KDIGO Clinical Practice Guideline for the Evaluation and Management of CKD

2024 Update

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2024 CKD Guideline:

- Most of the statements in the 2012 CKD guideline have been revised and updated.

- Only 6 statements were kept unchanged from the 2012 guideline.

What is still the same in 2024 Guideline?

- The Definition of CKD:
  - Abnormalities of kidney structure or function, present for a minimum of 3 months, with implications for health

- The CGA Classification:
  - The "CGA" (Cause, GFR, Albuminuria) staging system continues to be a key for CKD assessment.

- Albuminuria assessment:
  - The role of albuminuria as a crucial marker for kidney damage. Monitoring and addressing albuminuria are still key components of CKD care.

Recommendation 1.1.2.1: In adults at risk for CKD, we recommend using creatinine-based estimated glomerular filtration rate (eGFRcr). If cystatin C is available, the GFR category should be estimated from the combination of creatinine and cystatin C (creatinine and cystatin C–based estimated glomerular filtration rate [eGFRcr-cys]) *(1B)*.

2024 guideline:

- Recommendations for adult and pediatric population, ESKD and transplant excluded

- Chapters (6) cover:
  - Evaluation of CKD
  - Risk assessment in people with CKD
  - Delaying CKD progression and managing its complications
  - Medication management and drug stewardship in CKD
  - Optimal models of care
  - Research recommendations

2024 KDIGO recommendations (42):

Grade	Implications		
	Patients	Clinicians	Policy
Level 1 "We recommend"	Most people in your situation would want the recommended course of action, and only a small proportion would not.	Most patients should receive the recommended course of action.	The recommendation can be evaluated as a candidate for developing a policy or a performance measure.
Level 2 "We suggest"	The majority of people in your situation would want the recommended course of action, but many would not.	Different choices will be appropriate for different patients. Each patient needs help to arrive at a management decision consistent with their values and preferences.	The recommendation is likely to require substantial debate and involvement of stakeholders before policy can be determined.

Grade	Certainty of evidence	Meaning
A	High	We are confident that the true effect is close to the estimate of the effect.
B	Moderate	The true effect is likely to be close to the estimate of the effect, but there is a possibility that it is substantially different.
C	Low	The true effect may be substantially different from the estimate of the effect.
D	Very low	The estimate of effect is very uncertain, and often, it will be far from the true effect.

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2024 KDIGO practice points (141):

- Consensus-based statements of the expert judgment of the Work Group. Not graded
- Issued:
  - When no systematic review on a clinical question
  - To help readers implement the guidance from graded recs (like frequency of monitoring, referral to specialists, etc)
  - For issuing “good practice statement” when the alternative is considered to be absurd.

- PP are considered expert guidance. Use as they see fit to perform the care of patients
- PP should not be seen as “less important” or a “downgrade” from graded recommendations despite being based on a different methodology

1. CKD definition

Abnormalities of kidney structure or function, present for a minimum of 3 months, with implications for health

Table 1 | Criteria for chronic kidney disease (either of the following present for a minimum of 3 months)

Markers of kidney damage (1 or more)	Albuminuria (ACR ≥30 mg/g [≥3 mg/mmol])
	Urine sediment abnormalities
	Persistent hematuria
	Electrolyte and other abnormalities due to tubular disorders
	Abnormalities detected by histology
	Structural abnormalities detected by imaging
	History of kidney transplantation
Decreased GFR	GFR <60 ml/min per 1.73 m^2 (GFR categories G3a–G5)

ACR, albumin-to-creatinine ratio; GFR, glomerular filtration rate.

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CKD by GFR and Albuminuria category:

KDIGO: Prognosis of CKD by GFR and albuminuria categories

GFR categories (ml/min/1.73 m²) Description and range				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30–300 mg/g 3–30 mg/mmol	>300 mg/g >30 mg/mmol
	G1	Normal or high	≥90			
	G2	Mildly decreased	60–89			
	G3a	Mildly to moderately decreased	45–59			
	G3b	Moderately to severely decreased	30–44			
	G4	Severely decreased	15–29			
	G5	Kidney failure	<15			

Green: low risk (if no other markers of kidney disease, no CKD); Yellow: moderately increased risk; Orange: high risk; Red: very high risk. GFR, glomerular filtration rate.

- KDIGO breaks down the use of GFR and ACR throughout CKD stages
- In the absence of evidence of kidney damage, neither G1 nor G2 fulfills the criteria for CKD.

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1a. Etiology of CKD

- Methods to evaluate the cause include:
  - imaging
  - lab tests: serologic, urine tests
  - kidney biopsy*
  - genetic testing

Recommendation 1.1.4.1: We suggest performing a kidney biopsy as an acceptable, safe, diagnostic test to evaluate cause and guide treatment decisions when clinically appropriate *(2D)*.

2. Evaluation of chronicity: CKD vs AKD

- Past GFRs, albuminuria, imaging, fibrosis on pathology, etc.
- Past medical history
- Measurements within and beyond 3 months

3. CKD management throughout the lifespan

- Consider age, sex, gender
- Tailored strategies for diagnosis/testing, risk evaluation, management options, treatment goals.

4. Diagnostic approach for senior patients (>65 yo)

- Same threshold for GFR of 60 ml/min, even in the absence of albuminuria
- Below GFR of 60 ml/min the relative risk of adverse outcomes is consistently elevated and progressively increases

Overall	Urine albumin-creatinine ratio, mg/g					Urine albumin-creatinine ratio, mg/g				
eGFRcr	<10	10–29	30–299	300–999	1000+	<10	10–29	30–299	300–999	1000+
	All-cause mortality: 82 cohorts 26 444 384 participants; 2 604 028 events					Myocardial infarction: 64 cohorts 22 838 356 participants; 451 063 events				
105+	1.6	2.2	2.9	4.3	5.8	1.1	1.4	2.0	2.7	3.8
90–104	ref	1.3	1.8	2.6	3.1	ref	1.3	1.6	2.2	3.2
60–89	1.0	1.3	1.7	2.2	2.8	1.1	1.3	1.6	2.2	3.1
45–59	1.3	1.6	2.0	2.4	3.1	1.4	1.7	2.0	2.8	3.7
30–44	1.8	2.0	2.5	3.2	3.9	1.9	2.0	2.4	3.2	4.3
15–29	2.8	2.8	3.3	4.1	5.6	2.7	3.1	3.1	4.2	5.1
<15	4.6	5.0	5.3	6.0	7.0	4.6	5.6	4.8	6.0	6.0
	Cardiovascular mortality: 76 cohorts 26 022 346 participants; 776 441 events					Stroke: 68 cohorts 24 746 436 participants; 461 785 events				
105+	1.4	2.0	3.0	4.1	5.4	1.2	1.6	2.2	3.1	4.3
90–104	ref	1.3	1.9	2.7	3.6	ref	1.3	1.6	2.4	3.1
60–89	1.0	1.4	1.7	2.4	3.2	1.1	1.3	1.7	2.2	3.0
45–59	1.4	1.7	2.2	2.8	3.8	1.4	1.6	1.9	2.3	2.9
30–44	2.0	2.3	2.8	3.7	4.6	1.6	1.7	2.0	2.4	3.0
15–29	3.2	3.1	3.5	5.0	6.5	1.8	2.1	2.1	2.7	3.0
<15	6.1	6.4	6.4	7.3	8.2	3.2	2.8	2.9	3.2	3.8
	Kidney failure with replacement therapy: 57 cohorts 25 466 956 participants; 158 846 events					Heart failure: 61 cohorts 24 603 016 participants; 1 132 443 events				
105+	0.5	1.2	2.9	7.7	25	1.2	1.7	2.7	4.2	6.9
90–104	ref	1.8	4.3	12	43	ref	1.3	2.0	2.8	4.2
60–89	2.3	4.9	10	27	85	1.1	1.4	1.9	2.7	4.2
45–59	13	19	37	89	236	1.6	1.8	2.4	3.4	5.0
30–44	50	58	115	240	463	2.2	2.5	3.1	4.2	6.5
15–29	283	301	443	796	1253	3.6	3.5	4.1	5.8	8.1
<15	770	1040	1618	2297	2547	5.1	5.7	5.8	7.9	9.9
	Acute kidney injury: 49 cohorts 23 914 614 participants; 1 408 929 events					Atrial fibrillation: 50 cohorts 22 886 642 participants; 1 068 701 events				
105+	1.0	1.6	2.4	3.7	5.5	1.1	1.3	1.7	2.4	3.5
90–104	ref	1.4	2.1	3.2	5.0	ref	1.2	1.5	1.9	2.3
60–89	1.6	2.2	3.1	4.3	6.7	1.0	1.2	1.4	1.7	2.2
45–59	3.5	4.0	5.1	6.9	9.0	1.2	1.3	1.5	1.8	2.4
30–44	5.6	5.9	6.8	8.6	11	1.4	1.5	1.7	2.0	2.4
15–29	8.3	8.0	8.5	9.9	10	1.9	1.8	2.0	2.6	3.0
<15	8.5	11	7.9	5.5	5.7	2.6	2.5	3.1	3.6	4.2
	Hospitalization: 49 cohorts 25 426 722 participants; 8 398 637 events					Peripheral artery disease: 54 cohorts 24 830 794 participants; 378 924 events				
105+	1.4	1.7	2.1	2.1	2.3	0.9	1.4	1.9	2.8	5.0
90–104	ref	1.1	1.3	1.5	1.7	ref	1.3	1.9	2.8	4.3
60–89	1.0	1.1	1.3	1.5	1.8	1.0	1.3	1.8	2.5	3.8
45–59	1.3	1.3	1.5	1.7	2.1	1.5	1.7	2.1	2.9	4.2
30–44	1.5	1.5	1.6	1.9	2.3	2.0	1.9	2.5	3.6	5.0
15–29	1.8	1.8	1.9	2.4	2.8	3.3	3.3	3.8	5.7	8.1
<15	2.7	2.8	3.0	3.2	3.8	9.1	9.0	9.6	13	14

Associations of CKD staging by eGFR-Cr and ACR categories and risks for 10 common complications in multivariable-adjusted analyses.

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5. Improvement of GFR assessment

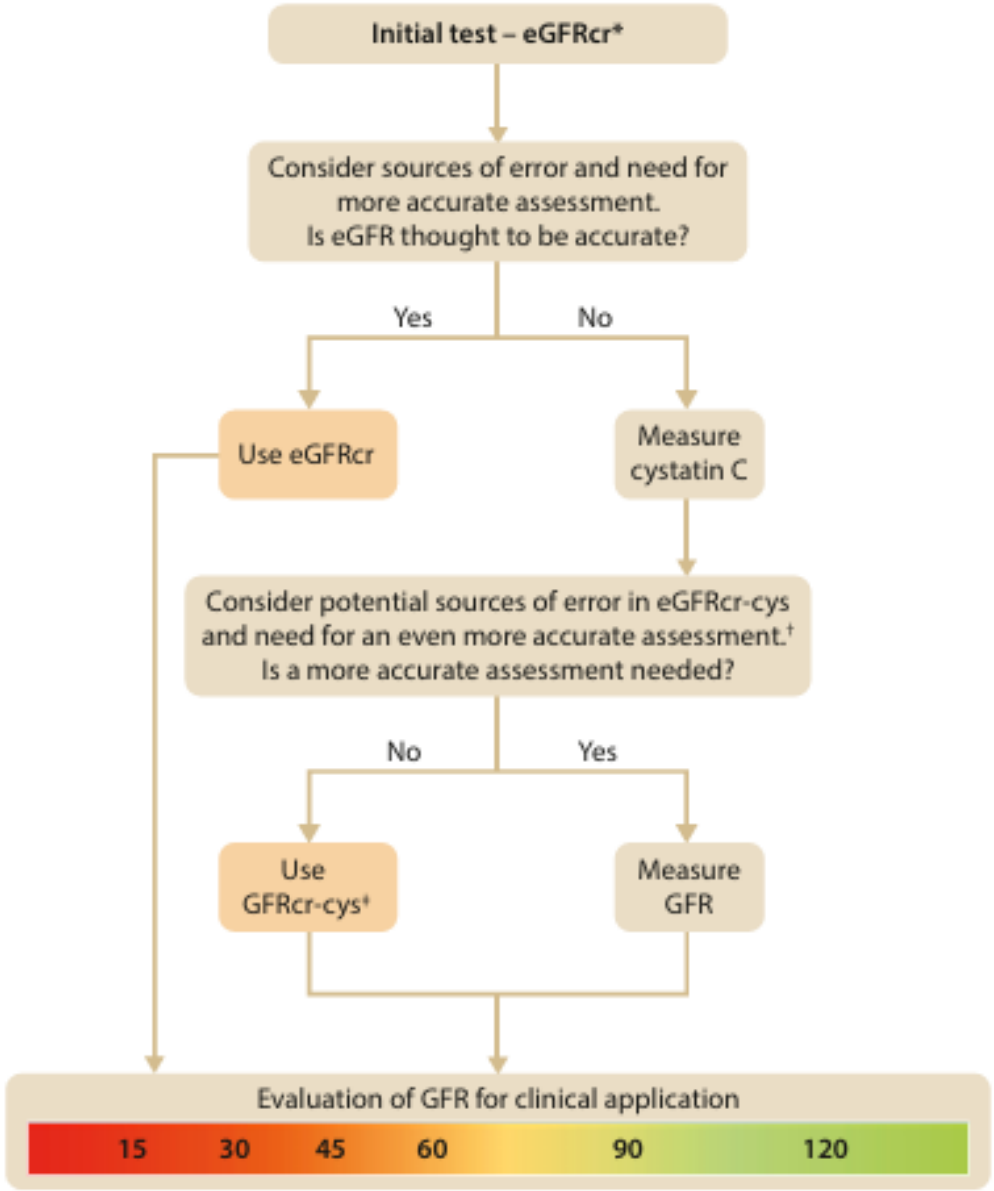
- When available, use both Cr and cystatin C to estimate GFR for accuracy, better risk assessment.

Recommendation 1.1.2.1: In adults at risk for CKD, we recommend using creatinine-based estimated glomerular filtration rate (eGFRcr). If cystatin C is available, the GFR category should be estimated from the combination of creatinine and cystatin C (creatinine and cystatin C–based estimated glomerular filtration rate [eGFRcr-cys]) *(1B)*.

Recommendation 1.2.2.1: We recommend using eGFRcr-cys in clinical situations when eGFRcr is less accurate and GFR affects clinical decision-making (Table 8[127-142]) *(1C)*.

- Measure GFR when more accurate assessment may impact your decisions

Practice Point 1.2.2.1: Use serum creatinine (SCr) and an estimating equation for initial assessment of GFR (Figure 11).



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6. ACR and eGFR results accuracy and reliability

- Understand variability of GFR and urine protein assessment
- Acknowledge limitations of our assessment methods to determine true changes
- Ensure laboratory following the necessary care standards

7. Use of a validated

Recommendation 1.2.4.1: We recommend using a validated GFR estimating equation to derive GFR from serum filtration markers (eGFR) rather than relying on the serum filtration markers alone *(1D)*.

- Equations to derive GFR from serum filtration markers:
  - Validation within the specific population of interest.
  - Standardized use of the same equation across geographical regions.
  - Different equations for adults and children.

8. Point-of-care testing

- May be used for Cr and urine albumin assessment
- Quality is adequately assured
- If access to lab testing limited, or
- If it will aid the clinical pathway

Recommendation 1.4.1: We suggest that point-of-care testing (POCT) may be used for creatinine and urine albumin measurement where access to a laboratory is limited or providing a test at the point-of-care facilitates the clinical pathway *(2C)*.

9. Risk assessment tools

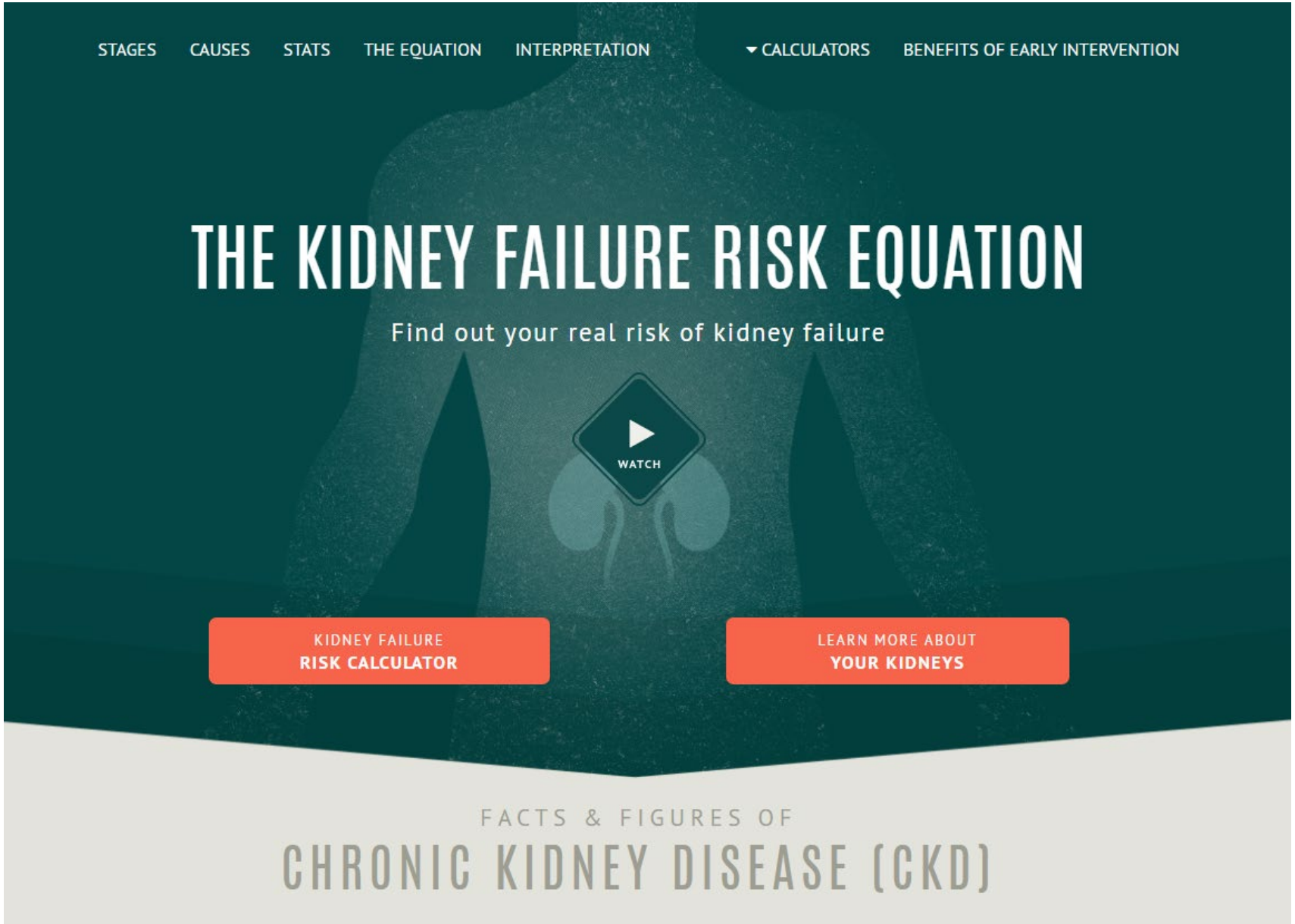
- Only externally validated tools should be used to help in decision making:
  - Tools to estimate the risk of kidney failure or GFR decline
  - Disease-specific prediction equations in people with IgAN and ADPKD

Recommendation 2.2.1: In people with CKD G3–G5, we recommend using an externally validated risk equation to estimate the absolute risk of kidney failure *(1A)*.

Kidney failure validated models:

- The Kidney Failure Risk Equation (Tangri et al. JAMA 2011)
- The Veterans Affairs model
- The Z6 Score model (Zacharias et al. Am J Kidney Dis 2022).

KFRE

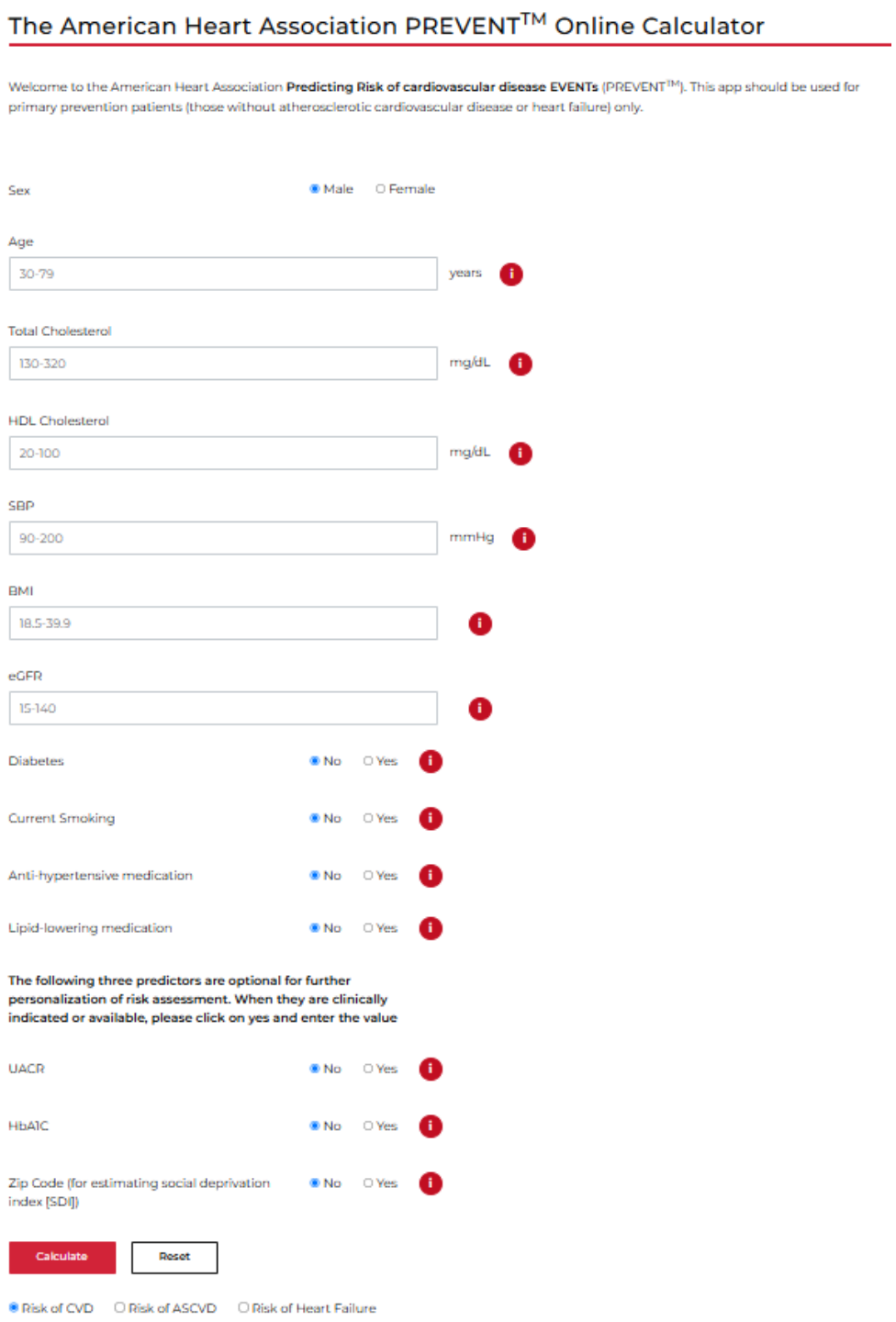


https://www.kidneyfailurerisk.com/

Tangri et al, JAMA 2011

9. Risk assessment tools (cont.)

- Externally validated tools, including patients with CKD or eGFR and urine albumin:
  - Cardiovascular risk prediction
  - All-mortality risk prediction tool



American Heart Association Predicting Risk of CVD EVENTs (PREVENT)

https://professional.heart.org/en/guidelines-and-statements/prevent-calculator

Other CV validated tools:

- QRISK3 (Hippisley-Cox et al. BMJ 2017),
- Ckdpc.org (Chronic Kidney Disease Prognosis Consortium KI 2018)

Khan et al, Circulation 2024.

All-mortality risk prediction*:

- To guide GOC discussion
- To identify high risk patients
- Not to be used to determine the futility of initiating KRT!

  - CKD-PC (Chronic Kidney Disease Prognosis Consortium KI 2018)
  - 5-year mortality model in the Cardiovascular Health Study (Khan et al Circulation 2024).

10. Longitudinal care

- Timing of reassessment:
  - In partnership with patients and considering targets of care
  - Using validated risk prediction tools and clinical evaluation
- Supporting people and families living with CKD

11.Comprehensive CKD treatment strategy

- Lifestyle factors modification
  - Physical activity* and optimal weight
  - Avoidance of tobacco products
  - Healthy diet
- Medical management
- Complications management

Recommendation 3.2.2.1: We recommend that people with CKD be advised to undertake moderate-intensity physical activity for a cumulative duration of at least 150 minutes per week, or to a level compatible with their cardiovascular and physical tolerance *(1D)*.

12. Dietary recommendations

- Healthy and diverse diet
- Higher consumption of plant-based foods over animal-based foods
- Minimize consumption of ultra processed food
- **Recommendation 3.3.2.1: We suggest that sodium intake be <2 g of sodium per day (or <90 mmol of sodium per day, or <5 g of sodium chloride per day) in people with CKD *(2C)*.**
- To benefit CKD progression, but also complications (acidosis, hyperK, hyperPhos)

13. Blood pressure control

- **Recommendation 3.4.1: We suggest that adults with high BP and CKD be treated with a target systolic blood pressure (SBP) of <120 mm Hg, when tolerated, using standardized office BP measurement *(2B)*.**
- Individualized approach to BP target
  - In frail patients
  - High fall risk patients
  - Patients with symptomatic postural hypotension
  - Patients with limited life expectancy

14. RAS and SGLT2 inhibitors – first line therapy

- Delay progression of CKD
- In patents with and without diabetes
- Consider level of albuminuria when starting SGLT2i in people without DM
- SGLT2i beneficial in CKD + CHF patients irrespective of albuminuria level
- In addition to moderate or high intensity statins

Recommendation 3.6.1: We recommend starting renin-angiotensin-system inhibitors (RASi) (angiotensin-converting enzyme inhibitor [ACEi] or angiotensin II receptor blocker [ARB]) for people with CKD and severely increased albuminuria (G1–G4, A3) without diabetes *(1B)*.

Recommendation 3.6.2: We suggest starting RASi (ACEi or ARB) for people with CKD and moderately increased albuminuria (G1–G4, A2) without diabetes *(2C)*.

Recommendation 3.6.3: We recommend starting RASi (ACEi or ARB) for people with CKD and moderately-to-severely increased albuminuria (G1–G4, A2 and A3) with diabetes *(1B)*.

Recommendation 3.6.4: We recommend avoiding any combination of ACEi, ARB, and direct renin inhibitor (DRI) therapy in people with CKD, with or without diabetes *(1B)*.

Recommendation 3.7.1: We recommend treating patients with type 2 diabetes (T2D), CKD, and an eGFR ≥20 ml/min per 1.73 m^2 with an SGLT2i *(1A)*.

Recommendation 3.7.2: We recommend treating adults with CKD with an SGLT2i for the following *(1A)*:

- eGFR ≥20 ml/min per 1.73 m^2 with urine ACR ≥200 mg/g (≥20 mg/mmol), or
- heart failure, irrespective of level of albuminuria.

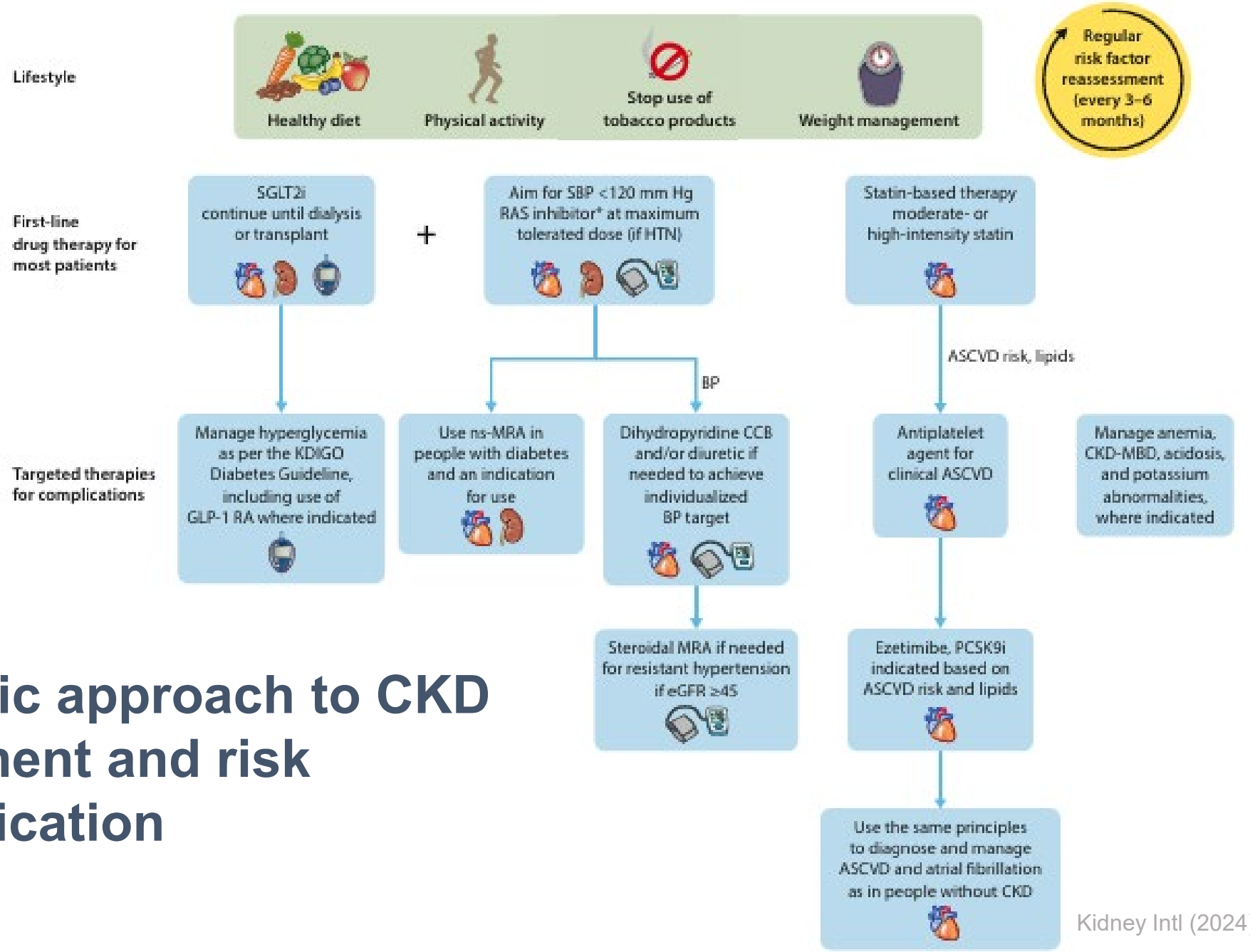
Recommendation 3.7.3: We suggest treating adults with eGFR 20 to 45 ml/min per 1.73 m^2 with urine ACR <200 mg/g (<20 mg/mmol) with an SGLT2i *(2B)*.

15. Expected GFR change after RASi and SGLT2i start

- GFR dip within 30% from baseline is expected
- GFR drop >30% should prompt review and evaluation for other causes and requires close monitoring

16.Cardiovascular risk estimation

- 10-year CV risk estimation using externally validated tools incorporating CKD to guide CV disease prevention
- CKD is NOT a contraindication for invasive treatment in unstable heart disease, or imaging studies, but individualized approach should be used



Holistic approach to CKD treatment and risk modification

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17.Medication stewardship

- Complex medication regimens and multiple providers/specialists – medication review is a key
- Limitation of OTC medications, dietary an herbal remedies
- EGFR adjusted dosing. Use of measured GFR when accuracy needed

18. Optimal medication regimen

- Ensure clear communications about medication discontinuation and restarting to avoid harm and minimize associated risks
- Document the plan, and share the plan with patient and their health care providers

19.Symptom management

- Symptoms identification and regular reassessment
- Patient centered targeted treatment and change in treatment plan when needed
- Effective communication and shared decision making to build treatment strategy

20. Advanced care planning

- Timely and clear communication between person with CKD, caregivers, family and healthcare providers
- Planning for the future at any stage of lifelong CKD condition, including end-of-life care
- Supportive care

References:

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