



Applying Race-Agnostic eGFR for Medication-Related Decisions: Case Vignettes



CKD intercept



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Vignette 1 – Ambulatory Care/Anticoagulation #1

A 62-year-old female with atrial fibrillation is referred to you to discuss anticoagulation options. She is unable to complete routine lab monitoring necessary for warfarin but also has concerns that direct-acting oral anticoagulants (DOACs) may be cost prohibitive. After investigating her medication insurance formulary options and discussing options with the patient, you collaboratively identify generic dabigatran as the most practical approach for long-term anticoagulation to balance affordability, safety, and fewer monitoring requirements.

Past Medical History

- Non-valvular atrial fibrillation
- Obstructive sleep apnea
- Heart failure with preserved ejection fraction (HFpEF)
- Dyslipidemia
- Hypertension
- CKD Stage G3b

Current Medications

- Atorvastatin 40 mg daily
- Calcium carbonate 600 mg + vitamin D 25 mcg – 1 tablet daily
- Empagliflozin 10 mg daily
- Furosemide 20 mg daily
- Lisinopril 40 mg daily
- Metoprolol succinate 50 mg daily

Laboratory Information

	Today	3 months ago
Sodium (mEq/L)	137	138
Potassium (mEq/L)	4.5	4.8
Chloride (mEq/L)	98	97
CO ₂ (mEq/L)	26	26
BUN (mg/dL)	32	31
Serum Creatinine (mg/dL)	1.52	1.54
*eGFR _{cr} (mL/min/1.73m ²)	39	38
ALT (U/L)	15	—
AST (U/L)	19	—
Platelets (cells/mm ³)	187	—

*Standardized eGFR_{cr} reported using the 2021 CKD-EPI_{cr} equation

Measurements

	Today	3 months ago
Height (cm)	154.5	154.5
Weight (kg)	84.2	84.1
BMI (kg/m ²)	35.3	35.2
BSA (m ²) [Dubois method]	1.83	1.83
Blood Pressure (mmHg)	134/72	131/69
Pulse (bpm)	66	68

Electronic Health Record (EHR) Automated Reporting of Estimated Creatinine Clearance:
eCrCL_{IBW} 29 mL/min [Formula: $\{((140 - \text{age}) \times \text{ideal body weight}) / (72 \times \text{SCr})\} \times 0.85$ (if female)]

QUESTIONS

1. What is the patient's 2021 CKD-EPIcr $eGFR_{BSAadj}$ based on today's labs/measurements?
 - A. 29 mL/min/1.73 m²
 - B. 34 mL/min
 - C. 39 mL/min/1.73 m²
 - D. 41 mL/min
2. Why is the $eGFR_{BSAadj}$ higher than the eGFR reported in the patient's chart?
 - A. Because the patient's serum creatinine is greater than 1 mg/dL
 - B. Because the patient's body surface area is greater than 1.73 m²
 - C. Because the patient's height is greater than 150 cm
 - D. Because the patient's weight is greater than 72 kg
3. What dabigatran dosage is recommended based on the $eGFR_{BSAadj}$?
 - A. 75 mg by mouth twice daily
 - B. 110 mg by mouth twice daily
 - C. 150 mg by mouth twice daily
 - D. 110 mg by mouth on first day, then 220 mg by mouth once daily

Vignette 2 – Ambulatory Care/Anticoagulation #2

A 68-year-old female with atrial fibrillation is referred to you to initiate direct-acting oral anticoagulant (DOAC) therapy for new onset atrial fibrillation and you find that rivaroxaban is the preferred agent on her insurance formulary.

Past Medical History

- Depression
- Hypothyroidism
- Osteoarthritis
- Atrial fibrillation

Current Medications

- Acetaminophen 650 mg twice daily
- Levothyroxine 88 mcg daily
- Metoprolol tartrate 25 mg twice daily
- Sertraline 100 mg daily

Social History

- No alcohol
- No smoking
- Vegetarian diet (since age 20)

Laboratory Information

	Today	3 months ago
Sodium (mEq/L)	137	138
Potassium (mEq/L)	4.5	4.8
Chloride (mmol/L)	98	97
CO ₂ (mEq/L)	26	26
BUN (mg/dL)	32	31
Serum Creatinine (mg/dL)	0.90	0.90
Cystatin C (mg/L)	1.41	1.44
*eGFR _{cr} (mL/min/1.73m ²)	70	70
**eGFR _{cys} (mL/min/1.73m ²)	44	43
***eGFR _{cr-cys} (mL/min/1.73m ²)	56	55
ALT (U/L)	15	—
AST (U/L)	19	—
TSH (mIU/L)	2.4	—
Free T ₄ (ng/dL)	1.1	—
Platelets (cells/mm ³)	187	—

*Standardized eGFR_{cr} reported using the 2021 CKD-EPI_{cr} equation

**Standardized eGFR_{cys} reported using the 2012 CKD-EPI_{cys} equation

***Standardized eGFR_{cr-cys} reported using the 2021 CKD-EPI_{cr-cys} equation

Measurements

	Today	3 months ago
Height (cm)	164.5	164.5
Weight (kg)	55	55
BMI (kg/m ²)	20.3	20.3
BSA (m ²) [Dubois method]	1.59	1.59
Blood Pressure (mmHg)	134/72	131/69
Pulse (bpm)	66	68

Electronic Health Record (EHR) Automated Reporting of Estimated Creatinine Clearance:

eCr_{CL_{BW}} 53 mL/min [Formula: $\{((140-\text{age}) \times \text{ideal body weight}) / (72 \times \text{SCr})\} \times 0.85$ (if female)]

QUESTIONS

1. Which eGFR equation should be used for medication-related decision making in this patient?
 - A. 2021 CKD-EPI_{cr} eGFR
 - B. 2021 CKD-EPI_{cr-cys} eGFR
 - C. 2012 CKD-EPI_{cys} eGFR
 - D. 1976 Cockcroft-Gault eCrCL

2. What rivaroxaban dosage is recommended based on the 2012 CKD-EPI_{cys} eGFR_{BSAdj}?
 - A. 15 mg daily
 - B. 20 mg daily
 - C. 10 mg twice daily
 - D. 15 mg twice daily

Vignette 3 – Ambulatory Care/Comprehensive Medication Review

A 66-year-old female is referred to you for a pharmacotherapy consult. The referring provider is requesting your input on the appropriate doses for medications to treat an acute herpes zoster (shingles) flare given her CKD. Since you are reviewing the patient's profile, the referring provider also requests guidance on whether the patient's current medications are appropriately dosed for her kidney function.

Past Medical History

- Type 2 diabetes
- Hypertension
- Non-valvular atrial fibrillation
- CKD Stage G3a
- History of post-herpetic neuralgia

Current Medications

- Dapagliflozin 10 mg once daily
- Hydrochlorothiazide 25 mg once daily
- Losartan 100 mg once daily
- Metformin 1000 mg twice daily
- Rivaroxaban 20 mg once daily
- Rosuvastatin 10 mg once daily

Laboratory Information

	Today	3 months ago
Sodium (mEq/L)	140	140
Potassium (mEq/L)	4.5	4.4
Chloride (mEq/L)	100	99
CO ₂ (mEq/L)	26	26
BUN (mg/dL)	20	19
Serum Creatinine (mg/dL)	1.26	1.28
*eGFR _{cr} (mL/min/1.73m ²)	47	46
ALT (U/L)	18	—
AST (U/L)	18	—

*Standardized eGFR_{cr} reported using the 2021 CKD-EPI_{cr} equation

Measurements

	Today	3 months ago
Height (cm)	175	175
Weight (kg)	82	80
BMI (kg/m ²)	26.8	26.1
BSA (m ²) [Dubois method]	1.98	1.96
Blood Pressure (mmHg)	126/74	130/72
Pulse (bpm)	72	68

Electronic Health Record (EHR) Automated Reporting of Estimated Creatinine Clearance:

eCrCL_{IBW} 46 mL/min [Formula: $\{((140 - \text{age}) \times \text{ideal body weight}) / (72 \times \text{SCr})\} \times 0.85$ (if female)]

QUESTIONS

- What is the patient's $eGFR_{BSAadj}$ based on today's labs/measurements?
 - 46 mL/min
 - 47 mL/min
 - 50 mL/min
 - 54 mL/min
- The referring provider is interested in prescribing **valacyclovir** for the patient's acute shingles flare-up. The FDA-approved prescribing information is provided below. What is the most appropriate dosage for this patient?

Indication	Creatinine Clearance (mL/min)			
	≥50	30–49	10–29	<10
<i>Herpes zoster</i>	1 gram every 8 hours	1 gram every 12 hours	1 gram every 24 hours	500 mg every 24 hours

- 1 gram by mouth every 8 hours
 - 1 gram by mouth every 12 hours
 - 1 gram by mouth every 24 hours
 - 500 mg by mouth every 24 hours
- The referring provider is also interested in prescribing **pregabalin** to treat the patient's neuralgias secondary to her acute shingles flare-up. The FDA-approved prescribing information is provided below. What is the most appropriate dosage for this patient?

Indication	Creatinine Clearance (mL/min)			
	≥60	30–59	15–29	<15
<i>Postherpetic neuralgia</i>	150 mg/day (divided in 2–3 doses)	75 mg/day (divided in 2–3 doses)	25–50 mg/day (divided in 1–2 doses)	25 mg once daily

- 75 mg by mouth twice daily
 - 50 mg by mouth twice daily
 - 25 mg by mouth three times daily
 - 25 mg by mouth twice daily
- Which rivaroxaban dosage is most appropriate considering this patient's kidney function?
 - Continue 20 mg by mouth once daily
 - Increase to 15 mg by mouth twice daily
 - Decrease to 15 mg by mouth once daily
 - Decrease to 10 mg by mouth once daily

Vignette 4 – Ambulatory Care/GFR Biomarkers

You are working in a rural clinic with an attached outpatient pharmacy where you provide medication management and patient education. You are authorized to order labs and other measurements as needed for accurate assessment of kidney function at least annually.

The following is a list of patients who are scheduled for a clinic visit today. Each patient had a metabolic panel checked in the preceding days in preparation for their visit, and *all patients have stable kidney function*.



Patient 1

65-year-old male who is currently prescribed glipizide, lisinopril, metoprolol, and atorvastatin

- SCr: 1.41 mg/dL
- Weight: 123 kg
- Height: 70 inches
- PMH: hypertension, CV disease, type 2 diabetes, and class 3 obesity



Patient 2

62-year-old male who is currently prescribed amlodipine and tadalafil

- SCr: 0.92 mg/dL
- Weight: 78 kg
- Height: 72 inches
- PMH: hypertension, BPH, and ED



Patient 3

49-year-old female who is currently prescribed pregabalin

- SCr: 0.40 mg/dL
- Weight: 41 kg
- Height: 64 inches
- PMH: spinal cord injury with quadriplegia



Patient 4

75-year-old female who is currently prescribed a daily aspirin and as needed albuterol

- SCr: 0.61 mg/dL
- Weight: 68 kg
- Height: 66 inches
- PMH: former smoker (quit in 2004)

QUESTIONS

1. Of the 4 patients you will see today, whose kidney function assessment should incorporate a measurement of cystatin C to be most accurate?
 - A. Patients 1 and 2
 - B. Patients 1, 2, and 4
 - C. Patients 3 and 4
 - D. Patients 1 and 3

2. In which patient would serum creatinine alone be reasonable for assessing kidney function?
 - A. Patient 1
 - B. Patient 2
 - C. Patient 3
 - D. Patient 4

Vignette 5 – Ambulatory Care/GFR Biomarkers

You are working in a rural clinic with an attached outpatient pharmacy where you provide medication management and patient education. You are authorized to order labs and other measurements as needed for accurate assessment of kidney function at least annually.

A 55-year-old male returns to his primary care provider (PCP) for a follow up visit. His PCP has discussed the need for him to see a nephrologist and to start additional drug therapy to manage his CKD, but the patient was reluctant to go to another doctor or add medications to his regimen. Since his last visit 6 months ago, he has learned more about kidney failure and what it means to need dialysis or require a transplant and would like to discuss additional treatment options for CKD.

Past Medical History

- Type 2 diabetes
- Hypertension
- CKD stage G4
- Class 2 obesity
- Gout

Current Medications

- Metformin 500 mg PO twice daily
- Lisinopril 20 mg PO daily (taking for 6 months)
- Allopurinol 100 mg PO daily
- ASA 81 mg PO daily

Laboratory Information

	Today	6 months ago
Potassium (mEq/L)	4.4	4.5
BUN (mg/dL)	28	30
Glucose (mg/dL)	150	168
Serum Creatinine (mg/dL)	2.74	2.69
Cystatin C (mg/L)	1.81	1.78
*eGFRcr (mL/min/1.73 m ²)	27	27
**eGFRcr-cys (mL/min/1.73 m ²)	31	32
UACR (mg/g)	330	250
HgA1C (%)	8.5	8.2

*Standardized eGFRcr reported using the 2021 CKD-EPIcr equation

**Standardized eGFRcr-cys reported using the 2021 CKD-EPIcr-cys equation

Measurements

	Today	3 months ago
Height (cm)	183	183
Weight (kg)	120	121
BMI (kg/m ²)	35.9	36.2
Blood Pressure (mm Hg)	138/75	136/76
Pulse (bpm)	74	72

Electronic Health Record (EHR) Automated Reporting of Estimated Creatinine Clearance:

eCrCL_{IBW} 34 mL/min [Formula: $\{((140-\text{age}) \times \text{ideal body weight}) / (72 \times \text{SCr})\} \times 0.85$ (if female)]

QUESTIONS

1. Which estimate of kidney function should be used for the purpose of drug dosing?
 - A. Standardized eGFRcr (mL/min/1.73 m²)
 - B. Standardized eGFRcr-cys (mL/min/1.73 m²)
 - C. BSA-adjusted eGFRcr-cys (mL/min)
 - D. Estimated creatinine clearance (mL/min) reported by the EHR
2. When using the 2021 CKD-EPI eGFR equation for the purpose of drug dosing in a patient with obesity, the standardized eGFR result reported by the lab in mL/min/1.73 m² should be multiplied by:
 - A. Body weight in kg
 - B. BSA divided by 1.73
 - C. Body weight in kg divided by 1.73
 - D. 1.73 m², then divided by the patient's BSA
3. The PCP is concerned about the use of metformin in this patient due to the warning in those with an eGFR <30 mL/min/1.73 m² and corresponding risk of lactic acidosis. Which is the appropriate course of action regarding metformin therapy?
 - A. Discontinue metformin since his standardized eGFRcr is < 30 mL/min/1.73 m²
 - B. Discontinue metformin since estimates of kidney function are likely inaccurate in this patient
 - C. Continue metformin since his BSA-adjusted eGFRcr-cys is 44 mL/min
 - D. Obtain a measured CrCl to assess his kidney function and determine metformin dosing

Vignette 6 – Inpatient Care/Infectious Disease/Transitions of Care

A 50-year-old man presents to the ED with worsening dyspnea after two recent hospitalizations for pneumonia. He was discharged one week ago after receiving vancomycin and cefepime, and he was prescribed ciprofloxacin to complete a 7-day course. On admission, imaging shows worsening patchy lung infiltrates leading to concerns for progressive pneumonia despite multiple antibiotics.

Past Medical History

- Hypertension
- Type 2 diabetes
- Neuropathic pain
- Autosomal recessive polycystic kidney disease (CKD Stage G3a)

Current Medications

- Amlodipine 10 mg daily
- Dapagliflozin 10 mg daily
- Gabapentin 300mg two times daily
- Metformin 1000 mg twice daily
- Sitagliptin 50 mg daily

Laboratory Information as reported in the Electronic Health Record

	Admission	3 months ago
Creatinine (mg/dL)	3.08	1.54
Cystatin C (mg/L)	2.51	1.41
*eCrCL (mL/min)	30	61
**eGFRcr (mL/min/1.73 m ²)	24	55
***eGFRcys (mL/min/1.73 m ²)	23	51
****eGFRcr-cys (mL/min/1.73 m ²)	24	53

*eCrCl reported by using original Cockcroft-Gault equation with actual body weight

**Standardized eGFRcr reported using the 2021 CKD-EPIcr equation

***Standardized eGFRcys reported using the 2012 CKD-EPIcys equation

****Standardized eGFRcr-cys reported using the 2021 CKD-EPIcr-cys equation

Measurements

	Today
Height (cm)	165
Weight (kg)	75
BMI (kg/m ²)	27.5
BSA (m ²) [Dubois method]	1.82

QUESTIONS

1. The infectious disease physician consulted the pharmacy for dosing recommendations of piperacillin/tazobactam (Pip/Taz) for suspected pneumonia due to *Pseudomonas aeruginosa* infection. The FDA-approved prescribing information is provided below. Which of the following would be the most appropriate equation to estimate kidney function for the purpose of drug dosing?

Creatinine Clearance (mL/min)		
>40	20 to 40	<20
4.5 g IV every 6 hours	3.375 g IV every 6 hours	2.25 g IV every 6 hours

- A. eGFR using the 2021 CKD-EPI equation with adjustment for BSA
 B. Creatinine Clearance (eCrCL) using the Cockcroft-Gault equation
 C. eGFR using the MDRD equation with adjustment for BSA
 D. None of the equations will accurately estimate kidney function
2. The patient completed a seven-day course of appropriate antibiotics. By discharge, his serum creatinine had returned to baseline (1.54 mg/dL). The hospital medicine team requested pharmacy assistance in optimizing his gabapentin dosing for discharge. The FDA-approved prescribing information is provided below. Which of the following statements is most appropriate?

Creatinine Clearance (mL/min)			
≥ 60	30–59	15–29	< 15*
Maximum 1200 mg three times daily (3600 mg total daily dose)	Maximum 700 mg twice daily (1400 mg total daily dose)	Maximum 700 mg once daily (700 mg total daily dose)	Maximum 300 mg once daily (300 mg total daily dose)

*For patients with creatinine clearance <15 mL/min, reduce daily dose in proportion to creatinine clearance (e.g., patients with a creatinine clearance of 7.5 mL/min should receive one-half the daily dose that patients with a creatinine clearance of 15 mL/min receive).

- A. Increase the gabapentin dose to 600 mg three times daily given the patient's eCrCl > 60 mL/min
 B. Continue gabapentin 300 mg two times daily given the eGFR_{BSAAdj} is between 30–59 mL/min
 C. Decrease the gabapentin dose to 300 mg once daily given the eGFR is < 30 mL/min/1.73m²
 D. Switch the gabapentin to pregabalin 75 mg twice daily because the eGFR_{BSAAdj} is > 60 mL/min
3. The endocrinologist requested a pharmacy consult to adjust the dosing of sitagliptin, metformin, and dapagliflozin based on the patient's kidney function upon discharge. As a reminder, his serum creatinine has returned to baseline (1.54 mg/dL). Which of the following statements is most appropriate?
- A. Based on the eGFR_{BSAAdj}, reduce metformin to 500 mg twice daily, continue sitagliptin 50 mg daily, and continue dapagliflozin 10 mg daily with close monitoring of kidney function
 B. Based on the eGFR_{BSAAdj}, continue metformin 1000 mg twice daily, increase sitagliptin to 100 mg daily, and continue dapagliflozin 10 mg daily with close monitoring of kidney function
 C. Based on the eGFR, continue metformin 1000 mg twice daily, increase sitagliptin to 100 mg daily, and continue dapagliflozin 10 mg daily with close monitoring of kidney function
 D. Based on the eCrCl, continue metformin 1000 mg twice daily, increase sitagliptin to 100 mg daily, and continue dapagliflozin 10 mg daily with close monitoring of kidney function

Vignette 7 – Inpatient Care/Infectious Disease/Anticoagulation

A 75-year-old woman was admitted to the hospital a week ago for diabetic foot infection. The infectious diseases team was consulted and recommended cefepime following successful surgical debridement.

Past Medical History

- Chronic kidney disease (Stage G3b)
- Type 2 diabetes
- Hypertension
- Dyslipidemia
- Coronary artery disease
- Atrial fibrillation
- Cerebrovascular event 3 years ago

Current Medications

- Amlodipine 10 mg daily
- Apixaban 5 mg twice daily
- Aspirin 81 mg daily
- Insulin glargine 20 units nightly
- Linagliptin 5 mg daily
- Rosuvastatin 20 mg daily

Laboratory Information

	Today
Creatinine (mg/dL)	1.40
Cystatin C (mg/L)	1.50
*eCrCl (mL/min)	29
**eGFRcr (mL/min/1.73 m ²)	39
***eGFRcys (mL/min/1.73 m ²)	40
****eGFRcr-cys (mL/min/1.73 m ²)	41

*eCrCl reported using original Cockcroft-Gault equation with actual body weight

**Standardized eGFRcr reported using the 2021 CKD-EPIcr equation

***Standardized eGFRcys reported using the 2012 CKD-EPIcys equation

****Standardized eGFRcr-cys reported using the 2021 CKD-EPIcr-cys equation

Measurements

	Today
Height (cm)	155
Weight (kg)	52.2
BSA (m ²)	1.49

QUESTIONS

1. The attending physician consulted the pharmacy for cefepime dosage recommendations for this patient. The FDA-approved prescribing information is provided below. Which of the following regimens is most appropriate?

Creatinine Clearance (mL/min)			
>60	30–60	11–29	<11
2 g IV every 8 hours	2 g IV every 12 hours	1 g IV every 12 hours or 2 g IV every 24 hours	1 g IV every 24 hours

- A. Cefepime 2 g IV every 8 hours
B. Cefepime 2 g IV every 12 hours
C. Cefepime 1 g IV every 12 hours
D. Cefepime 1 g IV every 24 hours
2. The cardiologist recommended holding apixaban and initiating therapeutic-dose subcutaneous enoxaparin for atrial fibrillation management during the hospital stay. Which of the following dosages is most appropriate (in addition to monitoring for anti-factor Xa levels)?
- A. Initiate enoxaparin 50 mg SubQ q12h
B. Initiate enoxaparin 50 mg SubQ q24h
C. Initiate enoxaparin 40 mg SubQ q24h
D. Initiate enoxaparin 30 mg SubQ q24h
3. On discharge, the attending physician consulted the pharmacy for appropriate apixaban dosing. Which of the following statements is most appropriate?
- A. Change apixaban dose to 10 mg twice daily for 7 days followed by 5 mg twice daily
B. Continue with apixaban home dose of 5 mg twice daily
C. Reduce apixaban home dose to 2.5 mg twice daily
D. Stop apixaban and switch patient to warfarin dosed by pharmacy
4. Three months later, the nephrologist saw the patient and noted an increase in serum creatinine to 1.61 mg/dL. The nephrologist consulted you for appropriate rosuvastatin dosing. Which of the following dosing strategies is most appropriate?
- A. Rosuvastatin 40 mg daily
B. Rosuvastatin 20 mg daily
C. Rosuvastatin 10 mg daily
D. Switch to atorvastatin 10 mg daily