

1/ Hey #NephTwitter 🙌🙌

Could a very high eGFR be a warning sign, not reassurance? This #Klreports editorial reframes "supra-normal" filtration as early cardiorenal stress and makes the case for a next-generation heat map

@Kataoka\_ABM

[https://www.kireports.org/article/S2468-0249\(26\)02718-X/fulltext](https://www.kireports.org/article/S2468-0249(26)02718-X/fulltext)



## The Next-Generation CKD Heat Map: Hyperfiltration and eGFR Slope in the Cardiorenal Continuum

Check for updates

Hiroshi Kataoka<sup>1,2</sup>, Yusuke Ushio<sup>1,3</sup>, Shun Manabe<sup>1</sup> and Junichi Hoshino<sup>1</sup>

<sup>1</sup>Department of Nephrology, Tokyo Women's Medical University, Tokyo, Japan; and <sup>2</sup>Department of Clinical Engineering, Faculty of Human Care at Makuhari, Tohto University, Chiba, Japan

*Kidney Int Rep* (2026) 11, 106486; <https://doi.org/10.1016/j.ekir.2026.106486>  
© 2026 The Author(s). Published by Elsevier Inc. on behalf of the International Society of Nephrology. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

Chronic kidney disease (CKD) has become one of the world's fastest-rising causes of death, yet it is still often detected too late to allow meaningful prevention.<sup>S1</sup> The 2023 CKD Prognosis Consortium heat map, later adopted into the 2024 Kidney Disease: Improving Global Outcomes (KDIGO) CKD guidelines, established the current global standard for risk stratification based on estimated glomerular filtration rate (eGFR) and albuminuria categories.<sup>1,2</sup> This static, cross-classification approach transformed clinical communication by enabling clear visualization of adverse outcomes across 10 kidney and cardiovascular end points.

However, CKD risk assessment remains largely cross-sectional.

The heat map captures severity at a single time point but does not explicitly incorporate physiologic or temporal dimensions of kidney function. An intriguing observation within the CKD Prognosis Consortium analysis is that individuals with very high eGFR ( $\geq 105$  mL/min per  $1.73$  m<sup>2</sup>) combined with albuminuria may experience higher cardiovascular and mortality risk than patients with moderate CKD (eGFR: 30–44 mL/min per  $1.73$  m<sup>2</sup>).<sup>1,2</sup> Rather than contradicting the heat-map framework, this pattern may reflect physiologic processes not explicitly represented in static staging models.

Here, we propose that 2 complementary dimensions—glomerular hyperfiltration and eGFR slope—provide a physiologically grounded framework for interpreting these observations across the cardiorenal continuum.<sup>3–8,S2–S7</sup>





Correspondence: Hiroshi Kataoka or


2/ The current @goKDIGO heat maps give an overview of adverse outcomes across 10 kidney and cardiovascular endpoints. They tell us how damaged the kidney looks today, but not how the kidneys would behave over time. A static snapshot can miss early danger

Age <65 eGFR<sub>cr</sub>-cys	ACR, mg/g				ACR, mg/g			
	<10	10-29	30-299	300+	<10	10-29	30-299	300+
	All-cause mortality				Myocardial infarction			
105+	0.99	1.2	1.5	2.4	0.93	1.0	1.1	2.6
90-104	ref	1.3	1.5	2.5	ref	1.2	1.3	1.9
60-89	1.2	1.6	2.0	2.9	1.3	1.4	1.6	2.1
45-59	2.1	2.7	2.9	4.5	1.8	2.6	3.1	3.5
30-44	2.7	3.8	4.2	5.6	1.9	2.3	3.0	3.9
<30	5.2	4.0	7.1	8.6	4.1	3.6	4.7	5.8
	Cardiovascular mortality				Stroke			
105+	0.95	1.4	1.7	4	0.96	1.2	1.6	2.7
90-104	ref	1.6	1.8	3.5	ref	1.2	1.5	2.2
60-89	1.3	1.7	2.3	3.9	1.2	1.4	1.7	2.6
45-59	2.5	4.0	4.6	6.0	1.9	2.0	2.5	3.8
30-44	3.1	6.6	5.3	7.1	2.6	3.7	3.5	3.5
<30	6.0	5.5	9.4	12	2.6	2.9	5.1	5.1
	Kidney failure replacement therapy				Heart failure			
105+	0.57	0.77	2.3	12	0.86	1.1	1.7	3.4
90-104	ref	1.4	3.9	11	ref	1.3	1.5	3.0
60-89	1.9	3.7	8.3	33	1.2	1.7	2.1	3.6
45-59	7.0	16	28	100	1.7	3.3	3.4	5.3
30-44	22	34	109	210	3.5	4.3	6.8	5.7
<30	335	267	419	625	7.5	6.3	9.7	8.9
	Acute kidney injury				Atrial fibrillation			
105+	0.75	1.0	1.4	3.4	0.93	1.0	1.3	1.9
90-104	ref	1.2	1.8	2.6	ref	1.2	1.4	2.3
60-89	1.6	2.7	2.9	5.8	1.1	1.3	1.5	1.8
45-59	4.2	6.0	5.6	7.6	1.5	2.0	2.1	2.6
30-44	5.7	9.4	9.8	9.4	1.8	2.4	3.0	2.8
<30	15	14	14	13	3.7	2.9	4.3	5.4
	Hospitalization				Peripheral artery disease			
105+	1.0	1.1	1.1	1.5	0.93	1.9	1.5	2.6
90-104	ref	1.1	1.2	1.3	ref	1.8	2.1	3.9
60-89	1.1	1.2	1.3	1.6	1.2	2.1	2.2	5.4
45-59	1.3	1.7	1.5	2.0	3.2	7.3	3.4	8.4
30-44	1.5	1.8	1.6	2.1	6.5	9.1	6.6	13
<30	2.1	2.4	2.4	3.5	1.4	7.6	18	16

Age 65+ eGFR<sub>cr</sub>-cys	ACR, mg/g				ACR, mg/g			
	<10	10-29	30-299	300+	<10	10-29	30-299	300+
	All-cause mortality				Myocardial infarction			
105+	1.2	1.4	1.9	3.5	0.97	1.4	2.0	1.9
90-104	ref	1.2	1.4	2.0	ref	1.2	1.1	1.9
60-89	1.2	1.5	1.8	2.3	1.1	1.4	1.5	1.9
45-59	1.6	2.0	2.4	2.9	1.6	1.9	2.3	3.4
30-44	2.0	2.4	3.2	4.1	2.1	2.6	3.1	3.8
<30	3.4	4.1	5.1	6.5	4.9	3.0	5.1	5.0
	Cardiovascular mortality				Stroke			
105+	1.1	1.5	2.0	12	1.2	1.3	1.5	3.3
90-104	ref	1.4	1.4	3.4	ref	1.3	1.3	2.8
60-89	1.2	1.7	2.2	3.1	1.1	1.4	1.8	2.5
45-59	1.7	2.4	3.0	4.3	1.5	1.7	2.0	2.3
30-44	2.4	3.1	4.5	5.8	1.5	2.0	2.1	2.3
<30	5.7	5.2	5.1	7.8	1.7	2.0	2.4	4.8
	Kidney failure replacement therapy				Heart failure			
105+	2.0	1.0	2.1		0.99	1.5	1.7	7.0
90-104	ref	1.9	4.7	10	ref	1.3	1.5	2.2
60-89	1.4	2.6	6.2	19	1.2	1.5	2.0	3.2
45-59	3.7	7.9	16	42	1.6	2.0	2.9	4.1
30-44	14	14	46	137	2.3	2.9	3.5	6.1
<30	87	364	241	406	4.4	4.1	5.5	7.2
	Acute kidney injury				Atrial fibrillation			
105+	0.91	1.1	1.3	1.9	0.95	1.1	1.0	3.7
90-104	ref	1.3	1.4	3.9	ref	1.2	1.3	2.4
60-89	1.5	2.1	2.7	4.7	1.1	1.2	1.5	2.0
45-59	3.6	4.3	5.1	7.3	1.2	1.4	1.7	1.9
30-44	5.7	5.9	7.2	9.8	1.5	1.8	2.0	2.2
<30	10	11	11	22	1.8	1.8	2.2	3.2
	Hospitalization				Peripheral artery disease			
105+	1.0	1.1	1.2	2.2	1.1	2.3	2.9	4.9
90-104	ref	1.1	1.3	1.4	ref	1.3	2.0	4.8
60-89	1.1	1.2	1.3	1.5	1.3	1.6	2.0	3.2
45-59	1.2	1.2	1.4	1.6	2.0	2.8	3.1	3.1
30-44	1.5	1.4	1.6	2.0	3.5	2.8	3.8	5.9
<30	1.9	1.9	2.0	2.6	8.4	4.1	5.9	10

3/ Before we dig into the topic, what do we understand by high eGFR? There is no unitary answer- and “at best” we can phrase it as the definition depends on age, albuminuria presence, and clinical context

 Age group	 eGFR threshold	 Interpretation	 Context modifiers
<40	Any high value	Often physiologic	Albuminuria or metabolic stress= ↑ concern
40-65	≥ 105	Possible hyperfiltration	Especially with albuminuria/ metabolic stress
≥65	≥ 90	Relative hyperfiltration	Lower threshold triggers evaluation

 **Metabolic stress-** conditions that increase tubular workload and oxygen demand in the kidney, driving potentially maladaptive, hemodynamic responses (e.g. obesity).

Kataoka K et al, *Kidney Int Rep*, 2026 (suppl)  
Yang Y et al, *Kidney Int*, 2026

4/ Authors focus on 2 dynamic signals: hyperfiltration & eGFR slope

👉 very high eGFR ( $\geq 105$ ) + with albuminuria may have higher CV and mortality risk compared to moderate CKD (eGFR 30-44)

<https://pubmed.ncbi.nlm.nih.gov/38490803/>

## Glomerular Hyperfiltration as a Paradoxical Risk State: Limitations of Kidney-Failure-Focused Outcomes in the CKD Heat Map

All-cause mortality						Cardiovascular mortality						Kidney failure					
Overall	Urine albumin-creatinine ratio, mg/g					Overall	Urine albumin-creatinine ratio, mg/g					Overall	Urine albumin-creatinine ratio, mg/g				
eGFRcr	<10	10-29	30-299	300-999	1000+	eGFRcr	<10	10-29	30-299	300-999	1000+	eGFRcr	<10	10-29	30-299	300-999	1000+
All-cause mortality: 82 cohorts 26 444 384 participants; 2 604 028 events						Cardiovascular mortality: 76 cohorts 26 022 346 participants; 776 441 events						Kidney failure with replacement therapy: 57 cohorts 25 466 956 participants; 158 846 events					
105+	1.6	2.2	2.9	4.3	5.8	105+	1.4	2.0	3.0	4.1	5.4	105+	0.5	1.2	2.9	7.7	25
90-104	ref	1.3	1.8	2.6	3.1	90-104	ref	1.3	1.9	2.7	3.6	90-104	ref	1.8	4.3	12	43
60-89	1.0	1.3	1.7	2.2	2.8	60-89	1.0	1.4	1.7	2.4	3.2	60-89	2.3	4.9	10	27	85
45-59	1.3	1.6	2.0	2.4	3.1	45-59	1.4	1.7	2.2	2.8	3.8	45-59	13	19	37	89	236
30-44	1.8	2.0	2.5	3.2	3.9	30-44	2.0	2.3	2.8	3.7	4.6	30-44	50	58	115	240	463
15-29	2.8	2.8	3.3	4.1	5.6	15-29	3.2	3.1	3.5	5.0	6.5	15-29	283	301	443	796	1253
<15	4.6	5.0	5.3	6.0	7.0	<15	6.1	6.4	6.4	7.3	8.2	<15	770	1040	1618	2297	2547

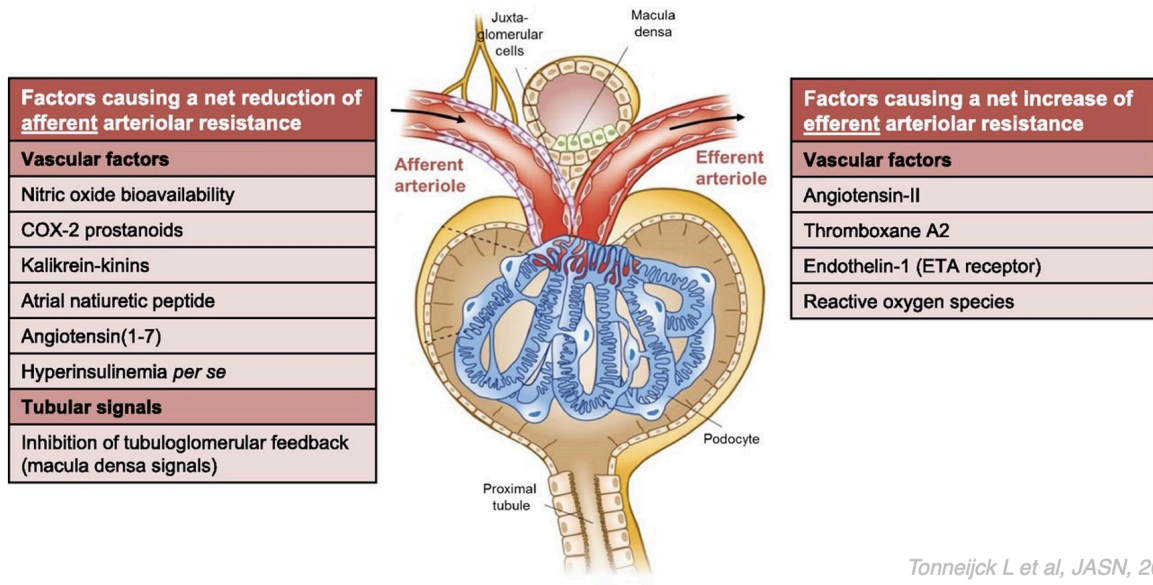
© Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. *Kidney Int.* 2024.

- The top row of the CKD heat map highlights very high eGFR with albuminuria as a potential hyperfiltration risk phenotype.
- Kidney-failure-focused endpoints may obscure recognition of this early risk.

5/ Hyperfiltration is a risk phenotype: cardiometabolic & hemodynamic stress raise single-nephron workload, making high filtration biologically expensive.

👉 examples: obesity, diabetes, hypertension, and insulin resistance

# Glomerular hyperfiltration in diabetes

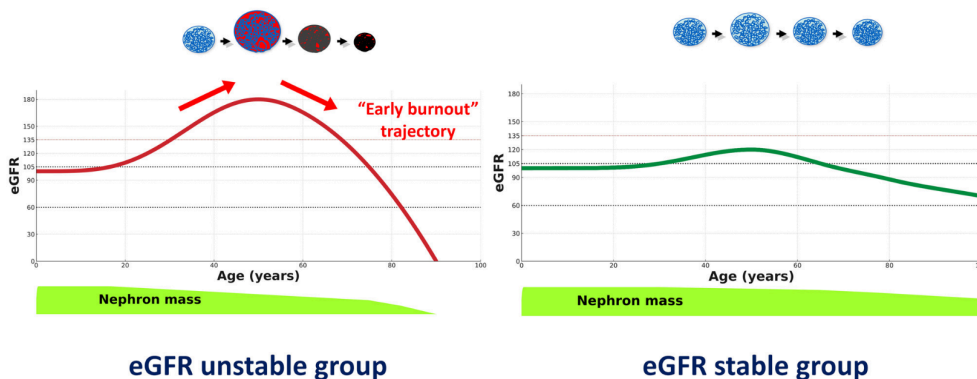


6/ Hyperfiltration predicts kidney decline, CVD and mortality. Thus, elevated eGFR requires context- trajectory, age, clinical setting- as it signals early cardiovascular vulnerability, not a standalone diagnosis

7/ Hyperfiltration and kidney failure are the same disease at different stages: starting with overload, ending with burnout. What matters is how the kidney function changes over time

💡 Watch the trajectory, don't wait for the decline

## a Hyperfiltration and Glomerular Hypertrophy Shape Lifetime eGFR Trajectories



8/ A single eGFR is a snapshot. Trajectory reveals more:

- ♦ rapid decline signals structural damage
- ♦ unexpected rise 🙌 hemodynamic overload

Both falling too fast/ climbing paradoxically predict kidney failure, heart events, and death, regardless of baseline eGFR or albuminuria

**b**

## Conceptual Expansion of the CKD Heat Map Adding eGFR Slope as the 11th Outcome

**Unstable eGFR slope**

		UACR		
		A1	A2	A3
eGFR	≥105	Yellow	Red	Red
	90–104	Green	Yellow	Red
	60–89	Green	Yellow	Red
	45–59	Yellow	Orange	Red
	30–44	Orange	Red	Red
	15–29	Red	Red	Red
	<15	Red	Red	Red

9/ In recognition of this evidence, the FDA and European Medicines Agency now accept eGFR slope as a surrogate endpoint in clinical trials

<https://pubmed.ncbi.nlm.nih.gov/31473020/>

10/ Very high eGFR signals glomerular pressure and tubular overload, not healthy reserve, out-risking stage 3b CKD. Add albuminuria (podocyte injury), and vulnerability multiplies

11/ Current staging misses the pre-CKD phase. Add slope + hyperfiltration to the heat map. The tools already exist- SGLT2 inhibitors, GLP-1 agonists, RAAS blockade, and weight management- all of which stabilize filtration trajectories

12/ Conclusion:

- ⚠ Very high eGFR + albuminuria = warning
- ⚠ Hyperfiltration signals early overload; eGFR slope captures instability
- ⚠ Update the heat map

📖 #KIreports thread by Cristina Popa @CristinaDeReins (Romanian nephrologist)

Thank you, Melvin, Brian, and Sophie for the feedback

Check out [#KIReportsCommunity](#) educational [#blogposts](#) and threads at [kireportscommunity.org](https://www.kireportscommunity.org).

<https://www.kireportscommunity.org/>