RWD37

Comorbidities are a risk predictor of kidney disease progression among patients diagnosed with chronic kidney disease

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Objective

- The aim of this study is to evaluate how comorbidities, including hypertension, type 2 diabetes, and cardiovascular disease impact CKD progression and adverse health outcomes longer term

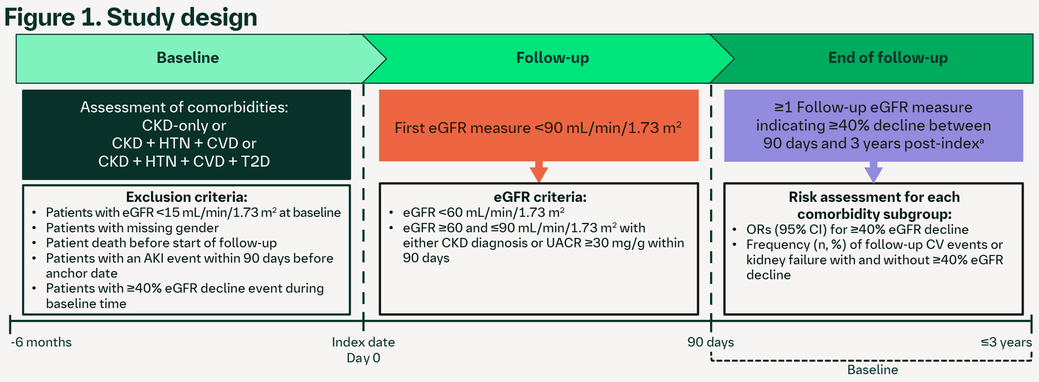
Introduction

- Chronic kidney disease (CKD) is a progressive condition affecting millions globally, often accompanied by comorbidities such as hypertension (HTN), type 2 diabetes (T2D), and cardiovascular disease (CVD)[1,2]
- Estimated glomerular filtration rate (eGFR) is a key biomarker used alongside urine albumin-creatinine ratio (UACR) to monitor kidney function and predict CKD progression
- Although eGFR decline is recognized as a predictor of disease progression, less is known about its association with adverse outcomes in the presence of multiple comorbidities
- Understanding the incremental risk posed by comorbid conditions is critical for optimising disease management and improving patient-relevant outcomes in CKD populations

Methods

- The study design is presented in **Figure 1**. US Optum Market Clarity database linked claims and electronic health records (January 2017–June 2024) were used to identify patients with CKD, defined as ≥2 eGFR measures within 1 year and ≥90 days apart that are <60 mL/min/1.73 m^2, or ≥60 and ≤90 mL/min/1.73 m^2 with either CKD diagnosis or UACR ≥30 mg/g
  - The first valid eGFR date was the index date
  - Patients were required to have 2 additional eGFR values measured during the second and third year post-index, respectively
  - The baseline period spanned from the index date until ≥1 eGFR measure indicating ≥40% decline between 90 days and 3 years post-index
- Comorbidities were assessed within 6 months before the index date
  - Patients with multimorbid conditions were stratified into subgroups by diagnosis of CKD only, CKD + HTN + CVD, and CKD + HTN + CVD + T2D
- Event rates were calculated for each comorbidity subgroup
  - ORs (95% CI) for the outcome of ≥40% eGFR decline were determined via logistic regression
  - The frequency of adverse outcomes (n, %) were determined for patients with and without ≥40% eGFR decline

Figure 1. Study design



[a]3 year baseline period was selected based on 2–2.4 years median follow-up in CKD trials[3,4]

Patients

- The mean duration of follow-up across all subgroups was 2.74 years
- Patient demographics are presented in **Table 1**
- The final CKD population consisted of 135,364 patients with CKD only, 251,865 patients with CKD + HTN + CVD, and 237,669 patients with CKD + HTN + CVD + T2D

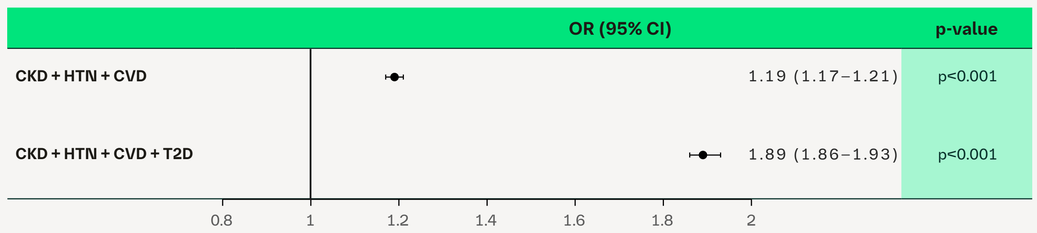
Table 1. Baseline patient demographics and comorbidities

	CKD-only	CKD + HTN + CVD	CKD + HTN + CVD + T2D	Total
Cohort, N	N=135,364	N=251,865	N=237,669	N=624,928
Age, mean (SD)	69.24 (11.38)	72.51 (9.91)	70.60 (9.31)	71.07 (10.11)
Male, n (%)	54,253 (40.08)	100,932 (40.07)	109,761 (46.18)	264,946 (42.40)
Race/ethnicity, n (%)				
Caucasian	106,799 (78.90)	199,779 (79.32)	172,274 (72.48)	478,852 (76.63)
Black	15,252 (11.27)	31,723 (12.60)	40,061 (16.85)	87,036 (13.93)
Asian	2136 (1.58)	2860 (1.14)	4679 (1.97)	9675 (1.55)
Hispanic	1805 (1.33)	2333 (0.93)	4581 (1.93)	8719 (1.40)
Unknown	9372 (6.92)	15,170 (6.02)	16,104 (6.77)	40,646 (6.50)
Pre-baseline covariates, n (%)				
CVD	0 (0)	251,865 (100)	237,699 (100)	489,564 (78.34)
Type 2 diabetes	0 (0)	0 (0)	237,699 (100)	237,699 (38.04)
PAD	3841 (2.84)	38,201 (15.17)	40,475 (17.03)	82,517 (13.20)
Sleep disorder	4745 (3.51)	24,020 (9.54)	36,821 (15.49)	65,586 (10.49)
Hospitalisation for MI	7 (0.01)	3986 (1.58)	5703 (2.40)	9696 (1.55)
Hospitalised stroke	24 (0.02)	4248 (1.69)	5215 (2.19)	9487 (1.52)
Urgent HF visit	2 (0)	3340 (1.33)	4670 (1.96)	8012 (1.28)
Kidney failure	164 (0.12)	2124 (0.84)	2630 (1.11)	4918 (0.79)

Results

- The risk of CKD progression of ≥40% eGFR decline increased by 19% and 89% in patients with CKD + HTN + CVD and CKD + HTN + CVD + T2D, respectively, in comparison to patients with CKD only (**Figure 2**)
- Across subgroups, the proportion of patients with eGFR decline ≥40% increased in correspondence with comorbidity burden, representing 12.49%, 14.52%, and 21.28% of patients with CKD only, CKD + HTN + CVD, and CKD + HTN + CVD + T2D, respectively (**Figure 3**)
- For each comorbidity subgroup, the incidence of adverse outcomes was higher in patients with ≥40% decline in eGFR compared to those with <40% decline in eGFR (**Table 2**)
  - The proportion of patients with ≥40% decline in eGFR who experienced an adverse outcome consistently increased with the addition of each comorbidity across patients with CKD only, CKD + HTN + CVD, and CKD + HTN + CVD + T2D, respectively

Figure 2. Odds ratios (95% CI) for eGFR decline ≥40% according to comorbidity subgroups[a]



[a]Compared with the CKD-only cohort

Figure 3. Number of CKD patients with eGFR decline ≥40% by comorbidity subgroup

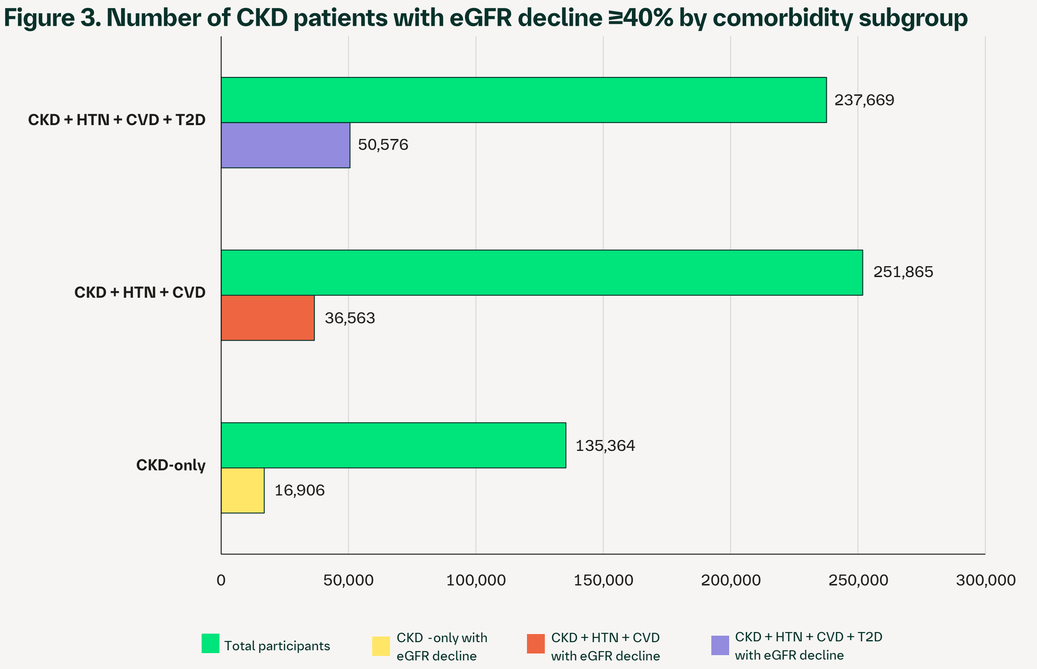


Table 2. Frequency of adverse follow-up outcomes by comorbidity subgroup and eGFR decline <40% or ≥40%

	CKD-only		CKD + HTN + CVD		CKD + HTN + CVD + T2D	
Outcomes, n (%)	eGFR decline <40%	eGFR decline ≥40%	eGFR decline <40%	eGFR decline ≥40%	eGFR decline <40%	eGFR decline ≥40%
CV-related death	8309 (7.01)	2855 (16.89)	26,549 (12.33)	9289 (25.41)	25,894 (13.84)	13,250 (26.20)
Hospitalisation for MI	10,133 (8.55)	3878 (22.94)	31,203 (14.49)	10,787 (29.50)	35,199 (18.81)	17,903 (35.40)
Hospitalised stroke	13,260 (11.19)	3724 (22.03)	37,222 (17.29)	10,495 (28.70)	38,386 (20.51)	16,693 (33.01)
Urgent HF visit	5365 (4.53)	2625 (15.53)	23,597 (10.96)	9572 (26.18)	25,115 (13.42)	15,037 (29.73)
Kidney failure	3791 (3.20)	2236 (13.23)	8797 (4.09)	3788 (10.36)	13,970 (7.47)	8801 (17.40)

Conclusions

- The growing population of patients with multimorbid CKD face a significantly increased risk of sustained ≥40% eGFR decline and adverse health outcomes compared with patients who have CKD alone
- The findings of this study highlight the unmet need for personalised disease management strategies to address the complex requirements of multimorbid CKD patients in order to mitigate kidney disease progression, improve patient outcomes, and reduce mortality risk

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Abbreviations
CI, confidence interval; CKD, chronic kidney disease; CV, cardiovascular; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate; HF, heart failure; HR, hazard ratio; MI, myocardial infarction; OR, odds ratio; PAD, pulmonary artery disease; T2D, type 2 diabetes; UACR, urine albumin-creatinine ratio.

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