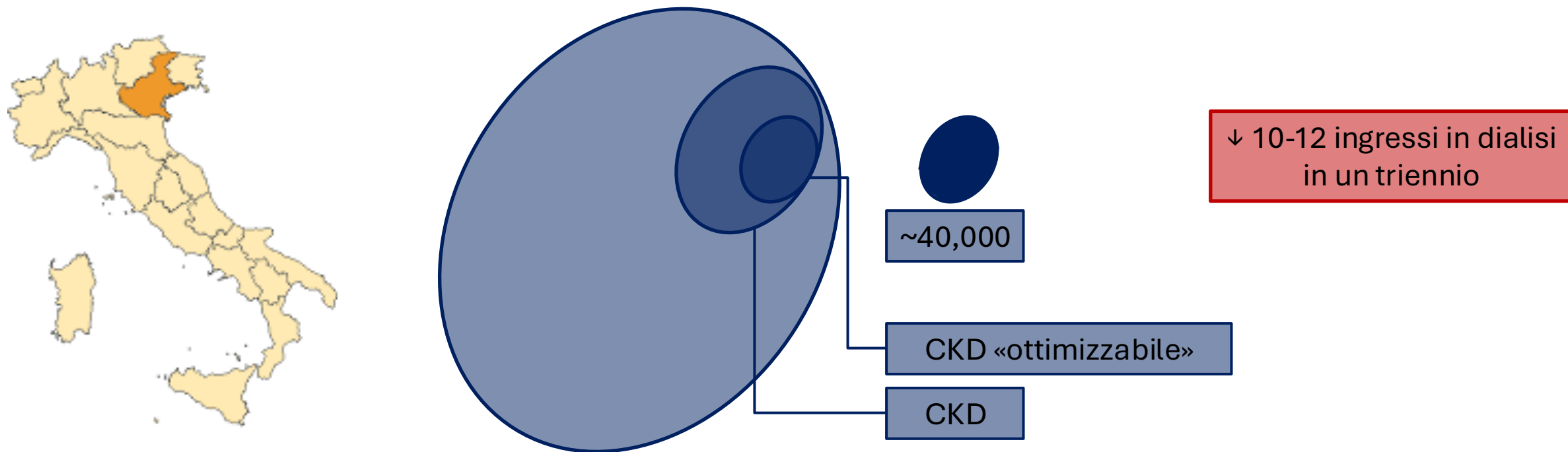
19% 18%

Risk of death Risk of kidney failure

Of 100 people who are like you now, within 5 years we would expect 18 to have developed kidney failure, and 19 to die with or without kidney failure.

Liu, BMJ 2024

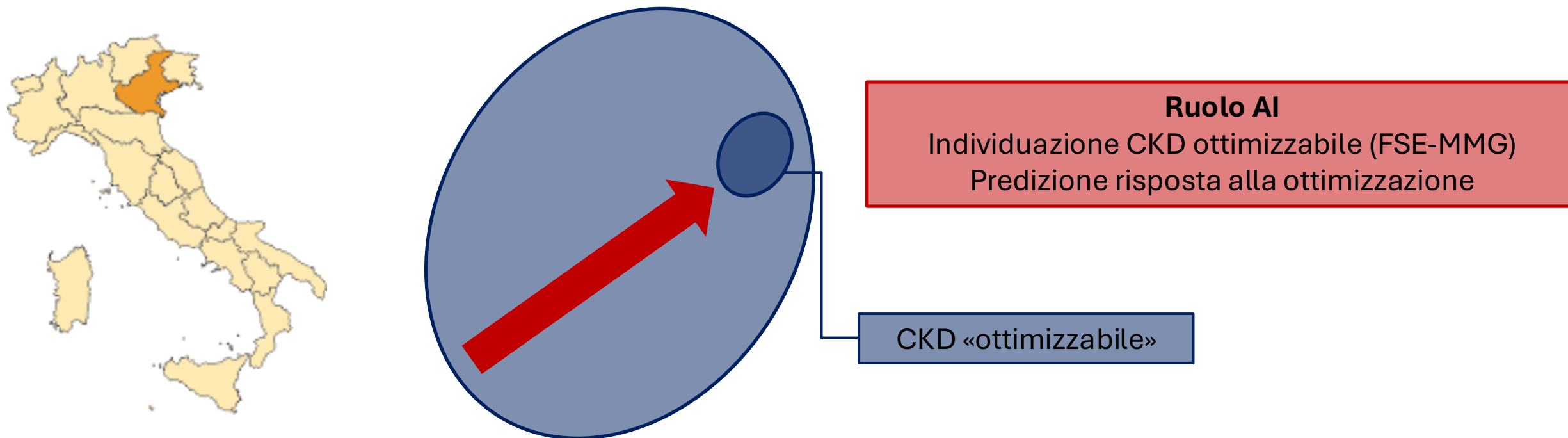
Esempio di integrazione di modelli AI in politiche sanitarie di interesse nefrologico



Simulazione con integrazione di dati INCIPE + RVDT + letteratura

Ferraro...Nordio (submitted)

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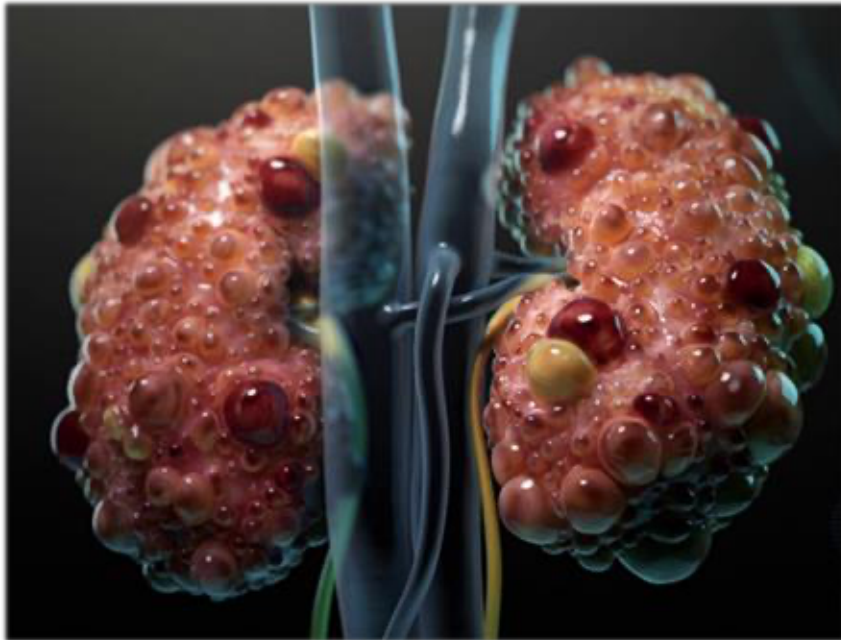


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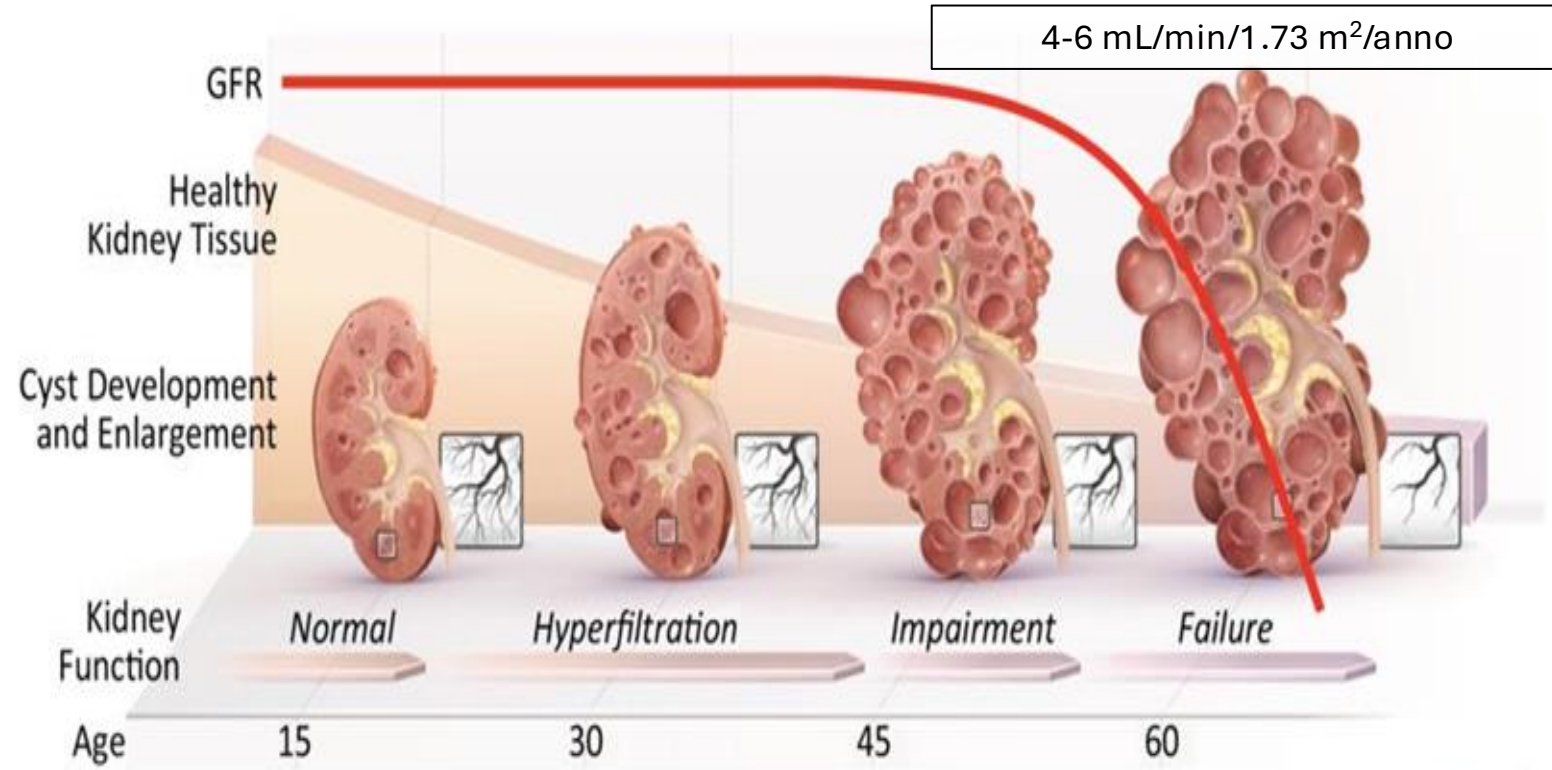
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Applicazione di un modello AI nel rene policistico

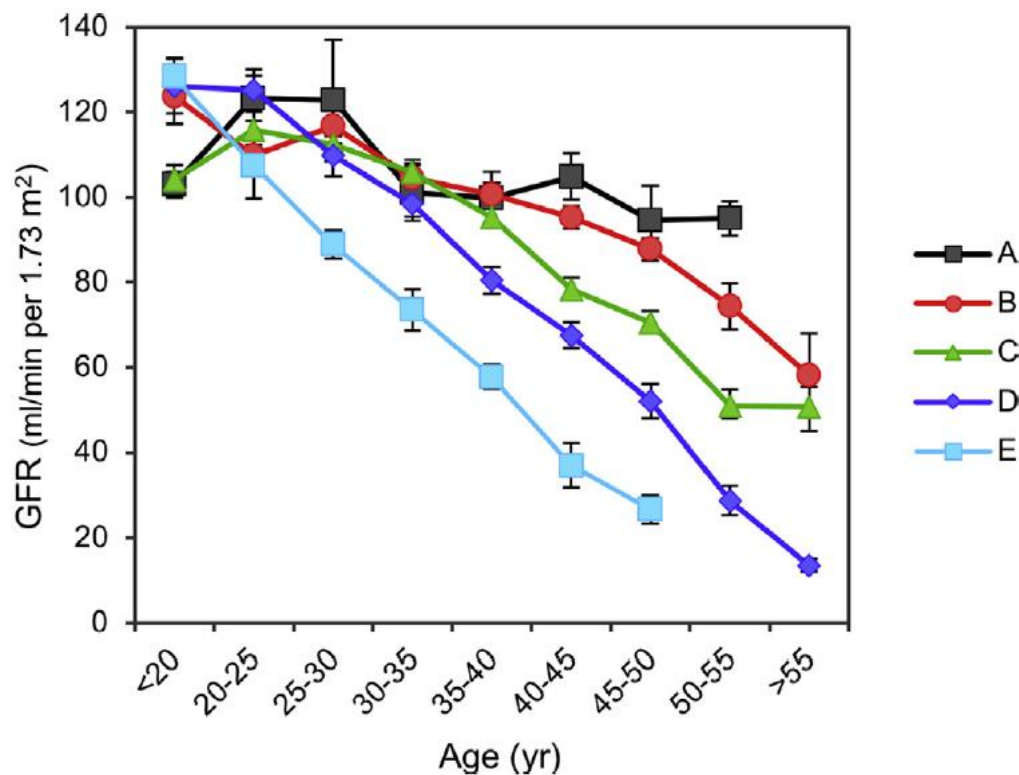
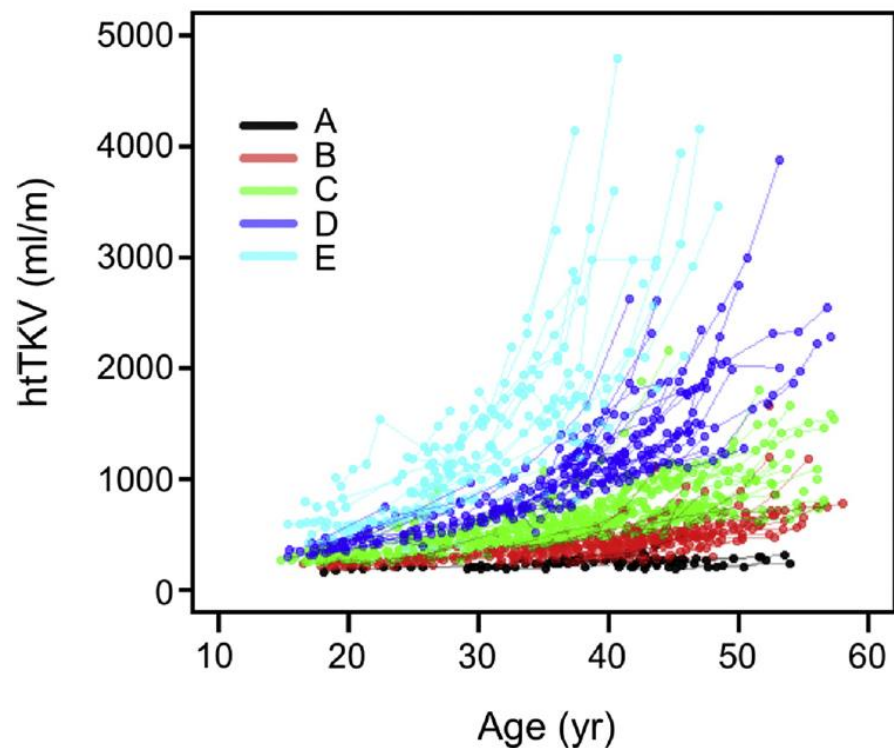
Il rene policistico come causa di CKD/ESKD



1° causa genetica di CKD
5° causa di ESKD



Traiettorie cliniche eterogenee nel rene policistico

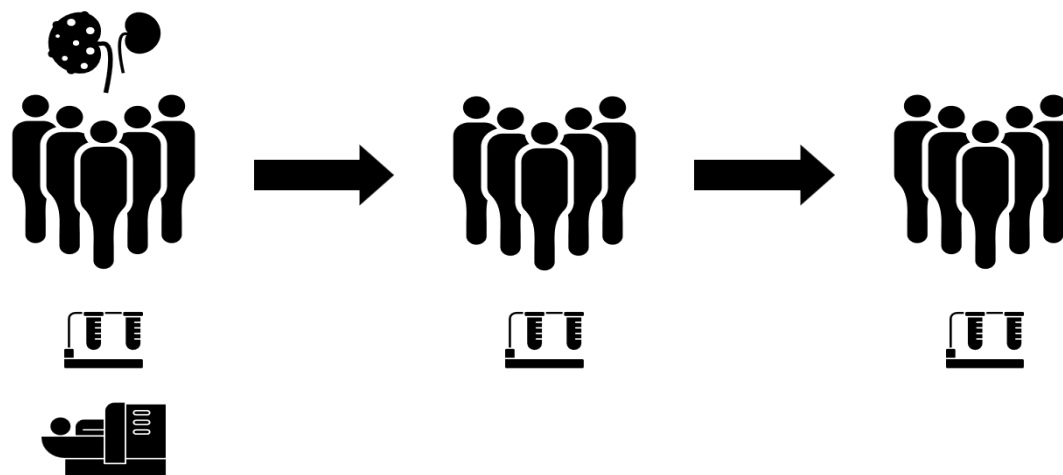


Yu, Kidney Int 2019

Diffusion and multiparametric MRI radiomics predict renal function decline in ADPKD

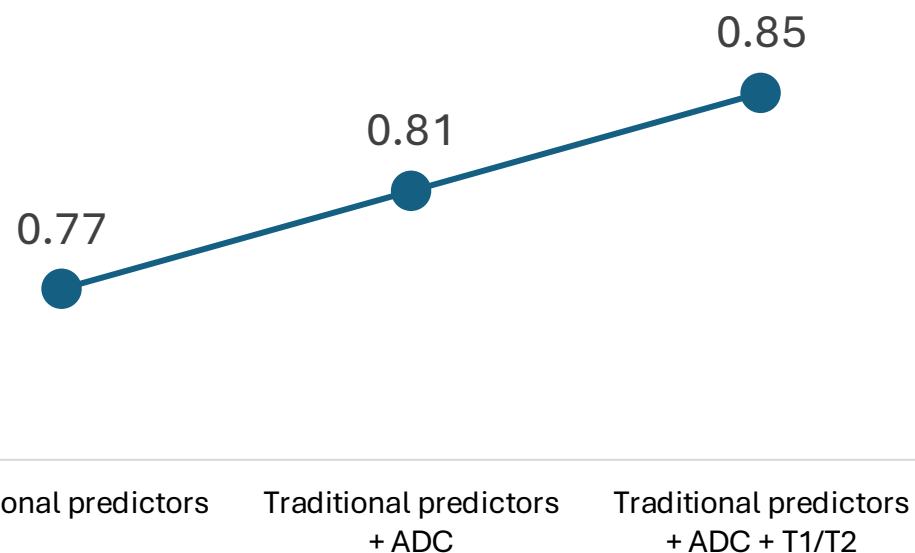
Authors: Matteo Bargagli¹, Luisa Altabella², Marina Fedon Vocaturo^{2,3}, Riccardo Negrelli⁴, Maria Chiara Ambrosetti⁴, Giovanni Puppini⁴, Carlo Cavedon², Martin Scoglio^{1,5}, Daniel G. Fuster^{1*#} and Pietro Manuel Ferraro^{6*#}

- AOUI Verona
 - Nefrologia
 - Fisica Medica
 - Radiologia
- Università di Berna
 - Nefrologia



Le features radiomiche migliorano la predizione di rapido declino GFR

AUC



Traditional predictors: age, sex, height-adjusted total kidney volume, tolvaptan treatment, eGFR, BMI
Radiomic features extracted from T1-weighted (T1), T2-weighted (T2), and apparent diffusion coefficient (ADC) images
Outcome: eGFR slope ≥ 3 mL/min/1.73 m²/year

Calibration Plot

